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Foreword

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

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

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- x the first digit:
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- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

The present document establishes the minimum RF characteristics and minimum performance requirements for E-UTRA User Equipment (UE).

2 References

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

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.
 - 3GPP TR 21.905: "Vocabulary for 3GPP Specifications". [1] ITU-R Recommendation SM.329-10, "Unwanted emissions in the spurious domain" [2] [3] ITU-R Recommendation M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000". 3GPP TS 36.211: "Physical Channels and Modulation". [4] 3GPP TS 36.212: "Multiplexing and channel coding". [5] [6] 3GPP TS 36.213: "Physical layer procedures". [7] 3GPP TS 36.331: "Requirements for support of radio resource management". 3GPP TS 36.307: "Requirements on User Equipments (UEs) supporting a release-independent [8] frequency band". 3GPP TS 36.423: "X2 application protocol (X2AP) ". [9] [10] 3GPP TS 23.303: "Technical Specification Group Services and System Aspects; Proximity-based services (ProSe); Stage 2". 3GPP TS36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal [11] Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

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

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

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

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

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

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

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

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

Composite spectrum emission mask: Emission mask requirement for intraband non-contiguous carrier aggregation which is a combination of individual sub-block spectrum emissions masks.

Composite spurious emission requirement: Spurious emission requirement for intraband non-contiguous carrier aggregation which is a combination of individual sub-block spurious emission requirements.

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

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

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

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

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

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

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

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

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

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

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

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

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

NOTE: As defined in TS 23.303 [10].

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

NOTE: As defined in TS 23.303 [10].

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

NOTE: As defined in TS 23.303 [10].

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

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

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

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

Unsynchronized operation: Operation of TDD in two different systems, where the conditions for synchronized operation are not met.

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

3.2 Symbols

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

 $BW_{Channel}$ Channel bandwidth $Sub-block\ bandwidth,\ expressed\ in\ MHz.\ BW_{Channel,block} = F_{edge,block,high} - F_{edge,block,low.}$ $BW_{Channel,block} \\$ $BW_{Channel_CA}$ Aggregated channel bandwidth, expressed in MHz. BW_{GB} Virtual guard band to facilitate transmitter (receiver) filtering above / below edge CCs. E_{RS} Transmitted energy per RE for reference symbols during the useful part of the symbol, i.e. excluding the cyclic prefix, (average power normalized to the subcarrier spacing) at the eNode B transmit antenna connector $\hat{E}_{\mathfrak{s}}$ The averaged received energy per RE of the wanted signal during the useful part of the symbol, i.e. excluding the cyclic prefix, at the UE antenna connector; average power is computed within a set of REs used for the transmission of physical channels (including user specific RSs when present), divided by the number of REs within the set, and normalized to the subcarrier spacing

F Frequency

 $F_{agg_alloc_low} \qquad \quad Aggregated \ Transmission \ Bandwidth \ Configuration. \ The \ lowest \ frequency \ of \ the \ simultaneously$

transmitted resource blocks.

F_{agg_alloc_high} Aggregated Transmission Bandwidth Configuration. The highest frequency of the simultaneously

transmitted resource blocks.

 $F_{Interferer}$ (offset) Frequency offset of the interferer $F_{Interferer}$ Frequency of the interferer

F_C Frequency of the carrier centre frequency

 F_{C_agg} Aggregated Transmission Bandwidth Configuration. Center frequency of the aggregated carriers.

 $F_{C,block,\ high}$ Center frequency of the highest transmitted/received carrier in a sub-block. $F_{C,block,\ low}$ Center frequency of the lowest transmitted/received carrier in a sub-block.

 $\begin{array}{ll} F_{C_low} & \text{The centre frequency of the } \textit{lowest carrier}, \text{ expressed in MHz.} \\ F_{C_high} & \text{The centre frequency of the } \textit{highest carrier}, \text{ expressed in MHz.} \end{array}$

 $\begin{array}{ll} F_{DL_low} & The \ lowest \ frequency \ of \ the \ downlink \ operating \ band \\ F_{DL_high} & The \ highest \ frequency \ of \ the \ downlink \ operating \ band \\ F_{UL_low} & The \ lowest \ frequency \ of \ the \ uplink \ operating \ band \\ F_{UL_high} & The \ highest \ frequency \ of \ the \ uplink \ operating \ band \\ \end{array}$

 $\begin{array}{ll} F_{edge,block,low} & The \ lower \ sub-block \ edge, \ where \ F_{edge,block,low} = F_{C,block,low} - F_{offset}. \\ F_{edge,block,high} & The \ upper \ sub-block \ edge, \ where \ F_{edge,block,high} = F_{C,block,high} + F_{offset}. \\ F_{edge_low} & The \ lower \ edge \ of \ aggregated \ channel \ bandwidth, \ expressed \ in \ MHz. \\ F_{edge_high} & Frequency \ offset \ from \ F_{C_high} \ to \ the \ higher \ edge \ or \ F_{C_low} \ to \ the \ lower \ edge. \\ \end{array}$

 $F_{\text{offset,block,low}}$ Separation between lower edge of a sub-block and the center of the lowest component carrier

within the sub-block

 $F_{\text{offset,block,high}}$ Separation between higher edge of a sub-block and the center of the highest component carrier

within the sub-block

 $F_{offset_NS_23}$ Frequency offset in MHz needed if NS_23 is used

F_{OOB} The boundary between the E-UTRA out of band emission and spurious emission domains.

 P_{EMAX}

I_o	The power spectral density of the total input signal (power averaged over the useful part of the
	symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector, including the own-cell downlink signal
I_{or}	The total transmitted power spectral density of the own-cell downlink signal (power averaged over
	the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the eNode B transmit antenna connector
\hat{I}_{or}	The total received power spectral density of the own-cell downlink signal (power averaged over
	the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector
I_{ot}	The received power spectral density of the total noise and interference for a certain RE (average
	power obtained within the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector
L_{CRB}	Transmission bandwidth which represents the length of a contiguous resource block allocation expressed in units of resources blocks
N_{cp}	Cyclic prefix length Downlink EARFCN
$N_{ m DL} \ N_{oc}$	The power spectral density of a white noise source (average power per RE normalised to the
oc oc	subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as
	measured at the UE antenna connector
N_{oc1}	The power spectral density of a white noise source (average power per RE normalized to the
N.	subcarrier spacing), simulating interference in non-CRS symbols in ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector.
N_{oc2}	The power spectral density of a white noise source (average power per RE normalized to the
17	subcarrier spacing), simulating interference in CRS symbols in ABS subframe from all cells that are not defined in a test procedure, as measured at the UE antenna connector.
N_{oc3}	The power spectral density of a white noise source (average power per RE normalised to the
	subcarrier spacing), simulating interference in non-ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector
N_{oc}	The power spectral density (average power per RE normalised to the subcarrier spacing) of the
	summation of the received power spectral densities of the strongest interfering cells explicitly defined in a test procedure plus N_{oc} , as measured at the UE antenna connector. The respective
	power spectral density of each interfering cell relative to N_{oc} is defined by its associated DIP
	value, or the respective power spectral density of each interfering cell relative to N_{oc} is defined by
$N_{\rm Offs\text{-}DL}$	its associated Es/Noc value. Offset used for calculating downlink EARFCN
N _{Offs-UL}	Offset used for calculating uplink EARFCN
N_{otx}	The power spectral density of a white noise source (average power per RE normalised to the
	subcarrier spacing) simulating eNode B transmitter impairments as measured at the eNode B transmit antenna connector
N_{RB}	Transmission bandwidth configuration, expressed in units of resource blocks
$N_{ m RB_agg} \ N_{ m RB_alloc}$	The number of the aggregated RBs within the fully allocated Aggregated Channel bandwidth. Total number of simultaneously transmitted resource blocks in Channel bandwidth or Aggregated Channel Bandwidth.
$N_{RB,c}$	The transmission bandwidth configuration of component carrier c , expressed in units of resource blocks
$N_{RB,largest\;BW}$	The largest transmission bandwidth configuration of the component carriers in the bandwidth combination, expressed in units of resource blocks
N_{RX}	Number of receiver antennas
$N_{ m UL}$	Uplink EARFCN.
Rav	Minimum average throughput per RB.
P _{CMAX}	The configured maximum UE output power. The configured maximum UE output power for serving cell <i>c</i> .
P_{CMAX}, c P_{EMAX}	Maximum allowed IJE output power signalled by higher layers. Same as IE <i>P-Max</i> , defined in [7]

Maximum allowed UE output power signalled by higher layers. Same as IE *P-Max*, defined in [7].

 $P_{EMAX. c}$ Maximum allowed UE output power signalled by higher layers for serving cell c. Same as IE

P-Max, defined in [7].

 $P_{Interferer}$ Modulated mean power of the interferer

 $\begin{array}{ll} P_{PowerClass} & P_{PowerClass} \ is \ the \ nominal \ UE \ power \ (i.e., \ no \ tolerance). \\ P_{UMAX} & The \ measured \ configured \ maximum \ UE \ output \ power. \end{array}$

Puw Power of an unwanted DL signal Pw Power of a wanted DL signal

 $\begin{array}{ll} RB_{\text{start}} & \quad \text{Indicates the lowest RB index of transmitted resource blocks.} \\ RB_{\text{end}} & \quad \text{Indicates the highest RB index of transmitted resource blocks.} \end{array}$

 Δf_{OOB} Δ Frequency of Out Of Band emission.

 $\Delta R_{IB,c}$ Allowed reference sensitivity relaxation due to support for inter-band CA operation, for serving

cell c

 $\Delta T_{IB,c}$ Allowed maximum configured output power relaxation due to support for inter-band CA

operation, for serving cell c.

 $\Delta T_{\rm C}$ Allowed operating band edge transmission power relaxation.

 $\Delta T_{C,c}$ Allowed operating band edge transmission power relaxation for serving cell c.

ΔT_{ProSe} Allowed operating band transmission power relaxation due to support of E-UTRA ProSe on an

operating band.

σ Test specific auxiliary variable used for the purpose of downlink power allocation, defined in

Annex C.3.2. Sub-block gap size

3.3 Abbreviations

 W_{gap}

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

ABS Almost Blank Subframe

ACLR Adjacent Channel Leakage Ratio ACS Adjacent Channel Selectivity

A-MPR Additional Maximum Power Reduction

AWGN Additive White Gaussian Noise

BS Base Station

CA Carrier Aggregation

CA_X Intra-band contiguous CA of component carriers in one sub-block within Band X where X is the

applicable E-UTRA operating band

CA_X-X Intra-band non-contiguous CA of component carriers in two sub-blocks within Band X where X is

the applicable E-UTRA operating band

CA_X-Y Inter-band CA of component carrier(s) in one sub-block within Band X and component carrier(s)

in one sub-block within Band Y where X and Y are the applicable E-UTRA operating band

CA_X-X-Y CA of component carriers in two sub-blocks within Band X and component carrier(s) in one sub-

block within Band Y where X and Y are the applicable E-UTRA operating bands

CC Component Carriers CG Carrier Group

CPE Customer Premise Equipment

CPE_X Customer Premise Equipment for E-UTRA operating band X

CW Continuous Wave DC Dual Connectivity

DC_X-Y Inter-band DC of component carrier(s) in one sub-block within Band X and component carrier(s)

in one sub-block within Band Y where X and Y are the applicable E-UTRA operating band

DL Downlink

DIP Dominant Interferer Proportion

EARFCN E-UTRA Absolute Radio Frequency Channel Number

EPRE Energy Per Resource Element

E-UTRA Evolved UMTS Terrestrial Radio Access

EUTRAN Evolved UMTS Terrestrial Radio Access Network

EVM Error Vector Magnitude FDD Frequency Division Duplex FRC Fixed Reference Channel HD-FDD Half- Duplex FDD

MCS Modulation and Coding Scheme

MCG Main Carrier Group
MOP Maximum Output Power
MPR Maximum Power Reduction
MSD Maximum Sensitivity Degradation
OCNG OFDMA Channel Noise Generator

OFDMA Orthogonal Frequency Division Multiple Access

OOB Out-of-band PA Power Amplifier

PCC Primary Component Carrier

P-MPR Power Management Maximum Power Reduction

ProSe Proximity-based Services

PSBCH Physical Sidelink Broadcast CHannel
PSCCH Physical Sidelink Control CHannel
PSDCH Physical Sidelink Discovery CHannel
PSS Primary Synchronization Signal

PSS RA PSS-to-RS EPRE ratio for the channel PSS

PSSCH Physical Sidelink Shared CHannel PSSS Primary Sidelink Synchronization Signal

RE Resource Element

REFSENS Reference Sensitivity power level

r.m.s Root Mean Square

SCC Secondary Component Carrier SCG Secondary Carrier Group

SINR Signal-to-Interference-and-Noise Ratio

SNR Signal-to-Noise Ratio

SSS Secondary Synchronization Signal

SSS_RA SSS-to-RS EPRE ratio for the channel SSSSSS Secondary Sidelink Synchronization Signal

TDD Time Division Duplex UE User Equipment

UL Uplink

UL-MIMO Up Link Multiple Antenna transmission
UMTS Universal Mobile Telecommunications System

UTRA UMTS Terrestrial Radio Access

UTRAN UMTS Terrestrial Radio Access Network

xCH_RA xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols not containing RS xCH_RB xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols containing RS

4 General

4.1 Relationship between minimum requirements and test requirements

The Minimum Requirements given in this specification make no allowance for measurement uncertainty. The test specification TS 36.521-1 Annex F defines Test Tolerances. These Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the Minimum Requirements in this specification to create Test Requirements.

The measurement results returned by the Test System are compared - without any modification - against the Test Requirements as defined by the shared risk principle.

The Shared Risk principle is defined in ITU-R M.1545 [3].

4.2 Applicability of minimum requirements

- a) In this specification the Minimum Requirements are specified as general requirements and additional requirements. Where the Requirement is specified as a general requirement, the requirement is mandated to be met in all scenarios
- b) For specific scenarios for which an additional requirement is specified, in addition to meeting the general requirement, the UE is mandated to meet the additional requirements.
- c) The reference sensitivity power levels defined in subclause 7.3 are valid for the specified reference measurement channels.
- d) NOTE: Receiver sensitivity degradation may occur when:
 - 1) The UE simultaneously transmits and receives with bandwidth allocations less than the transmission bandwidth configuration (see Figure 5.6-1), and
 - 2) Any part of the downlink transmission bandwidth is within an uplink transmission bandwidth from the downlink center subcarrier.
- e) The spurious emissions power requirements are for the long term average of the power. For the purpose of reducing measurement uncertainty it is acceptable to average the measured power over a period of time sufficient to reduce the uncertainty due to the statistical nature of the signal.
- f) The requirements in this specification for TDD operating bands apply for downlink and uplink operations using Frame Structure Type 2 [4] except for Band 46 operating with Frame Structure Type 3.

4.3 Void

4.3A Applicability of minimum requirements (CA, UL-MIMO, ProSe, Dual Connectivity, UE category 0)

The requirements in clauses 5, 6 and 7 which are specific to CA, UL-MIMO, ProSe, Dual Connectivity and UE category 0 are specified as suffix A, B, C, D, E where;

- a) Suffix A additional requirements need to support CA
- b) Suffix B additional requirements need to support UL-MIMO
- c) Suffix C additional requirements need to support Dual Connectivity
- d) Suffix D additional requirements need to support ProSe
- e) Suffix E additional requirements need to support UE category 0

A terminal which supports the above features needs to meet both the general requirements and the additional requirement applicable to the additional subclause (suffix A, B, C, D and E) in clauses 5, 6 and 7. Where there is a difference in requirement between the general requirements and the additional subclause requirements (suffix A, B, C, D, and E) in clauses 5, 6 and 7, the tighter requirements are applicable unless stated otherwise in the additional subclause.

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

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

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

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

A terminal which supports CA, for each supported CA configuration, shall support Pcell transmissions in each of the aggregated Component Carriers unless indicated otherwise in clause 5.6A.1.

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

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

- the UE is associated with a serving cell on the ProSe carrier, or
- the UE is not associated with a serving cell on the ProSe carrier and is provisioned with the preconfigured radio parameters for ProSe Direct Communications and/or ProSe Direct Discovery that are associated with known Geographical Area, or
- the UE is associated with a serving cell on a carrier different than the ProSe carrier, and the radio parameters for ProSe Direct Discovery on the ProSe carrier are provided by the serving cell, or
- the UE is associated with a serving cell on a carrier different than the ProSe carrier, and has a non-serving cell selected on the ProSe carrier that supports ProSe Direct Discovery and/or ProSe Direct Communication.

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

A terminal that supports simultaneous E-UTRA ProSe sidelink transmissions and E-UTRA uplink transmissions for the inter-band E-UTRA ProSe/E-UTRA bands specified in Table 5.5D-2, shall meet the minimum requirements for the corresponding inter-band UL CA configuration (suffix A), unless otherwise specified. For transmitter characteristics specified in clause 6, the terminal is required to meet the conformance tests for the corresponding inter-band UL CA configuration and is not required to be retested with simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions.

4.4 RF requirements in later releases

The standardisation of new frequency bands and carrier aggregation configurations (downlink and uplink aggregation) may be independent of a release. However, in order to implement a UE that conforms to a particular release but supports a band of operation or a carrier aggregation configuration that is specified in a later release, it is necessary to specify some extra requirements. TS 36.307 [8] specifies requirements on UEs supporting a frequency band or a carrier aggregation configuration that is independent of release.

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

5 Operating bands and channel arrangement

5.1 General

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

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

- 5.2 Void
- 5.3 Void
- 5.4 Void

5.5 Operating bands

E-UTRA is designed to operate in the operating bands defined in Table 5.5-1.

Table 5.5-1 E-UTRA operating bands

E-UTRA Operating Band	Uplink (UL) oper BS rece UE trans	ive	Downlink (DL) operating band BS transmit UE receive FDL low - FDL high	Duplex Mode
1	1920 MHz –	1980 MHz	2110 MHz - 2170 MHz	FDD
2	1850 MHz –	1910 MHz	1930 MHz — 1990 MHz	FDD
3	1710 MHz –	1785 MHz	1805 MHz — 1880 MHz	FDD
4		1765 MHz		FDD
5	1710 MHz – 824 MHz –	849 MHz		FDD
6 ¹	830 MHz -	840 MHz	869 MHz — 894MHz 875 MHz — 885 MHz	FDD
7	2500 MHz –	2570 MHz	2620 MHz — 2690 MHz	FDD
8	880 MHz -	915 MHz	925 MHz - 960 MHz	FDD
0			923 WHZ - 960 WHZ	
9	1749.9 MHz [—]	1784.9 MHz	1844.9 MHz [—] 1879.9 MH:	
10	1710 MHz –	1770 MHz	2110 MHz - 2170 MHz	FDD
11	1427.9 MHz –	1447.9 MHz	1475.9 MHz — 1495.9 MH:	z FDD
12	699 MHz -	716 MHz	729 MHz - 746 MHz	FDD
13	777 MHz –	787 MHz	746 MHz - 756 MHz	FDD
14	788 MHz –	798 MHz	758 MHz - 768 MHz	FDD
15	Reserve		Reserved	FDD
16	Reserve	ed	Reserved	FDD
17	704 MHz –	716 MHz	734 MHz - 746 MHz	FDD
18	815 MHz –	830 MHz	860 MHz - 875 MHz	FDD
19	830 MHz -	845 MHz	875 MHz - 890 MHz	FDD
20	832 MHz –	862 MHz	791 MHz - 821 MHz	FDD
21	1447.9 MHz –	1462.9 MHz	1495.9 MHz — 1510.9 MH:	z FDD
22	3410 MHz -	3490 MHz	3510 MHz - 3590 MHz	FDD
23	2000 MHz -	2020 MHz	2180 MHz - 2200 MHz	FDD
24	1626.5 MHz –	1660.5 MHz	1525 MHz — 1559 MHz	FDD
25	1850 MHz –	1915 MHz	1930 MHz - 1995 MHz	FDD
26	814 MHz –	849 MHz	859 MHz - 894 MHz	FDD
27	807 MHz -	824 MHz	852 MHz - 869 MHz	FDD
28	703 MHz -	748 MHz	758 MHz - 803 MHz	FDD
29	N/A		717 MHz - 728 MHz	FDD ²
30	2305 MHz -	2315 MHz	2350 MHz - 2360 MHz	FDD
31	452.5 MHz -	457.5 MHz	462.5 MHz - 467.5 MHz	FDD
32	N/A		1452 MHz - 1496 MHz	FDD ²
33	1900 MHz –	1920 MHz	1900 MHz - 1920 MHz	TDD
34	2010 MHz -	2025 MHz	2010 MHz - 2025 MHz	TDD
35	1850 MHz -	1910 MHz	1850 MHz - 1910 MHz	TDD
36	1930 MHz -	1990 MHz	1930 MHz - 1990 MHz	TDD
37	1910 MHz –	1930 MHz	1910 MHz - 1930 MHz	TDD
38	2570 MHz -	2620 MHz	2570 MHz - 2620 MHz	TDD
39	1880 MHz -	1920 MHz	1880 MHz - 1920 MHz	TDD
40	2300 MHz -	2400 MHz	2300 MHz - 2400 MHz	TDD
41	2496 MHz	2690 MHz	2496 MHz 2690 MHz	TDD
42	3400 MHz -	3600 MHz	3400 MHz - 3600 MHz	TDD
43	3600 MHz -	3800 MHz	3600 MHz - 3800 MHz	TDD
44	703 MHz -	803 MHz	703 MHz - 803 MHz	TDD
45	1447 MHz –	1467 MHz	1447 MHz - 1467 MHz	TDD
46	5150 MHz –	5925 MHz	5150 MHz - 5925 MHz	TDD ^{8,9}
64		Rese	rved	
65	1920 MHz -	2010 MHz	2110 MHz - 2200 MHz	FDD
66	1710 MHz -	1780 MHz	2110 MHz - 2200 MHz	FDD⁴
67	N/A	55 11/1/12	738 MHz - 758 MHz	FDD ²
NOTE 1. D	land 6 is not applicab		700 1711 12	

NOTE 1: Band 6 is not applicable

NOTE 2: Restricted to E-UTRA operation when carrier aggregation is configured. The downlink operating band is paired with the uplink operating band (external) of the carrier aggregation configuration that is supporting the configured Pcell.

- NOTE 3: A UE that complies with the E-UTRA Band 65 minimum requirements in this specification shall also comply with the E-UTRA Band 1 minimum requirements.
- NOTE 4: The range 2180-2200 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured.
- NOTE 5: A UE that supports E-UTRA Band 66 shall receive in the entire DL operating band
- NOTE 6: A UE that supports E-UTRA Band 66 and CA operation in any CA band shall also comply with the minimum requirements specified for the DL CA configurations CA 66B, CA 66C and CA 66A-66A.
- NOTE 7: A UE that complies with the E-UTRA Band 66 minimum requirements in this specification shall also comply with the E-UTRA Band 4 minimum requirements.
- NOTE 8: This band is an unlicensed band restricted to licensed-assisted operation using Frame Structure Type 3
- NOTE 9: In this version of the specification, restricted to E-UTRA DL operation when carrier aggregation is configured.

5.5A Operating bands for CA

E-UTRA carrier aggregation is designed to operate in the operating bands defined in Tables 5.5A-1, 5.5A-2, 5.5A-2a and 5.5A-3.

Table 5.5A-1: Intra-band contiguous CA operating bands

E-UTRA	E-UTRA	Uplink (UL) operating band			Downlink (D	Duplex Mode			
CA Band	Band	BS receive) / e	E transmit	BS transi	BS transmit / UE receive			
		F _{UL_low}	- 1	F _{UL_high}	F _{DL_lo}	F _{DL_low} - F _{DL_high}			
CA_1	1	1920 MHz	-	1980 MHz	2110 MHz	-	2170 MHz	FDD	
CA_2	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD	
CA_3	3	1710MHz	-	1785MHz	1805MHz	-	1880MHz	FDD	
CA_5	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD	
CA_7	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD	
CA_8	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD	
CA_12	12	699 MHz	_	716 MHz	629 MHz	_	746 MHz	FDD	
CA_23	23	2000 MHz	_	2020 MHz	2180 MHz	_	2200 MHz	FDD	
CA_27	27	807 MHz	_	824 MHz	852 MHz	_	869 MHz	FDD	
CA_38	38	2570 MHz	_	2620 MHz	2570 MHz	_	2620 MHz	TDD	
CA_39	39	1880 MHz	_	1920 MHz	1880 MHz	_	1920 MHz	TDD	
CA_40	40	2300 MHz	-	2400 MHz	2300 MHz	-	2400 MHz	TDD	
CA_41	41	2496 MHz	_	2690 MHz	2496 MHz	_	2690 MHz	TDD	
CA_42	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD	
CA_66	66	1710 MHz	_	1780 MHz	2110 MHz	_	2200 MHz	FDD	

Table 5.5A-2: Inter-band CA operating bands (two bands)

E-UTRA	E-UTRA	Uplink (UL) operating band			Downlink (D	Duplex		
CA Band	Band	BS receive / UE transmit			BS transi	Mode		
		F _{UL 10}	w -	· F _{UL high}	F _{DL 10}	w –	F _{DL_high}	
04.40	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-3	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-3-3	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-5	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-7	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-8	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-11	11	1427.9 MHz	_	1447.9 MHz	1475.9 MHz	_	1495.9 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-18	18	815 MHz	_	830 MHz	860 MHz	_	875 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-19	19	830 MHz		845 MHz	875 MHz	_	890 MHz	FDD
	1	1920 MHz		1980 MHz	2110 MHz	_	2170 MHz	
CA_1-20	20	832 MHz		862 MHz	791 MHz	_	821 MHz	FDD
	1	1920 MHz	H	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-21	21	1447.9 MHz	<u> </u>	1462.9 MHz	1495.9 MHz	H	1510.9 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-26	26	814 MHz	_	849 MHz	859 MHz	_	894 MHz	FDD
				1980 MHz		_	2170 MHz	
CA_1-28	1 28	1920 MHz	_	748 MHz	2110 MHz	_	803 MHz	FDD
		703 MHz			758 MHz	-		EDD
CA_1-40	10	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
CA_1-41	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
	41	2496 MHz	_	2690 MHz	2496 MHz	_	2690 MHz	TDD
CA_1-42	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
CA_1-46	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
	46	5150 MHz	_	5925 MHz	5150 MHz	_	5925 MHz	TDD
CA_2-4	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_2-4-4	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_2-5	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
_	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	
CA_2-2-5	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
_	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	
CA_2-12	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	
CA_2-2-	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
12	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	
CA_2-13	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
	13	777 MHz	_	787 MHz	746 MHz	_	756 MHz	
CA_2-2-	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
13	13	777 MHz	_	787 MHz	746 MHz	_	756 MHz	
CA_2-17	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
JL 11	17	704 MHz	_	716 MHz	734 MHz	_	746 MHz	1 . 55
CA_2-28	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
J/ _∠-20	28	703 MHz	_	748 MHz	758 MHz	_	803 MHz	טטי
CA_2-29	2	1850 MHz	_	1910 MHz	1930 MHz	-	1990 MHz	FDD
OM_Z-Z9	29		N/	/A	717 MHz	-	728 MHz	FUU
CA_2-30	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
UA_2-3U	30	2305 MHz	L-	2315 MHz	2350 MHz	L=	2360 MHz	רטט

				4040 1411			4000 1411	
CA_2-46	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	FDD
	46	5150 MHz	_	5925 MHz	5150 MHz	-	5925 MHz	TDD
CA_3-5	3	1710 MHz	_	1785 MHz	1805 MHz	-	1880 MHz	FDD
	5	824 MHz	_	849 MHz	869 MHz	-	894 MHz	100
CA_3-3-5	3	1710 MHz	_	1785 MHz	1805 MHz	-	1880 MHz	FDD
CA_3-3-3	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
04.07	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	EDD
CA_3-7	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	
CA_3-8	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	
CA_3-3-8	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	
CA_3-19	19							FDD
		830 MHz	_	845 MHz	875 MHz	_	890 MHz	
CA_3-20	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	
CA_3-26	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
OA_5-20	26	814 MHz	_	849 MHz	859 MHz	-	894 MHz	100
CA 2.27	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	EDD
CA_3-27	27	807 MHz	_	824 MHz	852 MHz	_	869 MHz	FDD
04 0 00	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	
CA_3-28	28	703 MHz	_	748 MHz	758 MHz	_	803 MHz	FDD
	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	
CA_3-31	31	452.5 MHz	_	457.5 MHz	462.5 MHz	_	467.5 MHz	FDD
	3	1710 MHz		1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_3-38		2570 MHz		2620 MHz	2570 MHz		2620 MHz	TDD
	38		_			_		
CA_3-40	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
CA_3-41	3	1710 MHz	_	1785 MHz	1805 MHz	-	1880 MHz	FDD
O/ (_O 11	41	2496 MHz	_	2690 MHz	2496 MHz	_	2690 MHz	TDD
CA_3-42	3	1710 MHz	_	1785 MHz	1805 MHz	ı	1880 MHz	FDD
UA_3-42	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
CA 0.40	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_3-46	46	5150 MHz	_	5925 MHz	5150 MHz	_	5925 MHz	TDD
	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-5	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-4-5	5	824 MHz		849 MHz	869 MHz		894 MHz	FDD
	4			1755 MHz		_		
CA_4-7		1710 MHz	_		2110 MHz	_	2155 MHz	FDD
	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	
CA_4-4-7	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	
CA_4-12	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	. 55
CA_4-4-	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
12	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	FDD
04 440	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-13	13	777 MHz	_	787 MHz	746 MHz	_	756 MHz	FDD
CA_4-4-	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	
13	13	777 MHz	_	787 MHz	746 MHz	_	756 MHz	FDD
	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-17	17	704 MHz		716 MHz	734 MHz	_	746 MHz	FDD
	4	1710 MHz		1755 MHz	2110 MHz		2155 MHz	
CA_4-27	27		-			_		FDD
ļ		807 MHz	_	824 MHz	852 MHz	_	869 MHz	
CA_4-28	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
	28	703 MHz	_	748 MHz	758 MHz	_	803 MHz	
CA_4-29	4	1710 MHz	<u> </u>	1755 MHz	2110 MHz	_	2155 MHz	FDD
	29		N/		717 MHz	-	728 MHz	
CA_4-30	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
J - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	30	2305 MHz	-	2315 MHz	2350 MHz	-	2360 MHz	טטו

	4	4740 MIL	1	4755 MIL	0440 MIL		0455 MH-	- FDD
CA_4-46	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
	46	5150 MHz	_	5925 MHz	5150 MHz	_	5925 MHz	TDD
CA_5-7	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	
CA_5-12	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
0/1_0 12	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	100
CA_5-13	5	824 MHz	_	849 MHz	869 MHz	-	894 MHz	FDD
CA_5-13	13	777 MHz	_	787 MHz	746 MHz	ı	756 MHz	FDD
CA 5 17	5	824 MHz	_	849 MHz	869 MHz	-	894 MHz	EDD
CA_5-17	17	704 MHz	_	716 MHz	734 MHz	_	746 MHz	FDD
04 5 05	5	824 MHz	_	849 MHz	869 MHz	-	894 MHz	EDD
CA_5-25	25	1850 MHz	_	1915 MHz	1930 MHz	_	1995 MHz	FDD
0	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	
CA_5-29	29		N/		717 MHz	_	728 MHz	FDD
	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	
CA_5-30	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz	FDD
	5	824 MHz	_	849 MHz	869 MHz		894 MHz	FDD
CA_5-38	38	2570 MHz	_	2620 MHz	2570 MHz		2620 MHz	TDD
		824 MHz				_		FDD
CA_5-40	5		_	849 MHz	869 MHz	_	894 MHz	
	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
CA_7-8	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
_	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	
CA_7-12	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
O, (_, 1.2	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	
CA_7-20	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
UA_1-20	20	832 MHz	_	862 MHz	791 MHz	ı	821 MHz	ו טט
CA 7.00	7	2500 MHz	_	2570 MHz	2620 MHz	-	2690 MHz	EDD
CA_7-22	22	3410 MHz	_	3490 MHz	3510 MHz	_	3590 MHz	FDD
04.7.00	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	EDD
CA_7-28	28	703 MHz	_	748 MHz	758 MHz	_	803 MHz	FDD
	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
CA_7-40	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
	7	2500 MHz	_	2570 MHz	2620 MHz		2690 MHz	FDD
CA_7-42	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
CA_7-42-	7	2500 MHz		2570 MHz	2620 MHz		2690 MHz	FDD
42 42	42	3400 MHz		3600 MHz	3400 MHz	_	3600 MHz	TDD
72	7	2500 MHz		2570 MHz	2620 MHz	_	2690 MHz	FDD
CA_7-46			_	5925 MHz		_	5925 MHz	
	46	5150 MHz	_		5150 MHz	_		TDD
CA_8-11	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
_	11	1427.9 MHz	_	1447.9 MHz	1475.9 MHz	_	1495.9 MHz	
CA_8-20	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	
CA_8-40	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
G, (_G .G	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
CA_8-41	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
OA_0-41	41	2496 MHz	_	2690 MHz	2496 MHz	_	2690 MHz	TDD
CA_11-18	11	1427.9 MHz	_	1447.9 MHz	1475.9 MHz	ı	1495.9 MHz	FDD
CA_11-16	18	815 MHz	_	830 MHz	860 MHz	1	875 MHz	FDD
04 40 05	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	EDD
CA_12-25	25	1850 MHz	_	1915 MHz	1930 MHz	_	1995 MHz	FDD
	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	
CA_12-30	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz	FDD
	18	815 MHz	_	830 MHz	860 MHz	_	875 MHz	_
CA_18-28	28	703 MHz	_	733 MHz ¹	758 MHz	_	788 MHz ¹	FDD
 	19	830 MHz	<u> </u>	845 MHz	875 MHz	_	890 MHz	
CA_19-21	21	1447.9 MHz	 	1462.9 MHz	1495.9 MHz	_	1510.9 MHz	FDD
+	19	830 MHz		845 MHz	875 MHz	_	890 MHz	
CA_19-28	28	718 MHz ¹	_	748 MHz	773 MHz ¹	_	803 MHz	FDD
 	19		_			_		EDD
CA_19-42		830 MHz	_	845 MHz	875 MHz	_	890 MHz	FDD
	42	3400 MHz		3600 MHz	3400 MHz		3600 MHz	TDD

	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	
CA_20-31	31	452.5 MHz	_	457.5 MHz	462.5 MHz	_	467.5 MHz	FDD
_	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	
CA_20-32	32	002	N/		1452 MHz	_	1496 MHz	FDD
	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	FDD
CA_20-38	38	2570 MHz	_	2620 MHz	2570 MHz	_	2620 MHz	TDD
	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	FDD
CA_20-40	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
01 00 10	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	FDD
CA_20-42	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
CA 20-	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	FDD
42-42	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
<u> </u>	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	
CA_20-67	67		N/		738 MHz	_	758 MHz	FDD
04 04 40	21	1447.9 MHz	_	1462.9 MHz	1495.9 MHz	_	1510.9 MHz	FDD
CA_21-42	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
04 00 00	23	2000 MHz	_	2020 MHz	2180 MHz	_	2200 MHz	
CA_23-29	29		N/		717 MHz	_	728 MHz	FDD
04 05 00	25	1850 MHz	_	1915 MHz	1930 MHz	_	1995 MHz	500
CA_25-26	26	814 MHz	_	849 MHz	859 MHz	_	894 MHz	FDD
04 05 44	25	1850 MHz	_	1915 MHz	1930 MHz	_	1995 MHz	FDD
CA_25-41	41	2496 MHz	_	2690 MHz	2496 MHz	_	2690 MHz	TDD
04 00 44	26	814 MHz	_	849 MHz	859 MHz	_	894 MHz	FDD
CA_26-41	41	2496 MHz	_	2690 MHz	2496 MHz	_	2690 MHz	TDD
04 00 40	28	703 MHz	_	748 MHz	758 MHz	_	803 MHz	FDD
CA_28-40	40	2300 MHz	-	2400 MHz	2300 MHz	_	2400 MHz	TDD
04 00 44	28	703 MHz	_	748 MHz	758 MHz	_	803 MHz	FDD
CA_28-41	41	2496 MHz	_	2690 MHz	2496 MHz	_	2690 MHz	TDD
04 00 40	28	703 MHz	-	748 MHz	758 MHz	_	803 MHz	FDD
CA_28-42	42	3400 MHz	-	3600 MHz	3400 MHz	_	3600 MHz	TDD
CA 20 20	29		N/	A	717 MHz	_	728 MHz	רבה
CA_29-30	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz	FDD
CA 20 40	38	2570 MHz	_	2620 MHz	2570 MHz	_	2620 MHz	TDD
CA_38-40	40	2300 MHz	-	2400 MHz	2300 MHz	_	2400 MHz	TDD
CA 20 44	39	1880 MHz	-	1920 MHz	1880 MHz	_	1920 MHz	TDD
CA_39-41	41	2496 MHz	_	2690 MHz	2496 MHz	_	2690 MHz	TDD
04 44 40	41	2496 MHz	-	2690 MHz	2496 MHz	_	2690 MHz	TD 0
CA_41-42	42	3400 MHz	-	3600 MHz	3400 MHz	_	3600 MHz	TDD
CA 44 40	41	2496 MHz	-	2690 MHz	2496 MHz	_	2690 MHz	TDD
CA_41-46	46	5150 MHz	-	5925 MHz	5150 MHz	_	5925 MHz	TDD
CA_42-46	42	3400 MHz	-	3600 MHz	3400 MHz	_	3600 MHz	TDD
UA_42-46	46	5150 MHz	-	5925 MHz	5150 MHz	-	5925 MHz	TDD
NOTE 1: Th	ne frequency	range in band 2	28 is	restricted for this	CA band comb	inati	on.	

Table 5.5A-2a: Inter-band CA operating bands (three bands)

E-UTRA CA	E-UTRA			erating band			perating band	Duplex Mode
Band	Band			JE transmit			UE receive	wode
			<u>v —</u>	F _{UL_high}			F _{DL_high}	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-3-5	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-3-7	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
	7	2500 MHz	_	2570 MHz	2620 MHz	-	2690 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	-	2170 MHz	
CA_1-3-8	3	1710 MHz	_	1785 MHz	1805 MHz	ı	1880 MHz	FDD
	8	880 MHz	_	915 MHz	925 MHz	-	960 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-3-19	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
_	19	830 MHz	_	845 MHz	875 MHz	-	890 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-3-20	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	1
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-3-26	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
OA_1-3-20	26	814 MHz	_	849 MHz	859 MHz		894 MHz	100
	1	1920 MHz	_	1980 MHz	2110 MHz		2170 MHz	
CA 1 2 20	3	1710 MHz	_	1785 MHz	1805 MHz		1880 MHz	FDD
CA_1-3-28	28		_	748 MHz		_		FUU
	1	703 MHz	_		758 MHz	_	803 MHz	
04 4 0 40	3	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
CA_1-3-40		1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	TDD
	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
CA_1-3-42	3	1710 MHz	_	1785 MHz	1805 MHz	-	1880 MHz	
	42	3400 MHz	_	3600 MHz	3400 MHz	-	3600 MHz	TDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-5-7	5	824 MHz	_	849 MHz	869 MHz	-	894 MHz	FDD
	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	-	2170 MHz	FDD
CA_1-5-40	5	824 MHz	_	849 MHz	869 MHz	-	894 MHz	וסטו
	40	2300 MHz	-	2400 MHz	2300 MHz	ı	2400 MHz	TDD
	1	1920 MHz	_	1980 MHz	2110 MHz	-	2170 MHz	
CA_1-7-8	7	2500 MHz	_	2570 MHz	2620 MHz	-	2690 MHz	FDD
	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-7-20	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
_	20	832 MHz	_	862 MHz	791 MHz	_	821 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-7-28	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
_	28	703 MHz	_	748 MHz	758 MHz	_	803 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-8-11	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
0,1_1 0 11	11	1427.9 MHz	_	1447.9 MHz	1475.9 MHz	_	1495.9 MHz	1
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-8-40	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	FDD
UA_1-0 -4 0	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	טטו
CA 1 11 10	11		_					EDD
CA_1-11-18		1427.9 MHz	_	1447.9 MHz	1475.9 MHz	_	1495.9 MHz	FDD
	18	815 MHz	_	830 MHz	860 MHz	_	875 MHz	-
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-18-28	18	815 MHz	_	830 MHz	860 MHz	_	875 MHz	FDD
	28	703 MHz	_	733 MHz ¹	758 MHz	_	788 MHz ¹	
CA_1-19-21	11	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
	19	830 MHz	_	845 MHz	875 MHz	_	890 MHz	

	24	1447.9 MHz	_	1462.9 MHz	1495.9 MHz	_	1510 0 MH-	
	21 1		_			_	1510.9 MHz	
04 4 40 00	-	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
CA_1-19-28	19	830 MHz	_	845 MHz	875 MHz	_	890 MHz	FDD
	28	718 MHz ¹	_	748 MHz	773 MHz ¹	_	803 MHz	
-	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
CA_1-19-42	19	830 MHz	_	845 MHz	875 MHz	_	890 MHz	
	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
	11	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	FDD
CA_1-21-42	21	1447.9 MHz	_	1462.9 MHz	1495.9 MHz	_	1510.9 MHz	100
	42	3400 MHz	_	3600 MHz	3400 MHz	-	3600 MHz	TDD
	2	1850 MHz	_	1910 MHz	1930 MHz	-	1990 MHz	
CA_2-4-5	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
-	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-2-4-5	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	1
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-4-4-5	4	1710 MHz		1755 MHz	2110 MHz		2155 MHz	FDD
OA_2-4-4-0	5	824 MHz		849 MHz	869 MHz		894 MHz	100
	2	1850 MHz		1910 MHz	1930 MHz	_	1990 MHz	
CA 0.4.40	4		_		1	_		FDD
CA_2-4-12		1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	רטט
	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-4-13	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
	13	777 MHz	_	787 MHz	746 MHz	_	756 MHz	
-	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-4-29	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
	29		N/A		717 MHz	_	728 MHz	
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-4-30	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
	30	2305 MHz	_	2315 MHz	2350 MHz	-	2360 MHz	
	2	1850 MHz	-	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-5-12	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
-	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-2-5-12	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-5-13	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
0,1_2 0 10	13	777 MHz	_	787 MHz	746 MHz	_	756 MHz	1 . 55
	2	1850 MHz		1910 MHz	1930 MHz		1990 MHz	
CA 2-5-29	5	824 MHz		849 MHz	869 MHz		894MHz	FDD
OA_2-3-23	29	024 1011 12	N/A		717 MHz	_	728 MHz	100
	2	1950 MU-	1 11/7	1910 MHz				
04 05 00	5	1850 MHz	_		1930 MHz	_	1990 MHz	EDD
CA_2-5-30		824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz	-
04 0 45 55	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-12-30	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	FDD
	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz	
-	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
CA_2-29-30	29		N//		717 MHz	-	728 MHz	FDD
	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz	
	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_3-5-40	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	רטט
	40	2300 MHz	L=	2400 MHz	2300 MHz	L-	2400 MHz	TDD
	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	
CA_3-7-8	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
ļ	8	880	_	915	925	_	960	1
04 0 7 00	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	- FD-0
CA_3-7-20	7	2500 MHz	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
								1

1	20	000 MH		OCO MILI-	704 MILE		004 MH-	
	20	832 MHz -	_	862 MHz	791 MHz	_	821 MHz	
04 0 7 00	3	1710 MHz -	_	1785 MHz	1805 MHz	_	1880 MHz	EDD
CA_3-7-28	7	2500 MHz -	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
	28	703 MHz -	-	748 MHz	758 MHz	_	803 MHz	
04 0 0 40	3	1710 MHz -	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_3-8-40	8	880 MHz -	_	915 MHz	925 MHz	_	960 MHz	TDD
	40	2300 MHz -	-	2400 MHz	2300 MHz	_	2400 MHz	TDD
	3	1710 MHz -	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_3-19-42	19	830 MHz -	_	845 MHz	875 MHz	_	890 MHz	
	42	3400 MHz -	-	3600 MHz	3400 MHz	_	3600 MHz	TDD
	3	1710 MHz -	-	1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_3-7-38	7		V/ /		2620 MHz	_	2690 MHz	
	38		V/ /		2570 MHz	_	2620 MHz	TDD
	3	1710 MHz -	-	1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_3-28-40	28	703 MHz -	-	748 MHz	758 MHz	_	803 MHz	
	40	2300 MHz -	-	2400 MHz	2300 MHz	_	2400 MHz	TDD
	3	1710 MHz -	-	1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_3-41-42	41	2496 MHz -	_	2690 MHz	2496 MHz	_	2690 MHz	TDD
	42	3400 MHz -	-	3600 MHz	3400 MHz	_	3600 MHz	טטו
	4	1710 MHz -	-	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-5-12	5	824 MHz -	-	849 MHz	869 MHz	-	894 MHz	FDD
	12	699 MHz -	-	716 MHz	729 MHz	_	746 MHz	
	4	1710 MHz -	-	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-4-5-12	5	824 MHz -	-	849 MHz	869 MHz	_	894 MHz	FDD
	12	699 MHz -	-	716 MHz	729 MHz	_	746 MHz	
	4	1710 MHz -	-	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-5-13	5	824 MHz -	-	849 MHz	869 MHz	_	894 MHz	FDD
_	13	777 MHz -	-	787 MHz	746 MHz	_	756 MHz	
	4	1710 MHz -	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-5-29	5	824 MHz -	_	849 MHz	869 MHz	_	894 MHz	FDD
	29		V//		717 MHz	_	728 MHz	
	4	1710 MHz -	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-5-30	5	824 MHz -	_	849 MHz	869 MHz	_	894 MHz	FDD
	30	2305 MHz -	_	2315 MHz	2350 MHz	_	2360 MHz	
	4	1710 MHz -	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-7-12	7	2500 MHz -	_	2570 MHz	2620 MHz	_	2690 MHz	FDD
o, (12	t	_	716 MHz	729 MHz	_	746 MHz	
	4	1710 MHz -	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-12-30	12	699 MHz -	_	716 MHz	729 MHz	_	746 MHz	FDD
0,(_1,12,00	30	2305 MHz -	_	2315 MHz	2350 MHz	_	2360 MHz	. 55
	4	1710 MHz -	_	1755 MHz	2110 MHz	_	2155 MHz	
CA_4-29-30	29		V//		717 MHz	_	728 MHz	FDD
0/(_1 20 00	30		_	2315 MHz	2350 MHz	_	2360 MHz	, 55
	7	2500 MHz -		2570 MHz	2620 MHz	_	2690 MHz	
CA_7-8-20	8	880 MHz -		915 MHz	925 MHz		960 MHz	FDD
OA_1-0-20	20		_	862 MHz	791 MHz	_	821 MHz	וטט
	7		- \/ <i>F</i>		2620 MHz	_	2690 MHz	
CA_7-20-38	20		N/ <i>F</i>	862 MHz	791 MHz		821 MHz	FDD
UA_1-20-30	38		- \/ <i>F</i>		2570 MHz	_		TDD
	19	·		845 MHz		_	2620 MHz	טטו
CA 10 24 42	21		-		875 MHz	_	890 MHz	FDD
CA_19-21-42	42	1447.9 MHz -	_	1462.9 MHz	1495.9 MHz	_	1510.9 MHz	TDD
NOTE 4: T		3400 MHz -		3600 MHz	3400 MHz		3600 MHz	TDD
NOTE 1: The	rrequency rai	nge in band 28 is	re	stricted for this C	A pana combin	atior	1.	

Table 5.5A-2b: Inter-band CA operating bands (four bands)

E-UTRA CA	E-UTRA	Uplink (UL) op	erating band	Downlink (D	L) c	perating band	Duplex
Band	Band	BS receiv	re / l	UE transmit	BS transi	mit /	UE receive	Mode
			_w –	F _{UL_high}		w –	F _{DL_high}	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
1-3-5-40	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
1-3-3-40	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	
	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
1270	3	1710 MHz	-	1785 MHz	1805 MHz	_	1880 MHz	FDD
1-3-7-8	7	2500 MHz	-	2570 MHz	2620 MHz	_	2690 MHz	טטז
	8	880 MHz	_	915 MHz	925 MHz	_	960 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
1 2 0 40	3	1710 MHz	-	1785 MHz	1805 MHz	_	1880 MHz	FDD
1-3-8-40	8	880 MHz	_	915 MHz	925 MHz	-	960 MHz	
	40	2300 MHz	_	2400 MHz	2300 MHz	_	2400 MHz	TDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
4 0 40 40	3	1710 MHz	_	1785 MHz	1805 MHz	_	1880 MHz	FDD
1-3-19-42	19	830 MHz	_	845 MHz	875 MHz	_	890 MHz	
	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
4 40 04 40	19	830 MHz	_	845 MHz	875 MHz	_	890 MHz	FDD
1-19-21-42	21	1447.9 MHz	_	1462.9 MHz	1495.9 MHz	_	1510.9 MHz	
	42	3400 MHz	_	3600 MHz	3400 MHz	_	3600 MHz	TDD
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
0.4540	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	- FDD
2-4-5-12	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
2.4.5.20	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
2-4-5-29	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
	29		N/A	Ā	717 MHz	_	728 MHz	
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
0.45.00	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
2-4-5-30	5	824 MHz	_	849 MHz	869 MHz	_	894 MHz	FDD
	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz	
	2	1850 MHz	_	1910 MHz	1930 MHz	_	1990 MHz	
0.4.40.00	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	FDD
2-4-12-30	12	699 MHz	_	716 MHz	729 MHz	_	746 MHz	FDD
	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz]
	2	1850 MHz	_	1910 MHz	1930 MHz	-	1990 MHz	
0.4.00.00	4	1710 MHz	_	1755 MHz	2110 MHz	_	2155 MHz	
2-4-29-30	29		N/A	4	717 MHz	_	728 MHz	FDD
	30	2305 MHz	_	2315 MHz	2350 MHz	_	2360 MHz	1

Table 5.5A-3: Intra-band non-contiguous CA operating bands (with two sub-blocks)

E-UTRA	E-UTRA	Uplink (UL)	ope	rating band	Downlink (D	L) c	perating band	Duplex
CA Band	Band	BS receive / UE transmit			BS transi	Mode		
		F_{UL_low}	-	F _{UL_high}	F _{DL_lo}			
CA_2-2	2	1850 MHz	_	1910 MHz	1930 MHz	-	1990 MHz	FDD
CA_3-3	3	1710 MHz	-	1785 MHz	1805 MHz	_	1880 MHz	FDD
CA_4-4	4	1710 MHz	-	1755 MHz	2110 MHz	_	2155 MHz	FDD
CA_5-5	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	FDD
CA_7-7	7	2500 MHz	-	2570 MHz	2620 MHz	_	2690 MHz	FDD
CA_23-23	23	2000 MHz	-	2020 MHz	2180 MHz	_	2200 MHz	FDD
CA_25-25	25	1850 MHz	_	1915 MHz	1930 MHz	-	1995 MHz	FDD
CA_40-40	40	2300 MHz	-	2400 MHz	2300 MHz	_	2400 MHz	TDD
CA_41-41	41	2496 MHz	-	2690 MHz	2496 MHz	_	2690 MHz	TDD
CA_42-42	42	3400 MHz	-	3600 MHz	3400 MHz	-	3600 MHz	TDD
CA_66-66	66	1710 MHz	_	1780 MHz	2110 MHz	_	2200 MHz	FDD

5.5B Operating bands for UL-MIMO

E-UTRA UL-MIMO is designed to operate in the operating bands defined in Table 5.5-1.

Table 5.5B-1: Void

5.5C Operating bands for Dual Connectivity

E-UTRA dual connectivity is designed to operate in the operating bands defined in Table 5.5C-1.

Table 5.5C-1: Inter-band dual connectivity operating bands (two bands)

E-UTRA	E				•) operating band	Duplex
DC Band	UTRA					it / UE receive	Mode
	Band		_	F _{UL_high}		- F _{DL_high}	
DC_1-3	1	1920 MHz	_	1980 MHz	2110 MHz	– 2170 MHz	FDD
50 0	3	1710 MHz	_	1785 MHz	1805 MHz	 1880 MHz 	. 55
DC_1-5	1	1920 MHz	_	1980 MHz	2110 MHz	 2170 MHz 	FDD
DC_1-3	5	824 MHz	_	849 MHz	869 MHz	- 894 MHz	יטט ו
DC 17	1	1920 MHz	-	1980 MHz	2110 MHz	- 2170 MHz	רטט
DC_1-7	7	2500 MHz	_	2570 MHz	2620 MHz	- 2690 MHz	FDD
DO 4.0	1	1920 MHz	_	1980 MHz	2110 MHz	- 2170 MHz	-
DC_1-8	8	880 MHz	_	915 MHz	925 MHz	- 960 MHz	FDD
	1	1920 MHz	_	1980 MHz	2110 MHz	- 2170 MHz	
DC_1-19	19	830 MHz	_	845 MHz	875 MHz	- 890 MHz	FDD
	1	1920 MHz		1980 MHz	2110 MHz	- 2170 MHz	
DC_1-21	21	1447.9 MHz		1462.9 MHz	1495.9 MHz	- 1510.9 MHz	FDD
	1	1920 MHz		1980 MHz	2110 MHz	- 2170 MHz	
DC_1-42	42		_	3600 MHz	+	- 3600 MHz	FDD
		3400 MHz	_		3400 MHz		
DC_2-4	2	1850 MHz	_	1910 MHz	1930 MHz	- 1990 MHz	FDD
	4	1710 MHz	_	1755 MHz	2110 MHz	- 2155 MHz	
DC_2-5	2	1850 MHz	_	1910 MHz	1930 MHz	- 1990 MHz	FDD
	5	824 MHz	_	849 MHz	869 MHz	– 894 MHz	
DC_2-12	2	1850 MHz	_	1910 MHz	1930 MHz	 1990 MHz 	FDD
DO_2 12	12	699 MHz	_	716 MHz	729 MHz	 746 MHz 	100
DC_2-13	2	1850 MHz	_	1910 MHz	1930 MHz	 1990 MHz 	FDD
DC_2-13	13	777 MHz	-	787 MHz	746 MHz	- 756 MHz	רטט
DO 0.5	3	1710 MHz	_	1785 MHz	1805 MHz	- 1880 MHz	ר
DC_3-5	5	824 MHz	_	849 MHz	869 MHz	- 894 MHz	FDD
	3	1710 MHz	_	1785 MHz	1805 MHz	- 1880 MHz	
DC_3-7	7	2500 MHz	_	2570 MHz	2620 MHz	- 2690 MHz	FDD
	3	1710 MHz	_	1785 MHz	1805 MHz	- 1880 MHz	
DC_3-8	8	880 MHz		915 MHz	925 MHz	- 960 MHz	FDD
	3	1710 MHz		1785 MHz	1805 MHz	- 1880 MHz	
DC_3-19	19	830 MHz		845 MHz	875 MHz	- 890 MHz	FDD
	3	1710 MHz	_	1785 MHz	1805 MHz	- 1880 MHz	
DC_3-20			_				FDD
	20	832 MHz	_	862 MHz	791 MHz	- 821 MHz	
DC_3-26	3	1710 MHz	_	1785 MHz	1805 MHz	- 1880 MHz	FDD
	26	814 MHz	_	849 MHz	859 MHz	- 894 MHz	
DC_4-5	4	1710 MHz	_	1755 MHz	2110 MHz	– 2155 MHz	FDD
500	5	824 MHz	_	849 MHz	869 MHz	– 894 MHz	. 55
DC_4-7	4	1710 MHz	_	1755 MHz	2110 MHz	 2155 MHz 	FDD
DO_4-7	7	2500 MHz	_	2570 MHz	2620 MHz	 2690 MHz 	םם י
DC 440	4	1710 MHz	-	1755 MHz	2110 MHz	- 2155 MHz	ר
DC_4-12	12	699 MHz	_	716 MHz	729 MHz	- 746 MHz	FDD
DO 110	4	1710 MHz	_	1755 MHz	2110 MHz	– 2155 MHz	EDD
DC_4-13	13	777 MHz	_	787 MHz	746 MHz	- 756 MHz	FDD
	4	1710 MHz	_	1755 MHz	2110 MHz	- 2155 MHz	
DC_4-17	17	704 MHz	_	716 MHz	734 MHz	- 746 MHz	FDD
	5	824 MHz		849 MHz	869 MHz	- 894 MHz	
DC_5-7	7	2500 MHz		2570 MHz	<u> </u>	- 2690 MHz	FDD
			_		2620 MHz		
DC_5-12	5	824 MHz	_	849 MHz	869 MHz	- 894 MHz	FDD
	12	699 MHz	_	716 MHz	729 MHz	- 746 MHz	
DC_5-17	5	824 MHz	_	849 MHz	869 MHz	- 894 MHz	FDD
	17	704 MHz	_	716 MHz	734 MHz	- 746 MHz	
DC_7-20	7	2500 MHz	_	2570 MHz	2620 MHz	 2690 MHz 	FDD
DO_1-20	20	832 MHz	_	862 MHz	791 MHz	– 821 MHz	טט י
DC 7.00	7	2500 MHz	_	2570 MHz	2620 MHz	- 2690 MHz	בטיי
DC_7-28	28	703 MHz	_	748 MHz	758 MHz	- 803 MHz	FDD
	19	830 MHz	_	845 MHz	875 MHz	- 890 MHz	
DC_19-21	19						FDD

DC 39-41	39	1880 MHz	_	1920 MHz	1880 MHz	-	1920 MHz	TDD
DC_39-41	41	2496 MHz	_	2690 MHz	2496 MHz	-	2690 MHz	וטט

Table 5.5C-2: Inter-band dual connectivity operating bands (three bands)

E-UTRA DC	E-UTRA Band	Uplink (UL) ope	erating band	Downlink (I	perating band	Duplex Mode	
Band		BS receiv	BS receive / UE transmit			BS transmit / UE receive		
Build	Build	F _{UL_low} - F _{UL_high}			F _{DL_le}			
	1	1920 MHz	_	1980 MHz	2110 MHz	_	2170 MHz	
DC_1-3-19	3	1710 MHz	_	1785 MHz	1805 MHz		1880 MHz	FDD
	19	830 MHz	_	845 MHz	875 MHz	-	890 MHz	
	1	1920 MHz	_	1980 MHz	2110 MHz	-	2170 MHz	
DC_1-19-21	19	830 MHz	_	845 MHz	875 MHz	_	890 MHz	FDD
	21	1447.9 MHz	-	1462.9 MHz	1495.9 MHz	-	1510.9 MHz	

5.5D Operating bands for ProSe

E-UTRA ProSe is designed to operate in the operating bands defined in Table 5.5D-1.

Table 5.5D-1 E-UTRA ProSe operating band

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

E-UTRA ProSe is designed to operate concurrent with E-UTRA uplink/downlink on the operating bands combinations listed in Table 5.5D-2.

Table 5.5D-2 Inter-band E-UTRA ProSe / E-UTRA operating bands

E-UTRA ProSe Band Note 1	E-UTRA band / E-UTRA CA band Note
2	4
2	CA_2-4 ^{Note 3}
28	1
20	CA_1-28 ^{Note 3}
NOTE 1: As specified in Ta	ble 5.5D-1
NOTE 2: As specified in Ta	ble 5.5-1 and Table 5.5A-2
NOTE 3: Applies when E-U	TRA uplink is assigned to one E-UTRA
band and ProSe of	peration is restricted to the uplink
frequencies paired	d with either PCC or SCC.
NOTE 4: The concurrency f	or E-UTRA ProSe Direct Discovery with
E-UTRA uplink/do	wnlink applies after allowing for any
transmission and/	or reception gap requested by the UE.

5.6 Channel bandwidth

Requirements in present document are specified for the channel bandwidths listed in Table 5.6-1.

Table 5.6-1: Transmission bandwidth configuration N_{RB} in E-UTRA channel bandwidths

Channel bandwidth BW _{Channel} [MHz]	1.4	3	5	10	15	20
Transmission bandwidth configuration N _{RB}	6	15	25	50	75	100

Figure 5.6-1 shows the relation between the Channel bandwidth ($BW_{Channel}$) and the Transmission bandwidth configuration (N_{RB}). The channel edges are defined as the lowest and highest frequencies of the carrier separated by the channel bandwidth, i.e. at F_C +/- $BW_{Channel}$ /2.

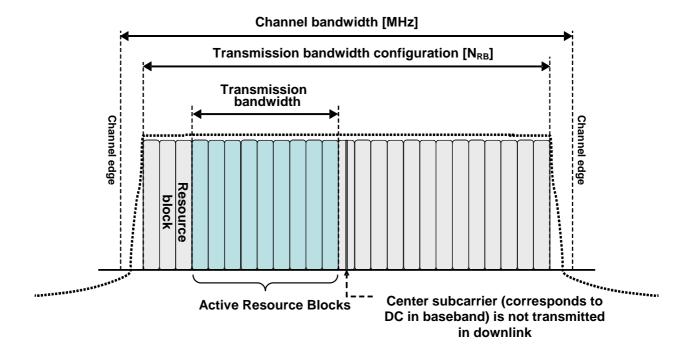


Figure 5.6-1: Definition of channel bandwidth and transmission bandwidth configuration for one E-UTRA carrier

5.6.1 Channel bandwidths per operating band

a) The requirements in this specification apply to the combination of channel bandwidths and operating bands shown in Table 5.6.1-1. The transmission bandwidth configuration in Table 5.6.1-1 shall be supported for each of the specified channel bandwidths. The same (symmetrical) channel bandwidth is specified for both the TX and RX path.

Table 5.6.1-1: E-UTRA channel bandwidth

	E-UTRA band / Channel bandwidth										
E-UTRA	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz					
Band											
1			Yes	Yes	Yes	Yes					
2	Yes	Yes	Yes	Yes	Yes ¹	Yes¹					
3	Yes	Yes	Yes	Yes	Yes ¹	Yes ¹					
4	Yes	Yes	Yes	Yes	Yes	Yes					
5	Yes	Yes	Yes	Yes ¹							
6			Yes	Yes ¹							
7			Yes	Yes	Yes ³	Yes ^{1, 3}					
8	Yes	Yes	Yes	Yes ¹							
9			Yes	Yes	Yes ¹	Yes ¹					
10			Yes	Yes	Yes	Yes					
11			Yes	Yes ¹							
12	Yes	Yes	Yes ¹	Yes ¹							
13			Yes ¹	Yes ¹							
14			Yes ¹	Yes ¹							
17			Yes ¹	Yes ¹							
18			Yes	Yes ¹	Yes ¹						
19			Yes	Yes ¹	Yes ¹						
20			Yes	Yes ¹	Yes ¹	Yes ¹					
21			Yes	Yes ¹	Yes ¹						
22			Yes	Yes	Yes ¹	Yes ¹					
23	Yes	Yes	Yes	Yes	Yes ¹	Yes ¹					
24			Yes	Yes							
25	Yes	Yes	Yes	Yes	Yes ¹	Yes ¹					
26	Yes	Yes	Yes	Yes ¹	Yes ¹						
27	Yes	Yes	Yes	Yes ¹							
28		Yes	Yes	Yes ¹	Yes ¹	Yes ^{1, 2}					
30			Yes	Yes ¹							
31	Yes	Yes ¹	Yes ¹								
33			Yes	Yes	Yes	Yes					
34			Yes	Yes	Yes						
35	Yes	Yes	Yes	Yes	Yes	Yes					
36	Yes	Yes	Yes	Yes	Yes	Yes					
37	1 20		Yes	Yes	Yes	Yes					
38			Yes	Yes	Yes ³	Yes ³					
39			Yes	Yes	Yes ³	Yes ³					
40			Yes	Yes	Yes	Yes					
41			Yes	Yes	Yes	Yes					
42			Yes	Yes	Yes	Yes					
43			Yes	Yes	Yes	Yes					
44		Yes	Yes	Yes	Yes	Yes					
45		. 55	Yes	Yes	Yes	Yes					
46			. 55	. 55		Yes					
						100					
64			Rese	erved		l					
65			Yes	Yes	Yes	Yes					
66			Yes	Yes	Yes	Yes					
110== 1			1 169	1 169	162	169					

NOTE 1: ¹ refers to the bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (subclause 7.3) is allowed.

NOTE 2: ² For the 20 MHz bandwidth, the minimum requirements are specified for

NOTE 2: ² For the 20 MHz bandwidth, the minimum requirements are specified for E-UTRA UL carrier frequencies confined to either 713-723 MHz or 728-738 MHz

NOTE 3: ³ refers to the bandwidth for which the uplink transmission bandwidth can be restricted by the network for some channel assignments in FDD/TDD co-existence scenarios in order to meet unwanted emissions requirements (Clause 6.6.3.2).

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

5.6A Channel bandwidth for CA

For intra-band contiguous carrier aggregation *Aggregated Channel Bandwidth*, *Aggregated Transmission Bandwidth Configuration* and *Guard Bands* are defined as follows, see Figure 5.6A-1.

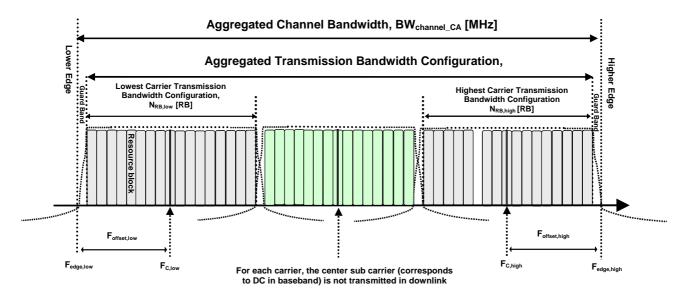


Figure 5.6A-1. Definition of Aggregated channel bandwidth and aggregated channel bandwidth edges

The aggregated channel bandwidth, BW_{Channel CA}, is defined as

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

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

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

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

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

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

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

where $\Delta f_1 = \Delta f$ for the downlink with Δf the subcarrier spacing and $\Delta f_1 = 0$ for the uplink, while $N_{RB,low}$ and $N_{RB,high}$ are the transmission bandwidth configurations according to Table 5.6-1 for the lowest and highest assigned component carrier, respectively. BW_{GB} denotes the *Nominal Guard Band* and is defined in Table 5.6A-1, and the factor 0.18 is the PRB bandwidth in MHz.

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

Aggregated Transmission Bandwidth Configuration is the number of the aggregated RBs within the fully allocated Aggregated Channel bandwidth and is defined per CA Bandwidth Class (Table 5.6A-1).

For intra-band non-contiguous carrier aggregation *Sub-block Bandwidth* and *Sub-block edges* are defined as follows, see Figure 5.6A-2.

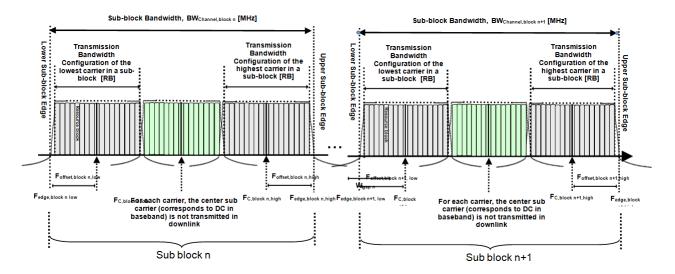


Figure 5.6A-2. Non-contiguous intraband CA terms and definitions

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

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

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

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

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

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

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

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

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

where $\Delta f_1 = \Delta f$ for the downlink with Δf the subcarrier spacing and $\Delta f_1 = 0$ for the uplink, while $N_{RB,low}$ and $N_{RB,high}$ are the transmission bandwidth configurations according to Table 5.6-1 for the lowest and highest assigned component carrier within a sub-block, respectively. BW_{GB} denotes the *Nominal Guard Band* and is defined in Table 5.6A-1, and the factor 0.18 is the PRB bandwidth in MHz.

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

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

Table 5.6A-1: CA bandwidth classes and corresponding nominal guard bands

CA Bandwidth Class	Aggregated Transmission Bandwidth Configuration	Number of contiguous CC	Nominal Guard Band BW _{GB}
Α	N _{RB,agg} ≤ 100	1	$a_1 \text{ BW}_{\text{Channel}(1)}$ - $0.5\Delta f_1 \text{ (NOTE 2)}$
В	25 < N _{RB,agg} ≤ 100	2	0.05 $max(BW_{Channel(1)},BW_{Channel(2)})$ - 0.5 Δf_1
С	100 < N _{RB,agg} ≤ 200	2	$0.05 \ max(BW_{Channel(1)},BW_{Channel(2)}) - 0.5\Delta f_1$
D	200 < N _{RB,agg} ≤ 300	3	0.05 $max(BW_{Channel(1)},BW_{Channel(2)}, BW_{Channel(3)}) - 0.5\Delta f_1$
E	300 < N _{RB,agg} ≤ 400	4	0.05 $max(BW_{Channel(1)},BW_{Channel(2)},BW_{Channel(3)},BW_{Channel(4)})$ - 0.5 Δf_1
F	$400 < N_{RB,agg} \le 500$	5	NOTE 3
	$700 < N_{RB,agg} \le 800$	8	NOTE 3

NOTE 1: BW_{Channel(j)}, j = 1, 2, 3, 4 is the channel bandwidth of an E-UTRA component carrier according to Table 5.6-1 and $\Delta f_1 = \Delta f$ for the downlink with Δf the subcarrier spacing while $\Delta f_1 = 0$ for the uplink.

NOTE 2: $a_1 = 0.16/1.4$ for BW_{Channel(1)} = 1.4 MHz whereas $a_1 = 0.05$ for all other channel bandwidths.

NOTE 3: Applicable for later releases.

The channel spacing between centre frequencies of contiguously aggregated component carriers is defined in subclause 5.7.1A.

5.6A.1 Channel bandwidths per operating band for CA

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

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

Requirements for intra-band contiguous carrier aggregation are defined for the carrier aggregation configurations and bandwidth combination sets specified in Table 5.6A.1-1. Requirements for inter-band carrier aggregation are defined for the carrier aggregation configurations and bandwidth combination sets specified in Table 5.6A.1-2 and Table 5.6A.1-2a. Requirements for intra-band non-contiguous carrier aggregation are defined for the carrier aggregation configurations and bandwidth combination sets specified in Table 5.6A.1-3.

The DL component carrier combinations for a given CA configuration shall be symmetrical in relation to channel centre unless stated otherwise in Table 5.6A.1-1, Table 5.6A.1-2, Table 5.6A.1-2a and Table 5.6A.1-2b.

Table 5.6A.1-1: E-UTRA CA configurations and bandwidth combination sets defined for intra-band contiguous CA

	Uplink CA	E-UTF Component carr	set				
E-UTRA CA configuratio n	configurat ions (NOTE 3)	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidth s for carrier [MHz]	Maximum aggregated bandwidth [MHz]	Bandwidth combinatio n set
CA_1C	CA_1C	15	15			40	0
OA_10	0A_10	20	20			70	0
		5	20				
CA_2C		10	15, 20			40	0
0/(_20		15	10, 15, 20			40	O
		20	5, 10, 15, 20				
CA_3C	CA_3C	5, 10, 15	20			40	0
OA_00	OA_50	20	5, 10, 15, 20			70	0
CA_5B		5, 10	10			20	0
OA_00		10	5			20	0
CA_7B		15	5			20	0
		15	15			40	0
		20	20			40	U
		10	20				
CA_7C	CA_7C	15	15, 20			40	1
		20	10, 15, 20				
		15	10, 15				
		20	15, 20			40	2
		5,10	10				
CA_8B	CA_8B	10	5			20	0
CA_12B	-	5	5, 10			15	0
		10	10				
CA_23B	-	5	15			20	0
		1.4, 3, 5	5				
CA_27B	-	1.4, 3	10			13	0
		15	15				
CA_38C	CA_38C	20	20			40	0
		5,10,15	20				
CA_39C	CA_39C	20	5, 10, 15			35	0
		10	20				
		15	15			40	0
		20	10, 20			1	
CA_40C	CA_40C	10, 15	20				
		15	15			40	1
		20	10, 15, 20			1	
		10, 15, 20	20	20			
CA_40D	CA_40C	20	10, 15	20		60	0
		20	20	10, 15		1	
CA_41C	CA_41C	10	20			40	0

		15	15, 20				
		20	10, 15, 20				
		5, 10	20				
		15	15, 20			40	1
		20	5, 10, 15, 20				
		10	15, 20				
		15	10, 15, 20			40	2
		20	10, 15, 20				
		10	20			40	0
		20	20			40	3
		10	20	15			
		10	15, 20	20			
		15	20	10, 15		1	
CA_41D	CA_41C	15	10, 15, 20	20		60	0
		20	15, 20	10		1	
		20	10, 15, 20	15, 20			
CA_42C	CA_42C	5, 10, 15, 20	20			40	0
CA_42C	CA_42C	20	5, 10, 15			40	U
0.4 400	04 400	5,10,15,20	20	20		00	0
CA_42D	CA_42C	20	20	5,10,15		60	0
04 405	04 400	5,10,15,20	20	20	20	00	
CA_42E	CA_42C	20	20	20	5,10,15	- 80	0
		5	5, 10, 15				
CA_66B	-	10	5, 10			20	0
		15	5			1	
		10	15, 20				
CA_66C	-	15	10, 15, 20			40	0
		20	5, 15, 10, 20			1	

NOTE 1: The CA configuration refers to an operating band and a CA bandwidth class specified in Table 5.6A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.

NOTE 2: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.

NOTE 3: Uplink CA configurations are the configurations supported by the present release of specifications.

Table 5.6A.1-2: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA (two bands)

	E-U1	RA CA c	onfigu	ation /	Bandw	idth co	mbina	tion set	t	
E-UTRA CA Configuration	Uplink CA configurations (NOTE 4)	E- UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combination set
CA_1A-3A	CA_1A-3A	3			Yes	Yes	Yes	Yes	40	0
		1			Yes	Yes	Yes	Yes		
CA 1A 2C		1	Coo (24 20	Yes	Yes	Yes	Yes	60	0
CA_1A-3C	-	3	See		in Table	5.6A.1	nbinatio	on Set	00	U
		1				Yes			20	0
CA_1A-5A	CA_1A-5A	5				Yes			20	0
0/(_1/(0/(0/1/1/10/1	1			Yes	Yes	Yes	Yes	30	1
		5			Yes	Yes			30	ı
CA 1A 7A	CA_1A-7A	1			Yes	Yes	Yes	Yes	40	0
CA_1A-7A	CA_TA-7A	7				Yes	Yes	Yes	40	U
		1			Yes	Yes	Yes	Yes	00	0
		8			Yes	Yes			30	0
		1			Yes	Yes				
CA_1A-8A	CA_1A-8A	8			Yes	Yes			20	1
		1			Yes	Yes	Yes	Yes		
		8		Yes	Yes	Yes	103	103	30	2
		1		163	Yes	Yes	Yes	Yes		
CA_1A-11A	-	11					165	162	30	0
					Yes	Yes	\/	\/		
		1			Yes	Yes	Yes	Yes	35	0
CA_1A-18A	CA_1A-18A	18			Yes	Yes	Yes			
		1			Yes	Yes			20	1
		18			Yes	Yes				·
CA_1A-19A	CA_1A-19A	1			Yes	Yes	Yes	Yes	35	0
CA_1A-19A	CA_IA-19A	19			Yes	Yes	Yes		33	U
04 44 004		1			Yes	Yes	Yes	Yes	40	0
CA_1A-20A	-	20			Yes	Yes	Yes	Yes	40	0
		1			Yes	Yes	Yes	Yes		_
CA_1A-21A	CA_1A-21A	21			Yes	Yes	Yes		35	0
		1			Yes	Yes	Yes	Yes		
		26			Yes	Yes	Yes		35	0
CA_1A-26A	CA_1A-26A	1			Yes	Yes				
		26			Yes	Yes			20	1
		1			Yes	Yes	Yes	Yes		
									40	0
CA_1A-28A	CA_1A-28A	28			Yes	Yes	Yes	Yes		
		1	-	-	Yes	Yes	 	 	20	1
		28			Yes	Yes	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		
CA_1A-40A	-	1			Yes	Yes	Yes	Yes	40	0
		40			Yes	Yes	Yes	Yes	-	-
CA_1A-41A	_	1			Yes	Yes	Yes	Yes	40	0
		41			Yes	Yes	Yes	Yes		
		1			Yes	Yes	Yes	Yes		
CA_1A-41C	-	41	See				Combina	ation	60	0
		71		Set	1 in Tal	ole 5.6 <i>P</i>				
CA_1A-42A	CA_1A-42A	1			Yes	Yes	Yes	Yes	40	0
UN_1/\ 1 2/\	J	42			Yes	Yes	Yes	Yes	70	
		1			Yes	Yes	Yes	Yes		
CA_1A-42C	-	42	See				Combina	ation	60	0
				Set	0 in Tal	ole 5.6A	\.1-1			
CA_1A-46A		1			Yes	Yes	Yes	Yes	40	0
		46						Yes	4 0	<u> </u>
		2	Yes	Yes	Yes	Yes	Yes	Yes	40	
CA_2A-4A	CA_2A-4A	4			Yes	Yes	Yes	Yes	40	0
○	_									

		4			Yes	Yes				
		2			Yes	Yes	Yes	Yes		_
		4			Yes	Yes	Yes	Yes	40	2
		2	See	CA_2A-				ation		
CA_2A-2A-4A	-			Set	0 in Tal	ble 5.6/	\.1-3		60	0
		4			Yes	Yes	Yes	Yes		
0.4.6.4.4.4.4		2		<u> </u>	Yes	Yes	Yes	Yes	0.0	
CA_2A-4A-4A	-	4	See	CA_4A-				nation	60	0
			Soci	CA_2A-	0 in Tal					
CA_2A-2A-		2	See	_	0 in Tal					
4A-4A	-		See	CA_4A-				nation	80	0
		4			0 in Tal					
		2			Yes	Yes	Yes	Yes	30	0
CA_2A-5A	CA_2A-5A	5			Yes	Yes			30	U
CA_ZA-JA	UA_2A-3A	2			Yes	Yes			20	1
		5			Yes	Yes			20	'
		2	See	CA_2A-				nation		
CA_2A-2A-5A	-			Set	0 in Tal	50	0			
		5	Soc		Yes					
CA_2C-5A	_	2	366	See CA_2C Bandwidth combination set 0 in Table 5.6A.1-1						0
UA_2U-3A	-	5		Τ	Yes	Yes	<u> </u>		50	
		2			Yes	Yes	Yes	Yes	22	_
		12			Yes	Yes			30	0
04 04 404	04 04 404	2			Yes	Yes	Yes	Yes		_
CA_2A-12A	CA_2A-12A	12		Yes	Yes	Yes			30	1
		2			Yes	Yes			20	2
		12							20	2
CA_2A-2A-		2	See	CA_2A-						
12A	-			Set	0 in Tal	1	\.1-3	ı	50	0
		12								
CA 2A 12B		2	0	04.46	Yes	Yes	Yes	Yes	25	0
CA_2A-12B	-	12	See	CA_12	2B Band 0 in Tal			ation	35	0
			See	CA 2A				ation		
CA_2A-2A-		2		_	0 in Tal			allon	55	
_ 12B	-	12	See	CA_12				ation	55	0
		12			0 in Tal					
		2	See	CA_2C				n set		
CA_2C-12A	-			0	in Table		-1	I	50	0
		12 2			Yes Yes	Yes Yes	Yes	Yes		
		13			162	Yes	162	162	30	0
CA_2A-13A	CA_2A-13A	2			Yes	Yes				
		13			169	Yes			20	1
		2	See	CA_2A-	-2A Bar		Combir	nation		
CA_2A-2A-	-	1 -			0 in Tal				50	0
13A		13				Yes				
CA 2A 17A		2			Yes	Yes			20	0
CA_2A-17A	-	17			Yes	Yes			20	U
CA_2A-28A		2			Yes	Yes	Yes	Yes	40	0
ON_2A-20A	-	28			Yes	Yes	Yes	Yes	70	
		2			Yes	Yes			20	0
		29		Yes	Yes	Yes				<u> </u>
CA_2A-29A	-	2			Yes	Yes			20	1
- <u>-</u>		29			Yes	Yes	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		_ -	
		2			Yes	Yes	Yes	Yes	30	2
		29	C== 1	24 00	Yes	Yes	nhine!	n C=+		
CA 2C 20A		2	See	CA_2C	in table			n Set	50	0
CA_2C-29A	-	29		I	Yes	Yes		50	"	
CA_2A-30A	-	29			Yes	Yes	Yes	Yes	30	0
UA_2A-3UA	_		1	1	100	100	169	100	50	1

		30			Yes	Yes						
		2	See	CA_2C		idth cor	nbinatio	n set				
CA_2C-30A	-			0	in Table	5.6A.1	-1		50	0		
		30			Yes	Yes						
CA_2A-46A	_	2			Yes	Yes	Yes	Yes	40	0		
O/(_Z/(+0/(46						Yes	40	Ü		
		3				Yes	Yes	Yes	30	0		
		5			Yes	Yes			30	U		
		3				Yes			20	1		
CA_3A-5A	CA_3A-5A	5			Yes	Yes			20	l l		
CA_SA-SA	CA_SA-SA	3			Yes	Yes	Yes	Yes	30	2		
		5			Yes	Yes			30			
		3			Yes	Yes	Yes	Yes	20	0		
		5		Yes	Yes	Yes			30	3		
		3	See 0	CA_3C	Bandwi	dth Cor	nbinatio	n Set				
CA_3C-5A	-	3	0	in Tabl	e 5.6A.	1-1 in T	S 36.10)1	50	0		
		5			Yes	Yes						
		3			Yes	Yes	Yes	Yes	40	0		
CA 3A 7A	CA 2A 7A	7				Yes	Yes	Yes	40	0		
CA_3A-7A	CA_3A-7A	3			Yes	Yes	Yes	Yes	40			
		7			Yes	Yes	Yes	Yes	40	1		
		3			Yes	Yes	Yes	Yes				
CA_3A-7B	-		See C	A_7B I					40	0		
_		7				5.6A.1-						
		3			Yes	Yes	Yes	Yes				
		7	See	CA_7C	Bandw	idth cor	nbinatio	n set	60	0		
CA 2A 7C	CA_3A-7A	7				5.6A.1					<u> </u>	
CA_3A-7C	CA_7C	3			Yes	Yes	Yes	Yes				
		7	See	CA_7C	Bandw	idth cor	nbinatio	n set	60	1		
		1				5.6A.1						
	3	See 0	CA_3C				on Set					
CA_3C-7A	CA_3C-7A			0		5.6A.1			60	0		
	O/_00	7			Yes	Yes	Yes	Yes				
		3				Yes	Yes	Yes	30	0		
		8			Yes	Yes			30	U		
		3				Yes			20	1		
CA_3A-8A	CA_3A-8A	8			Yes	Yes			20	1		
CA_5A-6A	OA_3A-0A	3			Yes	Yes	Yes	Yes	30	2		
		8		Yes	Yes	Yes			30			
		3			Yes	Yes	Yes	Yes	20	2		
		8			Yes	Yes			30	3		
		3	See	CA_3A-	3A Ban	dwidth	Combir	ation	50			
						le 5.6A			50	0		
CA 2A 2A 0A		8			Yes	Yes						
CA_3A-3A-8A	-	3	See C	A_3A-3	3A Band	dwidth (Combin	ation				
				Se	t 1 in ta	ble 5.6	A.1-3		40	1		
		8			Yes	Yes						
CA_3A-19A	CA 2A 40A	3			Yes	Yes	Yes	Yes	25			
CA_3A-19A	CA_3A-19A	19			Yes	Yes	Yes		35	0		
		3			Yes	Yes	Yes	Yes	20			
CA 34 334	CA 24 224	20			Yes	Yes			30	0		
CA_3A-20A	CA_3A-20A	3			Yes	Yes	Yes	Yes	40	4		
		20			Yes	Yes	Yes	Yes	40	1		
		3		1	Yes	Yes	Yes	Yes	0.7	-		
		26			Yes	Yes	Yes		35	0		
CA_3A-26A	CA_3A-26A	3		1	Yes	Yes						
		26		<u> </u>	Yes	Yes			20	1		
		3		†	Yes	Yes	Yes	Yes				
CA_3A-27A	-	27		 	Yes	Yes			30	0		
		3		 	Yes	Yes	Yes	Yes				
CA_3A-28A	-	28	1	 	Yes	Yes	Yes	Yes	40	0		
CA_3A-31A		3	1	 	Yes	Yes	Yes	Yes	25	0		
UA_3A-3TA	-	J			162	162	162	162	20	U		

		24	1	Vaa	. Vaa	1	1	ı		T
		31		Yes	Yes	Vaa	Vaa	Vaa		
CA_3A-38A	-	38			Yes	Yes	Yes	Yes	40	0
					Yes	Yes	Yes	Yes		
CA_3A-40A	-	3			Yes	Yes	Yes	Yes	40	0
_		40			Yes	Yes	Yes	Yes		
04 04 400		3			Yes	Yes	Yes	Yes	00	
CA_3A-40C	-	40	See		C Band			ation	60	0
				Set	1 in Tal					
CA_3A-41A	-	3			Yes	Yes	Yes	Yes	40	0
_		41			Yes	Yes	Yes	Yes		
04 04 440		3		<u> </u>	Yes	Yes	Yes	Yes	00	
CA_3A-41C	-	41	See		C Band			ation	60	0
				Set	0 in Tal					
CA_3A-42A	-	3			Yes	Yes	Yes	Yes	40	0
		42			Yes	Yes	Yes	Yes		
		3		L	Yes	Yes	Yes	Yes		
CA_3A-42C	-	42	See		C Band			ation	60	0
				Set	0 in Tal					
CA_3A-46A	-	3			Yes	Yes	Yes	Yes	40	0
22		46						Yes	.0	Ĭ
		4			Yes	Yes			20	0
CA_4A-5A	CA_4A-5A	5			Yes	Yes			20	U
CA_4A-3A	UA_4A-5A	4			Yes	Yes	Yes	Yes	30	1
		5			Yes	Yes			30	l l
		4	See	CA_4A-	-4A Ban	dwidth	Combir	nation		
CA_4A-4A-5A	-	4		Set	0 in tab	le 5.6A	.1-3		50	0
		5			Yes	Yes				
		4			Yes	Yes			20	0
00 40 70	CA 1A-7A	7			Yes	Yes	Yes	Yes	30	0
CA_4A-7A	CA_4A-7A	4			Yes	Yes	Yes	Yes		
		7			Yes	Yes	Yes	Yes	40	1
		4			Yes	Yes				
		4			Yes	Yes			40	0
		7			Yes	Yes	Yes	Yes	10	
CA_4A-4A-7A	-	4			Yes	Yes	Yes	Yes		
		4			Yes	Yes	Yes	Yes	60	1
		7			Yes	Yes	Yes	Yes	00	'
		4	Yes	Yes	Yes	Yes	162	162		
		12	165	168	Yes	Yes			20	0
			Vaa	V			Vaa	Vaa		
		4	Yes	Yes	Yes	Yes	Yes	Yes	30	1
		12	<u> </u>	<u> </u>	Yes	Yes				
		4		 	Yes	Yes	Yes	Yes	30	2
CA_4A-12A	CA_4A-12A	12		Yes	Yes	Yes				_
<u>_</u>		4			Yes	Yes			20	3
		12			Yes	Yes			20	Ŭ
		4			Yes	Yes	Yes	Yes	30	4
		12			Yes	Yes			30	<u></u>
		4			Yes	Yes	Yes		20	5
		12			Yes				20	5
CA 4A 4A		4	See		-4A Ban			nation		
CA_4A-4A- 12A	-		<u></u>	Set	0 in Tal	ole <u>5</u> .6/	1.1-3		50	0
14/\		12			Yes	Yes				
	<u>-</u>	4			Yes	Yes	Yes	Yes		
CA_4A-12B	-	12	See		B Band				35	0
				Set	0 in Tal	ole 5.6/	\.1-1			
		4			Yes	Yes	Yes	Yes	30	0
CA 4A 43A	CA 4A 42A	13				Yes			30	U
CA_4A-13A	CA_4A-13A	4			Yes	Yes				4
		13				Yes			20	1
0.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4.4		4	See	CA 4A-	-4A Ban		Combir	nation		
CA_4A-4A-				0 in Tal				50	0	
13A	13A -					Yes			-	
		13								

CA_4A-17A	CA_4A-17A	4			Yes	Yes			20	0
		17			Yes	Yes				
CA_4A-27A	_	4			Yes	Yes	Yes	Yes	30	0
OA_ 1 A-21A		27		Yes	Yes	Yes			30	
0.4.4.4.00.4		4			Yes	Yes	Yes	Yes	4.0	
CA_4A-28A	-	28			Yes	Yes	Yes	Yes	40	0
		4			Yes	Yes	103	103		
									20	0
		29		Yes	Yes	Yes				
CA_4A-29A	_	4			Yes	Yes			20	1
OA_ 1 A-23A		29			Yes	Yes			20	'
		4			Yes	Yes	Yes	Yes		
		29			Yes	Yes			30	2
		4			Yes	Yes	Yes	Yes		
CA_4A-30A	-						163	163	30	0
		30			Yes	Yes				
CA_4A-46A	-	4			Yes	Yes	Yes	Yes	40	0
O/_+/\ +0/\		46						Yes	40	
		5	Yes	Yes	Yes	Yes				
		7				Yes	Yes	Yes	30	0
CA_5A-7A	CA_5A-7A	5			Yes	Yes	100	100		
					165			.,	30	1
		7				Yes	Yes	Yes		
CA_5A-12A	CA_5A-12A	5			Yes	Yes			20	0
CA_5A-12A	CA_3A-12A	12			Yes	Yes			20	U
		5			Yes	Yes				
CA_5A-12B	_	12	Sac	CA_12			ombina	ation	25	0
OA_3A-12D		12	366		0 in Tal			allOII	20	
		-		Set			\. I - I	l		
CA_5A-13A	_	5			Yes	Yes			20	0
		13				Yes				
CA		5			Yes	Yes			20	0
CA_5A-17A	-	17			Yes	Yes			20	0
		5			Yes	Yes				
CA_5A-25A	-	25			Yes	Yes	Voo	Voo	30	0
		1					Yes	Yes		
CA_5A-29A	_	5			Yes	Yes			20	0
071_071 2071		29			Yes	Yes			20	Ů
04 54 004		5			Yes	Yes			00	_
CA_5A-30A	-	30			Yes	Yes			20	0
		5			Yes	Yes				
CA_5A-38A	-	<u> </u>					Voo	Yes	30	0
		38			Yes	Yes	Yes	res		
		5			Yes	Yes			30	0
CA_5A-40A		40			Yes	Yes	Yes	Yes	00	
CA_5A-40A	-	5		Yes	Yes	Yes				
		40			Yes	Yes	Yes	Yes	30	1
		5		t	Yes	Yes	1			†
			800	CA_40			<u>Λ 1 1 :-</u>	TC	50	0
		40							50	
CA_5A-40C	-		30.70	01 of Ba			ination	Set 1		1
		5	ļ	Yes	Yes	Yes		L		
		40		CA_40					50	1
		40	36.10	01 of Ba	andwidtl	h Comb	ination	Set 1		
		7				Yes	Yes	Yes	00	
		8		Yes	Yes	Yes			30	0
CA_7A-8A	-	7	-	. 55	. 55	Yes	Yes	Yes		<u> </u>
				 	\/ -		162	162	30	1
		8		ļ	Yes	Yes				
CA_7A-12A	_	7			Yes	Yes	Yes	Yes	30	0
J. 17. 12.7		12		1	Yes	Yes				
		7				Yes	Yes	Yes		
		20			Yes	Yes			30	0
CA_7A-20A	CA_7A-20A	7		1	163		Vac	Vac		+
			1	<u> </u>	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Yes	Yes	Yes	40	1
		20		ļ	Yes	Yes	Yes	Yes		ļ
CA 74 004		7	<u>L</u>	<u>L</u>		Yes	Yes	Yes	40	
CA_7A-22A	_	22			Yes	Yes	Yes	Yes	40	0
		7		İ	Yes	Yes	Yes	Yes		
CA_7A-28A	CA_7A-28A	28		†	Yes	Yes	Yes	. 55	35	0
	l	20			162	162	162			

		7			Yes	Yes	Yes	Yes	40	1
		28		L	Yes	Yes	Yes	Yes		
		7	See C	CA_7B				n set 0		
CA_7B-28A	-				n table				40	0
		28		L	Yes	Yes	Yes	Yes		
		7	See C	CA_7C I				n set 2		
CA_7C-28A	-			i	n table			1	60	0
		28			Yes	Yes	Yes	Yes		
CA_7A-40A		7			Yes	Yes	Yes	Yes	40	
CA_7A-40A	-	40			Yes	Yes	Yes	Yes	40	0
		7			Yes	Yes	Yes	Yes		
CA_7A-40C	-		See	CA_40		width C			60	0
		40			1 in Tal					
		7			Yes	Yes	Yes	Yes		
CA_7A-42A	-	42			Yes	Yes	Yes	Yes	40	0
CA_7A-42A-		7		0 0	Yes	Yes	Yes	Yes	00	0
42A	-	42			4_42A-4				60	0
			Col	mbinatio						
CA_7A-46A	_	7			Yes	Yes	Yes	Yes	40	0
J		46						Yes		Ŭ,
CA 9A 44A		8		L	Yes	Yes			20	
CA_8A-11A	-	11			Yes	Yes			20	0
		8			Yes	Yes				
		20	 	 	Yes	Yes			20	0
CA_8A-20A	-			Vaa						
		8		Yes	Yes	Yes			20	1
		20			Yes	Yes				
	_	8			Yes	Yes			30	0
CA 9A 40A	_	40			Yes	Yes	Yes	Yes	30	
CA_8A-40A		8		Yes	Yes	Yes			0.0	4
	-	40			Yes	Yes	Yes	Yes	30	1
		8	Yes	Yes	Yes	Yes				
CA_8A-41A		41	100	100	100	Yes		Yes	30	0
		8	Vaa	Vaa	Yes	Yes		163		
04 04 440		0	Yes	Yes					50	•
CA_8A-41C	-	41	See 0	CA_41C				on set	50	0
				3	in table	5.6A.1	-1			
CA_11A-18A		11			Yes	Yes			25	0
CA_TTA-TOA	-	18			Yes	Yes	Yes		25	0
0.4.0		12			Yes	Yes				
CA_12A-25A	-	25			Yes	Yes	Yes	Yes	30	0
		12			Yes	Yes				
CA_12A-30A	-	30			Yes				20	0
			 	-		Yes	\/-			
CA_18A-28A	CA_18A-28A	18	 	-	Yes	Yes	Yes		25	0
		28		ļ	Yes	Yes			-	-
CA_19A-21A	CA_19A-21A	19			Yes	Yes	Yes		30	0
UN_13A-21A	0//_13/4°Z1/A	21		<u> </u>	Yes	Yes	Yes			
OA 40A 00A		19			Yes	Yes	Yes		05	
CA_19A-28A	-	28	Ì	İ	Yes	Yes			25	0
		19			Yes	Yes	Yes			
CA_19A-42A	-	42	 	 	Yes	Yes	Yes	Yes	35	0
			}	-				169		
CA 40A 40C		19	-	0 4 4 7	Yes	Yes	Yes	4:-		
CA_19A-42C	-	42	See	CA_42				ation	55	0
			<u> </u>	Set	0 in Tal			l		
CA_20A-31A	_	20	ļ		Yes	Yes	Yes	Yes	25	0
		31	<u></u>	Yes	Yes					
CA 20A 20A		20			Yes	Yes			20	
CA_20A-32A	-	32			Yes	Yes	Yes	Yes	30	0
		20	1		Yes	Yes	Yes	Yes		
CA_20A-38A	-	38	1	 	Yes	Yes	Yes	Yes	40	0
			 	-	168					
CA_20A-40A	-	20				Yes	Yes	Yes	40	0
		40	ļ			Yes	Yes	Yes		
CA_20A-42A	_	20			Yes	Yes	Yes	Yes	40	0
UA_2UA-42A	_	42			Yes	Yes	Yes	Yes	40	

04		20			Yes	Yes	Yes	Yes		
CA_20A-42A-	-			See C/			ndwidth		60	0
42A		42	Coi			in Tab	le 5.6A			
CA_20A-67A	_	20			Yes	Yes	Yes	Yes	40	0
0A_20A-07A	-	67			Yes	Yes	Yes	Yes	70	0
CA_21A-42A	_	21			Yes	Yes	Yes		35	0
O/(_Z1/(12/(42			Yes	Yes	Yes	Yes		Ŭ.
		21			Yes	Yes	Yes			
CA_21A-42C	-	42	See				Combina	ation	55	0
				Set	0 in Tal			1		
		23			Yes	Yes	Yes	Yes	30	0
CA_23A-29A	_	29		Yes	Yes	Yes				ŭ
0/1_20/120/1		23			Yes	Yes			20	1
		29		Yes	Yes	Yes			20	'
		25		Yes	Yes	Yes	Yes	Yes	35	0
		26	Yes	Yes	Yes	Yes	Yes		33	U
04 054 004		25		Yes	Yes	Yes			00	
CA_25A-26A	-	26		Yes	Yes	Yes			20	1
		25			Yes	Yes				
		26			Yes	Yes			20	2
		25			Yes	Yes	Yes	Yes		
CA_25A-41A	-	41			Yes	Yes	Yes	Yes	40	0
CA 05A 44C	CA 44C	25		0.4.44	Yes	Yes	Yes	Yes	00	0
CA_25A-41C	CA_41C	41	See	_			Combina	ation	60	0
		25		Set	1 in Tal			\/		
04 054 445		25		0.4.44	Yes	Yes	Yes	Yes	00	0
CA_25A-41D	-	41	See				Combina	ation	80	0
		00		Set	0 in Tal			1		
CA_26A-41A	-	26			Yes	Yes	Yes		35	0
		41			Yes	Yes	Yes	Yes		
		26			Yes	Yes	Yes			_
CA_26A-41C	-	41	See				Combina	ation	55	0
				Set	1 in Tal			ı		
CA_28A-40A	_	28			Yes	Yes	Yes	Yes	40	0
0/1_20/1 10/1		40			Yes	Yes	Yes	Yes	10	Ů.
		28			Yes	Yes	Yes	Yes		
CA_28A-40C	-	40	See C	CA_40C	Bandw	idth Co	mbinati	on set	60	0
		40		1	in Table	5.6A.1	-1			
		28			Yes	Yes	Yes	Yes		
CA_28A-40D	-	40	See				Combina	ation	80	0
		40		Set	1 in Tal	ole 5.6/	\.1-1			
CA_28A-41A		28			Yes	Yes			30	0
CA_20A-41A	-	41			Yes	Yes	Yes	Yes	30	U
		28			Yes	Yes				
CA_28A-41C		4.4	See C	A_41C	Bandw		mbinati	on set	50	0
		41			in Table					
OA 00A 10A		28			Yes	Yes	Yes	Yes	40	0
CA_28A-42A	-	42			Yes	Yes	Yes	Yes	40	0
		28			Yes	Yes	Yes	Yes		
CA_28A-42C	-		See C	CA 420			mbinati		60	0
		42			in Table					
		29		Ī	Yes	Yes			_	
CA_29A-30A	-	30		1	Yes	Yes			20	0
		38		 	1.00	Yes		Yes		
CA_38A-40A	-	40		-	-	Yes		Yes	40	0
		38		 	 	Yes		Yes		
CA_38A-40A-				Soc C	<u> </u>		l ndwidth		60	0
40A	_	40	Ca						00	
		38	Col		Jii Sei (le 5.6A	Yes		
CV 38V 40C			800	CA 40	C Post	Yes	l Combine		60	0
CA_38A-40C	_	40	See				Combina	สแปก	60	0
		20	-	Set	0 in Tal			Vac		
CA_39A-41A	CA_39A-41A	39		1	1	Yes	Yes	Yes	40	0
		41						Yes	-	_

	1									1
	CA_41C	39				Yes	Yes	Yes		
CA_39A-41C	CA_39A-41A	41						Yes	60	0
	CA_39A-41C	41						Yes		
		39				Yes	Yes	Yes		
OA 00A 44D	CA_41C	41						Yes	00	
CA_39A-41D	CA_39A-41A	41						Yes	80	0
		41						Yes		
	CA 39C	39	See	CA 39	C Band	width C	Combina	ation		
CA_39C-41A	CA_39A-41A			Set	0 in Tal	ole 5.6 <i>A</i>	\.1-1		55	0
	CA_39C-41A	41						Yes		
	CA 20C	39	See	CA_39	C Band	lwidth C	Combina	ation		
CA 20C 44C	CA_39C CA_41C			Set	0 in Tal	ole 5.6 <i>P</i>	\.1-1		75	0
CA_39C-41C	CA_41C CA_39A-41A	41						Yes	75	0
	UA_33A-41A	41						Yes		
CA 41A 42A		41				Yes	Yes	Yes	40	0
CA_41A-42A	-	42				Yes	Yes	Yes	40	0
		41				Yes	Yes	Yes		
CA_41A-42C	-	42	See	CA 42	C Band	lwidth C	Combina	ation	60	0
_					0 in Tal					
		41	See	CA_41	C Band	lwidth C	Combina	ation		
CA_41C-42A	-			Set	0 in Tal	ole 5.6 <i>A</i>	۸.1-1		60	0
		42			Yes	Yes	Yes	Yes		
		41	See	CA 41	C Band	lwidth C	Combina	ation		
				_	0 in Tal					
CA_41C-42C	-	42	Soo	CA_42	C Banc	lwidth C	ation	80	0	
			366		0 in Tal		allOH			
		41		1	Yes	Yes	Yes	Yes		
CA_41A-46A	-	46			162	162	168	Yes	40	0
					Vaa	Vas	Vas			
CA_42A-46A	-	42			Yes	Yes	Yes	Yes	40	0
_		46						Yes		

NOTE 1: The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 5.6A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.

NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set.

NOTE 3: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.

NOTE 4: Uplink CA configurations are the configurations supported by the present release of specifications.

NOTE 5: For TDD inter-band Carrier Aggregation only non-simultaneous Rx/Tx uplink CA configurations can be supported by UE supporting corresponding DL CA configuration without simultaneous Rx/Tx.

Table 5.6A.1-2a: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA (three bands)

	E-U1	TRA CA c	onfigur	ation /	Bandw	idth co	mbinati	on set		
E-UTRA CA Configuration	Uplink CA configurations (NOTE 5)	E- UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combination set
		1			Yes	Yes	Yes	Yes		
	CA_1A-3A	3			Yes	Yes	Yes	Yes	50	0
CA_1A-3A-5A	CA_1A-5A ⁶	5			Yes	Yes				
	CA_3A-5A ⁶	1			Yes	Yes			40	_
	_	<u>3</u> 5			Yes	Yes	Yes	Yes	40	1
		1			Yes Yes	Yes Yes	Yes	Yes		
CA_1A-3A-7A	_	3			Yes	Yes	Yes	Yes	60	0
OA_IA-3A-7A	_	7			163	Yes	Yes	Yes	00	U
		1			Yes	Yes	Yes	Yes		
		3			Yes	Yes	Yes	Yes	50	0
		8		Yes	Yes	Yes	100	100		· ·
		1			Yes	Yes				
		3			Yes	Yes	Yes	Yes	40	1
CA 4A 2A 2A	CA_1A-3A	8		Yes	Yes	Yes			1	
CA_1A-3A-8A	CA_1A-8A ⁶ CA_3A-8A ⁶	1			Yes	Yes	Yes			
	CA_3A-8A	3			Yes	Yes	Yes		40	2
		8		Yes	Yes	Yes				
		1			Yes	Yes	Yes	Yes		
		3			Yes	Yes	Yes	Yes	50	3
		8			Yes	Yes				
	CA_1A-3A	1			Yes	Yes	Yes	Yes		
CA_1A-3A-19A	CA_1A-19A ⁶	3			Yes	Yes	Yes	Yes	55	0
	CA_3A-19A	19			Yes	Yes	Yes			
		1			Yes	Yes	Yes	Yes		
CA_1A-3A-26A	-	3			Yes	Yes	Yes	Yes	50	0
		26			Yes	Yes				
		1			Yes	Yes	Yes	Yes		
CA_1A-3A-20A	-	3			Yes	Yes	Yes	Yes	60	0
		20			Yes	Yes	Yes	Yes		
		1			Yes	Yes	Yes	Yes		
CA_1A-3A-28A	-	3			Yes	Yes	Yes	Yes	60	0
		28			Yes	Yes	Yes	Yes		
04 44 04 404		1			Yes	Yes	Yes	Yes		
CA_1A-3A-40A	-	3			Yes	Yes	Yes	Yes	60	0
		40			Yes	Yes	Yes	Yes		
00 40 00 400		1			Yes	Yes	Yes	Yes	00	0
CA_1A-3A-42A	-	3			Yes	Yes	Yes	Yes	60	0
		42 1			Yes Yes	Yes Yes	Yes Yes	Yes Yes		
		3			Yes	Yes	Yes	Yes	1	
CA_1A-3A-42C	-	42	See		Bandw	vidth cor	mbinatio		80	0
		1		ı	Yes	Yes	Yes	Yes		
CA_1A-5A-40A	_	5			Yes	Yes	. 55	. 55	50	0
2		40				Yes	Yes	Yes	1	
		1			Yes	Yes	1.55			
	04 44 - 16	5			Yes	Yes			40	0
00 40 50 70	CA_1A-5A ⁶	7				Yes	Yes	Yes	1	
CA_1A-5A-7A	CA_1A-7A	1			Yes	Yes	Yes	Yes		
	CA_5A-7A ⁶	5			Yes	Yes			50	1
		7				Yes	Yes	Yes]	
		1			Yes	Yes	Yes	Yes		
CA_1A-7A-8A	-	7				Yes	Yes	Yes	50	0
		8			Yes	Yes				
		1			Yes	Yes	Yes	Yes		
CA_1A-7A-20A	-	7				Yes	Yes	Yes	50	0
		20			Yes	Yes				

			1	1	1					T
04 44 74 55		1		ļ	Yes	Yes	Yes	Yes		
CA_1A-7A-28A	-	7		<u> </u>	\/-	Yes	Yes	Yes	55	0
		28			Yes	Yes	Yes	Vaa		
00 40 00 440		1			Yes	Yes	Yes	Yes	40	0
CA_1A-8A-11A	-	8			Yes	Yes			40	0
		11			Yes	Yes	Voc	Voc		
CA 4A 0A 40A				V	Yes	Yes	Yes	Yes	50	0
CA_1A-8A-40A	-	8		Yes	Yes	Yes			50	0
		40			Yes	Yes	Yes	Yes		
		1			Yes	Yes	Yes	Yes	45	0
CA 4A 44A		11			Yes	Yes	Yes		45	0
CA_1A-11A- 18A	-	18 1			Yes Yes	Yes Yes	Yes	Yes		
10/4		11			Yes	Yes	163	163	40	1
		18			Yes	Yes			70	'
		1			Yes	Yes	Yes	Yes		
		18			Yes	Yes	Yes	100	45	0
CA_1A-18A-	CA_1A-18A	28			Yes	Yes				
28A	CA_1A-28A ⁶	1			Yes	Yes	Yes	Yes		
	CA_18A-28A	18			Yes	Yes			40	1
		28			Yes	Yes				
	CA_1A-19A ⁶	1			Yes	Yes	Yes	Yes		
CA_1A-19A-	CA_1A-21A	19			Yes	Yes	Yes		50	0
21A	CA_19A-21A ⁶	21			Yes	Yes	Yes			
		1			Yes	Yes	Yes	Yes		
CA_1A-19A-	_	19			Yes	Yes	Yes		45	0
28A		28			Yes	Yes				
		1			Yes	Yes	Yes	Yes		
CA_1A-19A-	_	19			Yes	Yes	Yes		55	0
42A		42			Yes	Yes	Yes	Yes	33	
		1			Yes	Yes	Yes	Yes		
CA_1A-19A-		19			Yes	Yes	Yes	162		
42C	-	19	Soot	_Λ 42C	Bandv			on sot	75	0
120		42	See		in Table			JII SEL		
		1		Τ	Yes	Yes	Yes	Yes		
CA_1A-21A-	_	21			Yes	Yes	Yes	100	55	0
42A		42			Yes	Yes	Yes	Yes	00	
		1			Yes	Yes	Yes	Yes		
CA_1A-21A-		21			Yes	Yes	Yes	163		
42C	-		Sool	_Λ 42C	C Bandy			on set	75	0
120		42	366		in Table			JII 361		
		2		Ī	Yes	Yes	Yes	Yes		
CA_2A-4A-5A	_	4			Yes	Yes	Yes	Yes	50	0
O/1_2/1 //10/1		5			Yes	Yes			00	
		2	See	CA 2A	-2A Bar		Combin	ation		
CA_2A-2A-4A-		_	000		0 in Tal			ation		
5A	-	4			Yes	Yes	Yes	Yes	70	0
0, (5			Yes	Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-4A-		4	See	CA 4A	-4A Bar					_
5A	-				0 in Tal			auon	70	0
		5			Yes	Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-12A	CA_2A-4A	4			Yes	Yes	Yes	Yes	50	0
	CA_4A-12A	12			Yes	Yes		1		
		2	See	CA 2A	-2A Bar		Combin	ation		
CA_2A-2A-4A-		-			0 in Tal					
12A	-	4]	Yes	Yes	Yes	Yes	70	0
		12			Yes	Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-4A-		4	See	CA 4A	-4A Bar					_
12A	-]			0 in Tal				70	0
		12			Yes	Yes				
		•								•

		_	1							
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-13A	-	4			Yes	Yes	Yes	Yes	50	0
		13				Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-29A	-	4			Yes	Yes	Yes	Yes	50	0
		29			Yes	Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-30A	-	4			Yes	Yes	Yes	Yes	50	0
_		30			Yes	Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-5A-12A	_	5			Yes	Yes			40	0
O/(_Z/(12			Yes	Yes			40	O
		2	800	CA_2A-			Combin	otion		
CA 2A 2A 5A			366			ble 5.6A		alion		
CA_2A-2A-5A- 12A	-	5		1	Yes	Yes	l. 1-3		60	0
IZA		12			Yes	Yes				
		2		1			Vaa	Vaa		
					Yes	Yes	Yes	Yes		
CA_2A-5A-12B	-	5			Yes	Yes			45	0
_		12	See (CA_12B				on Set		
				0		5.6A.1				
	6	2			Yes	Yes	Yes	Yes		
CA_2A-5A-13A	CA_2A-13A ⁶	5			Yes	Yes			40	0
		13				Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-5A-29A	-	5			Yes	Yes			40	0
		29			Yes	Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-5A-30A	_	5			Yes	Yes			40	0
0/1_2/10/100/1		30			Yes	Yes			.0	Ü
		2	See (CA_2C i			-1 Band	width		
			366 (tion set		Widti		
CA_2C-5A-30A	-	5		1	Yes	Yes	Ī		60	0
		30			Yes	Yes				
		2			Yes	Yes	Yes	Yes		
CA_2A-12A-				1			165	165	40	0
_ 30A	-	12			Yes	Yes			40	0
		30			Yes	Yes	L			
		2	See	CA_2C i				width		
CA_2C-12A-	_	40		C		tion set	U		60	0
30A		12			Yes	Yes				
		30			Yes	Yes				
CA_2A-29A-		2			Yes	Yes	Yes	Yes		
30A	-	29			Yes	Yes			40	0
00/.		30			Yes	Yes				
		2	See	CA_2C_i				width		
CA_2C-29A-	_			С		tion set	0		60	0
30A	-	29		ļ	Yes	Yes			00	U
		30			Yes	Yes				
		3			Yes	Yes	Yes	Yes		
CA_3A-5A-40A	-	5			Yes	Yes			50	0
		40				Yes	Yes	Yes		
		3			Yes	Yes	Yes			
		7				Yes	Yes		40	0
04 04 74 04		8			Yes	Yes				
CA_3A-7A-8A	-	3			Yes	Yes	Yes	Yes		
		7		1		Yes	Yes	Yes	50	1
		8			Yes	Yes				
	CA_3A-7A	3	1	<u> </u>	Yes	Yes	Yes	Yes		
CA 2A 7A 20A		7		 	169	Yes	Yes	Yes	60	0
CA_3A-7A-20A	CA_3A-20A CA_7A-20A ⁶			-	Vaa				υυ	U
	UA_1 A-20A	20		 	Yes	Yes	Yes	Yes		
04 04 -4	CA_3A-7A-28A	3		ļ	Yes	Yes	Yes	Yes		_
CA_3A-7A-28A		7	1		Yes	Yes	Yes	Yes		0
		28			Yes	Yes	Yes	Yes		

		3				Yes	Yes	Yes		
CA 2A 7C 28A		7	See C	A_7C E	Bandwid		bination		90	0
CA_3A-7C-28A	-			i	n Table	5.6A.1-	1		80	U
		28				Yes	Yes	Yes		
CΔ 3Δ-7Δ-		3			Yes	Yes	Yes	Yes		
CA_3A-7A- 38A ⁷	-	7				Yes	Yes	Yes	60	0
		38			Yes	Yes	Yes	Yes		
		3			Yes	Yes	Yes	Yes		
CA_3A-8A-40A	-	8		Yes	Yes	Yes			50	0
		40			Yes	Yes	Yes	Yes		
CA_3A-19A-		3			Yes	Yes	Yes	Yes		
42A	-	19			Yes	Yes	Yes		55	0
127 (42			Yes	Yes	Yes	Yes		
		3			Yes	Yes	Yes	Yes		
CA_3A-19A-	_	19			Yes	Yes	Yes		75	0
42C		42	See (mbinatio	on set	. •	· ·
				0	in Table					
CA_3A-28A-		3			Yes	Yes	Yes	Yes		_
40A	-	28			Yes	Yes	Yes	Yes	60	0
		40			Yes	Yes	Yes	Yes		
		3			Yes	Yes	Yes	Yes		
CA_3A-28A-	-	28	_		Yes	Yes	Yes	Yes	80	0
40C		40	See (mbinatio	on set		
				0	in Table					
CA_3A-41A-		3			Yes	Yes	Yes	Yes	0.0	
42A	-	41		-	Yes	Yes	Yes	Yes	60	0
		42		-	Yes	Yes	Yes	Yes		
		4			Yes	Yes	Yes	Yes		_
CA_4A-5A-12A	-	5			Yes	Yes			40	0
		12		L	Yes	Yes	<u> </u>			
		4	See				Combin	ation		
CA_4A-4A-5A-	-			Set	0 in Tal		1.1-3	1	60	0
12A		5			Yes	Yes				
		12			Yes	Yes	V	Vaa		
00 40 50 400	00 40 4006	4			Yes	Yes	Yes	Yes	40	0
CA_4A-5A-13A	CA_4A-13A ⁶	5			Yes	Yes			40	0
		13			\/	Yes	\/	V		
04 44 54 004		4			Yes	Yes	Yes	Yes	40	•
CA_4A-5A-29A	-	5			Yes	Yes			40	0
		29			Yes	Yes				
00 40 50 00:		4		1	Yes	Yes	Yes	Yes	40	•
CA_4A-5A-30A	-	5		-	Yes	Yes	-		40	0
		30		<u> </u>	Yes	Yes	<u> </u>			
		4		ļ	Yes	Yes	\			_
		7		ļ	Yes	Yes	Yes	Yes	40	0
CA_4A-7A-12A	_	12		ļ	Yes	Yes	ļ.,			
		4		ļ	Yes	Yes	Yes	Yes		_
		7		ļ	Yes	Yes	Yes	Yes	50	1
		12		ļ	Yes	Yes	ļ.,_			
CA_4A-12A-		4			Yes	Yes	Yes	Yes		
30A	-	12			Yes	Yes			40	0
		30			Yes	Yes				
CA_4A-29A-		4			Yes	Yes	Yes	Yes		
30A	-	29		ļ	Yes	Yes	ļ		40	0
00/1		30			Yes	Yes				
		7				Yes	Yes	Yes		
	CA_7A-8A-20A	8		Yes	Yes	Yes			40	0
CA_7A-8A-20A	-				Yes	Yes				
CA_7A-8A-20A	-	20		<u> </u>						
	-					Yes	Yes	Yes		
	-	20			Yes		Yes Yes	Yes Yes	60	0
CA_7A-8A-20A CA_7A-20A- 38A ⁸	-	20 7				Yes			60	0

42A		21			Yes	Yes	Yes			
		42			Yes	Yes	Yes	Yes		
		19			Yes	Yes	Yes			
CA_19A-21A-	_	21			Yes	Yes	Yes		70	0
42C	-	42	See (CA_42C	Bandw	idth cor	nbinatio	n set	70	U
		42		0 in Table 5.6A.1-1						

- NOTE 1: The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 5.6A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.
- NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set.
- NOTE 3: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.
- NOTE 4: A terminal which supports a DL CA configuration shall support all the lower order fallback DL CA combinations and it shall support at least one bandwidth combination set for each of the constituent lower order DL combinations containing all the bandwidths specified within each specific combination set of the upper order DL combination.
- NOTE 5: Uplink CA configurations are the configurations supported by the present release of specifications.
- NOTE 6: If the UE supports uplink CA for corresponding downlink CA it shall support this uplink CA configuration.
- NOTE 7: UL carrier shall be supported in Band 3 only. Power imbalance between downlink carriers on Band 7 and Band 38 is assumed to be within [6dB].
- NOTE 8: UL carrier shall be supported in Band 20 only. Power imbalance between downlink carriers on Band 7 and Band 38 is assumed to be within [6dB]

Table 5.6A.1-2b: E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA (four bands)

	E-U	TRA CA	configu	ration /	Bandw	idth cor	nbinati	on set		
E-UTRA CA Configuration	Uplink CA configurations (NOTE 5)	E- UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combination set
		1			Yes	Yes	Yes	Yes		
CA_1A-3A-5A-		3			Yes	Yes	Yes	Yes	70	0
40A	-	5			Yes	Yes] /0	U
		40				Yes	Yes	Yes		
		1			Yes	Yes	Yes	Yes		
CA_1A-3A-7A-		3			Yes	Yes	Yes	Yes	70	0
8A	-	7				Yes	Yes	Yes] 70	U
		8			Yes	Yes				
		1			Yes	Yes	Yes	Yes]	
CA_1A-3A-8A-		3			Yes	Yes	Yes	Yes	70	0
40A	-	8		Yes	Yes	Yes			70	U
		40			Yes	Yes	Yes	Yes		
		1			Yes	Yes	Yes	Yes		
CA_1A-3A-		3			Yes	Yes	Yes	Yes	75	0
19A-42A	-	19			Yes	Yes	Yes		75	U
		42			Yes	Yes	Yes	Yes		
		1			Yes	Yes	Yes	Yes		
CA 4A 2A		3			Yes	Yes	Yes	Yes	ĺ	
CA_1A-3A-	-	19			Yes	Yes	Yes		95	0
19A-42C		42 See CA_42C Bandwidth combination set 0 in Table 5.6A.1-1								
		1			Yes	Yes	Yes	Yes		
CA_1A-19A- 21A-42A		19			Yes	Yes	Yes			_
	-	21			Yes	Yes	Yes		70	0
		42			Yes	Yes	Yes	Yes	İ	
		1			Yes	Yes	Yes	Yes		
		19			Yes	Yes	Yes		İ	
CA_1A-19A-	-	21			Yes	Yes	Yes		90	0
21A-42C		42	See CA_42C Bandwidth combination set 0 in Table 5.6A.1-1						-	
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-5A-		4			Yes	Yes	Yes	Yes		_
12A	-	5			Yes	Yes			60	0
		12			Yes	Yes			1	
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-5A-		4			Yes	Yes	Yes	Yes		_
29A	-	5			Yes	Yes			60	0
		29			Yes	Yes			İ	
		2			Yes	Yes	Yes	Yes		
CA_2A-4A-5A-		4			Yes	Yes	Yes	Yes		_
30A	-	5			Yes	Yes			60	0
		30			Yes	Yes			1	
		2			Yes	Yes	Yes	Yes		
CA 2A-4A-		4			Yes	Yes	Yes	Yes	1	
CA_2A-4A- 12A-30A	-	12			Yes	Yes	. 00	, 55	60	0
12/100/1		30			Yes	Yes			1	
		2			Yes	Yes	Yes	Yes		
		. ~	l	i	100	100	100		I	
CA 2A-4A-		4			Yes	Yes	Yes	Yes	1	
CA_2A-4A- 29A-30A	-	4 29			Yes Yes	Yes Yes	Yes	Yes	60	0

NOTE 1: The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 5.6A-1 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.

NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set.

NOTE 3: For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.

NOTE 4: A terminal which supports a DL CA configuration shall support all the lower order fallback DL CA combinations and it shall support at least one bandwidth combination set for each of the constituent lower order DL combinations containing all the bandwidths specified within each specific combination set of the upper order DL

combination.

NOTE 5: Uplink CA configurations are the configurations supported by the present release of specifications.

Table 5.6A.1-3: E-UTRA CA configurations and bandwidth combination sets defined for non-contiguous intra-band CA (with two sub-blocks)

					Ith combinatio	n set	
		Componer		rder of increas iency	ing carrier	Maximum	
E-UTRACA configuration	Uplink CA configurations (NOTE 1)	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	aggregated bandwidth [MHz]	Bandwidth combination set
CA_2A-2A	-	5, 10, 15, 20	5, 10, 15, 20	•	• •	40	0
		5, 10, 15, 20	5, 10, 15, 20			40	0
CA_3A-3A	-	5, 10	5, 10, 15, 20			30	1
00 40 40	00.40.40	5, 10, 15, 20	5, 10, 15, 20			40	0
CA_4A-4A	CA_4A-4A	5, 10	5, 10			20	1
CA_5A-5A	-	5,10	5,10			20	0
		5	15				
		10	10, 15			40	0
CA_7A-7A	-	15	15, 20			40	U
		20	20				
		5, 10, 15, 20	5, 10, 15, 20			40	1
CA_23A-23A	-	5	10			15	0
CA 25A 25A		5, 10	5, 10			20	0
CA_25A-25A	-	5, 10, 15, 20	5, 10, 15, 20			40	1
CA_40A-40A	-	10, 20	10, 20			40	0
CA 44 A 44 A		10, 15, 20	10, 15, 20			40	0
CA_41A-41A	-	5, 10, 15, 20	5, 10, 15, 20			40	1
CA_41A-41C	-	_	Combination	C Bandwidth Set 1 in Table A.1-1 5, 10, 15,		60	0
		5.6 <i>A</i> 5, 10, 15,	\.1-1	20 Bandwidth Cor	mhination Set		
CA_41A-41D	CA_41C	20 See CA_41D	0 Bandwidth Co	in Table 5.6A.1 mbination Set	-1 5, 10, 15,	80	0
CA_41C-41C	CA_41C	See CA_410	in Table 5.6A.1 C Bandwidth Set 0 in Table	See CA_410	20 C Bandwidth Set 0 in Table	80	0
CA_42A-42A	-	5, 10, 15, 20	5, 10, 15, 20	3.07		40	0
CA_42A-42C	-	5, 10, 15, 20	See CA_420 Combination	L C Bandwidth Set 0 in Table A.1-1		60	0
CA_42A-42D	-	5, 10, 15, 20	See CA_42D	Bandwidth Cor in Table 5.6A.1		80	0
CA_42C-42A	-	See CA_420	C Bandwidth Set 0 in Table	5, 10, 15, 20		60	0
CA_42C-42C	-	See CA_420	C Bandwidth Set 0 in Table		C Bandwidth Set 0 in Table \.1-1	80	0

CA_42D-42A	-		Bandwidth Con in Table 5.6A.1-		5, 10, 15, 20	80	0	
CA_66A-66A	-	5, 10, 15, 20	5, 10, 15, 20			40		
NOTE 1: Uplink CA configurations are the configurations supported by the present release of specifications.								

5.6B Channel bandwidth for UL-MIMO

The requirements specified in subclause 5.6 are applicable to UE supporting UL-MIMO.

5.6B.1 Void

5.6C Channel bandwidth for Dual Connectivity

For E-UTRA DC bands specified in 5.5C, the corresponding E-UTRA CA configurations in 5.6A.1, i.e., dual uplink inter-band carrier aggregation with uplink assigned to two E-UTRA bands, are applicable to Dual Connectivity.

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

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

5.6C.1 Void

Table 5.6C.1-1: Void

Table 5.6C.1-2: E-UTRA DC configurations and bandwidth combination sets defined for inter-band DC (three bands)

	E-UTRA DC configuration / Bandwidth combination set									
E-UTRA DC Configuration	Uplink DC configurations	E- UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combination set
	DC_1A-3A	1			Yes	Yes	Yes	Yes		
DC_1A-3A-19A	DC_1A-19A	3			Yes	Yes	Yes	Yes	55	0
	DC_3A-19A	19			Yes	Yes	Yes			
	DC_1A-19A	1			Yes	Yes	Yes	Yes		
DC_1A-19A-21A	DC_1A-21A DC_19A-21A	19			Yes	Yes	Yes		50	0
		21			Yes	Yes	Yes			

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

5.6D Channel bandwidth for ProSe

5.6D.1 Channel bandwidths per operating band for ProSe

The ProSe combination of channel bandwidths and operating bands is shown in Table 5.6D.1-1 and Table 5.6D.1-2. The transmission bandwidth configuration in Table 5.6D.1-1 and Table 5.6D.1-2 shall be supported for each of the specified channel bandwidths. The same (symmetrical) channel bandwidth is specified for both the TX and RX path.

E-UTRA ProSe band / ProSe channel bandwidth								
E-UTRA ProSe Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
2			Yes	Yes	Yes	Yes		
3			Yes	Yes	Yes	Yes		
4			Yes	Yes	Yes	Yes		
7			Yes	Yes	Yes	Yes		
14			Yes	Yes				
20			Yes	Yes	Yes	Yes		
26			Yes	Yes	Yes			
28			Yes	Yes	Yes	Yes		
31			Yes					
//1			Vac	Vac	Vac	Yes		

Table 5.6D.1-1 ProSe Direct Discovery channel bandwidth

Table 5.6D.1-2 ProSe Direct Communication channel bandwidth

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

5.7 Channel arrangement

5.7.1 Channel spacing

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

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

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

5.7.1A Channel spacing for CA

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

where $BW_{Channel(1)}$ and $BW_{Channel(2)}$ are the channel bandwidths of the two respective E-UTRA component carriers according to Table 5.6-1 with values in MHz. The channel spacing for intra-band contiguous carrier aggregation can be adjusted to any multiple of 300 kHz less than the nominal channel spacing to optimize performance in a particular deployment scenario.

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

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

5.7.2 Channel raster

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

5.7.2A Channel raster for CA

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

5.7.3 Carrier frequency and EARFCN

The carrier frequency in the uplink and downlink is designated by the E-UTRA Absolute Radio Frequency Channel Number (EARFCN) in the range 0-262143. The relation between EARFCN and the carrier frequency in MHz for the downlink is given by the following equation, where F_{DL_low} and $N_{Offs-DL}$ are given in Table 5.7.3-1 and N_{DL} is the downlink EARFCN.

$$F_{DL} = F_{DL \ low} + 0.1(N_{DL} - N_{Offs\text{-}DL})$$

The relation between EARFCN and the carrier frequency in MHz for the uplink is given by the following equation where F_{UL_low} and $N_{Offs-UL}$ are given in Table 5.7.3-1 and N_{UL} is the uplink EARFCN.

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

Table 5.7.3-1: E-UTRA channel numbers

E-UTRA		Downlink			Uplink	
Operating	F _{DL_low} (MHz)	N _{Offs-DL}	Range of N _{DL}	F _{UL_low}	N _{Offs-UL}	Range of N _{UL}
Band				(MHz)		
1	2110	0	0 – 599	1920	18000	18000 – 18599
2	1930	600	600 – 1199	1850	18600	18600 – 19199
3	1805	1200	1200 – 1949	1710	19200	19200 – 19949
4	2110	1950	1950 – 2399	1710	19950	19950 – 20399
5	869	2400	2400 – 2649	824	20400	20400 - 20649
6	875	2650	2650 – 2749	830	20650	20650 - 20749
7	2620	2750	2750 – 3449	2500	20750	20750 – 21449
8	925	3450	3450 – 3799	880	21450	21450 – 21799
9	1844.9	3800	3800 – 4149	1749.9	21800	21800 – 22149
10	2110	4150	4150 – 4749	1710	22150	22150 – 22749
11	1475.9	4750	4750 – 4949	1427.9	22750	22750 - 22949
12	729	5010	5010 - 5179	699	23010	23010 - 23179
13	746	5180	5180 - 5279	777	23180	23180 – 23279
14	758	5280	5280 - 5379	788	23280	23280 - 23379
17	734	5730	5730 – 5849	704	23730	23730 – 23849
18	860	5850	5850 - 5999	815	23850	23850 – 23999
19	875	6000	6000 - 6149	830	24000	24000 – 24149
20	791	6150	6150 – 6449	832	24150	24150 – 24449
21	1495.9	6450	6450 – 6599	1447.9	24450	24450 – 24599
22	3510	6600	6600 - 7399	3410	24600	24600 - 25399
23	2180	7500	7500 – 7699	2000	25500	25500 – 25699
24	1525	7700	7700 – 8039	1626.5	25700	25700 – 26039
25	1930	8040	8040 - 8689	1850	26040	26040 - 26689
26	859	8690	8690 - 9039	814	26690	26690 - 27039
27	852	9040	9040 – 9209	807	27040	27040 – 27209
28	758	9210	9210 – 9659	703	27210	27210 – 27659
29 ²	717	9660	9660 – 9769		N/A	
30	2350	9770	9770 – 9869	2305	27660	27660 – 27759
31	462.5	9870	9870 – 9919	452.5	27760	27760 – 27809
32 ²	1452	9920	9920 – 10359		N/A	
33	1900	36000	36000 – 36199	1900	36000	36000 – 36199
34	2010	36200	36200 - 36349	2010	36200	36200 - 36349
35	1850	36350	36350 - 36949	1850	36350	36350 - 36949
36	1930	36950	36950 – 37549	1930	36950	36950 – 37549
37	1910	37550	37550 – 37749	1910	37550	37550 – 37749
38	2570	37750	37750 – 38249	2570	37750	37750 – 38249
39	1880	38250	38250 - 38649	1880	38250	38250 - 38649
40	2300	38650	38650 - 39649	2300	38650	38650 - 39649
41	2496	39650	39650 -41589	2496	39650	39650 -41589
42	3400	41590	41590 – 43589	3400	41590	41590 – 43589
43	3600	43590	43590 – 45589	3600	43590	43590 – 45589
44	703	45590	45590 – 46589	703	45590	45590 – 46589
45	1447	46590	46590 – 46789	1447	46590	46590 – 46789
46 ⁴	5150	46590	46590 – 54339	5150	46590	46590 – 54339
				<u> </u>		
64	04:5	05500	Rese		1012=2	101070 101071
65	2110	65536	65536 - 66435	1920	131072	131072 – 131971
66 ⁵	2110	66436	66436 – 67335	1710	131972	131972 – 132671
67 ²	738	67336	67336 – 67535		N/A	

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

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

NOTE 3: For ProSe the corresponding UL channel number are also specified for the DL for the associated ProSe operating bands i.e. ProSe_F_{UL} = F_{UL} and ProSe_F_{DL} = F_{UL}.

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

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

5.7.4 TX-RX frequency separation

a) The default E-UTRA TX channel (carrier centre frequency) to RX channel (carrier centre frequency) separation is specified in Table 5.7.4-1 for the TX and RX channel bandwidths defined in Table 5.6.1-1

Table 5.7.4-1: Default UE TX-RX frequency separation

E-UTRA Operating Band	TX – RX carrier centre frequency separation
1	190 MHz
2	80 MHz.
3	95 MHz.
4	400 MHz
5	45 MHz
6	45 MHz
7	120 MHz
8	45 MHz
9	95 MHz
10	400 MHz
11	48 MHz
12	30 MHz
13	-31 MHz
14	-30 MHz
17	30 MHz
18	45 MHz
19	45 MHz
20	-41 MHz
21	48 MHz
22	100 MHz
23	180 MHz
24	-101.5 MHz
25	80 MHz
26	45 MHz
27	45 MHz
28	55 MHz
30	45 MHz
31	10 MHz
65	190 MHz
66	400 MHz

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

5.7.4A TX-RX frequency separation for CA

For intra-band contiguous carrier aggregation, the same TX-RX frequency separation as specified in Table 5.7.4-1 is applied to PCC and SCC, respectively.

6 Transmitter characteristics

6.1 General

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

6.2 Transmit power

6.2.1 Void

6.2.2 UE maximum output power

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

Table 6.2.2-1: UE Power Class

EUTRA band	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
1					23	±2		
2					23	±2 ²		
3					23	±2 ² ±2 ²		
4					23	±2		
5					23	±2		
6					23	±2		
7					23	±2 ±2 ² ±2 ²		
8					23	±2 ²		
9					23	±2		
10					23	±2		
11					23	±2		
12					23	±2 ²		
13					23			
14	31	+2/-3			23	±2 ±2		
					_			
17					23	±2		
18					23	±2 ⁵		
19					23			
20					23	±2 ±2 ²		
21					23	±2		
22					23	+2/-3.5 ²		
23					23 ⁶	±2 ⁶		
24					23	+2		
25					23	±2 ±2 ² ±2 ²		
26					23	+222		
27					23	±2		
28					23	+2/-2.5		
30					23	±2		
31					23	±2		
33					23	±2		
34					23	±2		
35					23	±2		
36					23	±2		
37				 	23	±2		
38					23	±2		
39				1	23	±2		
40				1	23			
41				1	23	±2 ±2 ²		
42				1		+2/-3		
43				1	23 23	+2/-3		
43				1	23	+2/-3 +2/[-3]		
44					23	+2/[-3] ±2		
					۷۵	±Ζ		
 65					22	±2		
65		-		 	23			
66	l .			<u> </u>	23	±2	l	

NOTE 1: Void

NOTE 2: ² refers to the transmission bandwidths (Figure 5.6-1) confined within F_{UL_low} and F_{UL_low} + 4 MHz or F_{UL_high} – 4 MHz and F_{UL_high} , the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB

NOTE 3: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.

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

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

NOTE 6: When NS_20 is signalled, the total output power within 2000-2005 MHz shall be limited to 7 dBm.

6.2.2A UE maximum output power for CA

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

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

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

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

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

E-UTRA CA Configuration	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
CA_1A-3A	, ,	(*)	,	(3)	23	+2/-3 ²	,	(*)
CA_1A-5A					23	+2/-3		
CA_1A-7A					23	+2/-3 ²		
CA_1A-8A					23	+2/-3 ²		
CA_1A-18A					23	+2/-3 ⁵		
CA_1A-19A					23	+2/-3		
CA_1A-21A					23	+2/-3		
CA_1A-26A					23	+2/-3 ²		
CA_1A-28A					23	+2/-3		
CA_1A-42A					23	+2/-3		
CA_2A-4A					23	+2/-3 ²		
CA_2A-5A					23	+2/-3 ²		
CA_2A-12A					23	+2/-3 ²		
CA_2A-13A					23	+2/-3 ²		
CA_3A-5A					23	+2/-3 ²		
CA_3A-7A					23	+2/-3 ²		
CA_3A-8A					23	+2/-3 ²		
CA_3A-19A					23	+2/-3 ²		
CA_3A-20A					23	+2/-3 ²		
CA_3A-26A					23	+2/-3 ²		
CA_4A-5A					23	+2/-3		
CA_4A-7A					23	+2/-3 ²		
CA_4A-12A					23	+2/-3 ²		
CA_4A-13A					23	+2/-3		
CA_4A-17A					23	+2/-3		
CA_5A-7A					23	+2/-3 ²		
CA_5A-12A					23	+2/-3 ²		
CA_5A-17A					23	+2/-3		
CA_7A-20A					23	+2/-3 ²		
CA_7A-28A					23	+2/-3 ²		
CA_18A-28A					23	+2/-3		
CA_19A-21A					23	+2/-3		
CA 39A-41A					23	+2/-3 ²		
CA_39A-41C					23	+2/-3 ²		
CA_39C-41A					23	+2/-3 ²		

NOTE 1: Void

- NOTE 2: ² refers to the transmission bandwidths (Figure 5.6-1) confined within F_{UL_low} and F_{UL_low} + 4 MHz or F_{UL_high} 4 MHz and F_{UL_high}, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB
- NOTE 3: PPowerClass is the maximum UE power specified without taking into account the tolerance
- NOTE 4: For inter-band carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).
- NOTE 5: For a UE that supports both Band 18 and Band 26, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB for transmission bandwidths confined within 815 MHz and 818 MHz.

For intra-band contiguous carrier aggregation the maximum output power is specified in Table 6.2.2A-1.

Table 6.2.2A-1: CA UE Power Class for intraband contiguous CA

E-UTRA CA Configuration	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
CA_1C					23	+2/-2		•
CA_3C					23	+2/-22		
CA_7C					23	+2/-2 ²		
CA_8B					23	+2/-2 ²		
CA_38C					23	+2/-2		
CA_39C					23	+2/-2		
CA_40C					23	+2/-2		
CA_41C					23	+2/-2 ²		
CA_42C					23	+2/-3		

NOTE 1: Void

NOTE 2: If all transmitted resource blocks (Figure 5.6A-1) over all component carriers are confined within F_{UL_low} and F_{UL_low} + 4 MHz or/and F_{UL_high} – 4 MHz and F_{UL_high}, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB

NOTE 3: PpowerClass is the maximum UE power specified without taking into account the tolerance

NOTE 4: For intra-band contiguous carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).

For intra-band non-contiguous carrier aggregation with one uplink carrier on the PCC, the requirements in subclause 6.2.2 apply. For intra-band non-contiguous carrier aggregation with two uplink carriers the maximum output power is specified in Table 6.2.2A-2.

Table 6.2.2A-2: UE Power Class for intraband non-contiguous CA

E-UTRA CA Configuration	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)		
CA_4A-4A					23	+2/-2				
	NOTE 1: For transmission bandwidths (Figure 5.6-1) confined within F _{UL_low} and F _{UL_low} + 4 MHz or F _{UL_high} – 4 MHz and F _{UL_high} , the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB									

NOTE 2: P_{PowerClass} is the maximum UE power specified without taking into account the tolerance

NOTE 3: For intra-band non-contiguous carrier aggregation the maximum power requirement should apply to the total transmitted power over all component carriers (per UE).

6.2.2B UE maximum output power for UL-MIMO

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

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

EUTRA band	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
1	(аып)	(ub)	(ubiii)	(ub)	23	+2/-3	(ubiii)	(UB)
					23	+2/-3 +2/-3 ²		
3						+2/-3 ²		
					23			
4					23	+2/-3		
5					23	+2/-3		
6					23	+2/-3		
7					23	+2/-3 ²		
8					23	+2/-3 ²		
9					23	+2/-3		
10					23	+2/-3		
11					23	+2/-3		
12					23	+2/-3 ²		
13					23	+2/-3		
14					23	+2/-3		
17					23	+2/-3		
18					23	+2/-3		
19					23	+2/-3		
20					23	+2/-3 ²		
21					23	+2/-3		
22					23	+2/-4.5 ²		
23					23	+2/-3		
24					23	+2/-3		
25					23	+2/-3 ²		
26					23	+2/-3 ²		
27					23	+2/-3		
28					23	+2/[-3]		
30					23	+2/-3		
31					23	+2/-3		
33					23	+2/-3		
34					23	+2/-3		
35					23	+2/-3		
36					23	+2/-3		
37					23	+2/-3		
38					23	+2/-3		
39					23	+2/-3		
40					23	+2/-3		
41					23	+2/-3 ²		
42					23	+2/-3		-
43					23	+2/-4		-
43					23	+2/-4		
44 45								
					23	+2/-3		
 GE					22	10/0		
65					23	+2/-3		
66 NOTE 1:	\ <u></u>				23	+2/-3		

NOTE 1: Void
NOTE 2: ² refers to the transmission bandwidths (Figure 5.6-1) confined within F_{UL_low} and F_{UL_low} + 4 MHz or $F_{UL_high} - 4 \; \text{MHz and} \; F_{UL_high}, \; \text{the maximum output power requirement is relaxed by reducing the lower}$ tolerance limit by 1.5 dB

NOTE 3: For the UE which supports both Band 11 and Band 21 operating frequencies, the tolerance is FFS.

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

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

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

For single-antenna port scheme, the requirements in subclause 6.2.2 apply.

6.2.2C Void

<reserved for future use>

6.2.2D UE maximum output power for ProSe

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

6.2.3 UE maximum output power for modulation / channel bandwidth

For UE Power Class 1 and 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1.

Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1 and 3

Modulation	Cha	Channel bandwidth / Transmission bandwidth (N _{RB})							
	1.4 3.0 5			10	10 15	20			
	MHz	MHz	MHz	MHz	MHz	MHz			
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1		
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1		
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2		
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2		
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3		

For PRACH, PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each subframe, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For transmissions with non-contiguous resource allocation in single component carrier, the allowed Maximum Power Reduction (MPR) for the maximum output power in table 6.2.2-1, is specified as follows

$$MPR = CEIL \{M_A, 0.5\}$$

Where M_A is defined as follows

 $M_A = 8.00-10.12A$; $0.00 < A \le 0.33$

5.67 - 3.07A ; $0.33 < A \le 0.77$

3.31 ; $0.77 < A \le 1.00$

Where

 $A = N_{RB \text{ alloc}} / N_{RB}$

CEIL{M_A, 0.5} means rounding upwards to closest 0.5dB, i.e. MPR \in [3.0, 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0]

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5 apply.

6.2.3A UE Maximum Output power for modulation / channel bandwidth for CA

For inter-band carrier aggregation with uplink assigned to one E-UTRA band (Table 5.6A-1), the requirements in subclause 6.2.3 apply.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirements in subclause 6.2.3 apply for each uplink component carrier.

For intra-band contiguous carrier aggregation the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1due to higher order modulation and contiguously aggregated transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3A-1. In case the modulation format is different on different component carriers then the MPR is determined by the rules applied to higher order of those modulations.

CA bandwidth Class B and C MPR Modulation 75 RB + 25 RB + 50 RB + 75 RB + 100 RB + 25 RB + 50 RB + (dB) **50 RB 50 RB** 100 RB 100 RB **75 RB** 100 RB 100 RB QPSK > 8 and ≤ > 12 and > 8 and ≤ > 12 and > 16 and > 16 and > 18 and 25 ≤ 50 25 ≤ 50 ≤ 75 ≤ 75 ≤ 100 > 75 > 75 **QPSK** > 25 > 25 > 100 ≤ 2 > 50 > 50 ≤ 1 16 QAM ≤ 8 ≤ 12 ≤ 16 ≤ 16 ≤ 8 ≤ 12 ≤ 18 > 16 and 16 QAM > 12 and > 12 and > 16 and > 18 and ≤2 > 8 and ≤ > 8 and ≤ 25 ≤ 50 25 ≤ 50 ≤ 75 ≤ 75 ≤ 100 16 QAM > 25 > 50 > 25 > 50 > 75 > 75 > 100 ≤ 3 64 QAM ≤ 8 and ≤ 12 and ≤ 8 and ≤ 12 and ≤ 16 and ≤ 16 and ≤ 18 and ≤ 2 allocation allocation allocation allocation allocation allocation allocation wholly wholly wholly wholly wholly wholly wholly contained contained contained contained contained contained contained within a within a within a within a within a within a within a single CC single CC single CC single CC single CC single CC single CC 64 QAM > 8 or > 12 or > 8 or > 12 or > 16 or > 16 or > 18 or ≤ 3 allocation allocation allocation allocation allocation allocation allocation extends extends extends extends extends extends extends across across across across across across across two CC's two CC's two CC's two CC's two CC's two CC's two CC's

Table 6.2.3A-1: Maximum Power Reduction (MPR) for Power Class 3

For PUCCH and SRS transmissions, the allowed MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1 is specified as follows

$$MPR = CEIL \{ min(M_A, M_{IM5}), 0.5 \}$$

Where M_A is defined as follows

$$\begin{array}{lll} M_A = & 8.2 & ; 0 \leq A < 0.025 \\ & 9.2 - 40A & ; 0.025 \leq A < 0.05 \\ & 8 - 16A & ; 0.05 \leq A < 0.25 \\ & 4.83 - 3.33A & ; 0.25 \leq A \leq 0.4, \\ & 3.83 - 0.83A & ; 0.4 \leq A \leq 1, \end{array}$$

and M_{IM5} is defined as follows

$$\begin{split} M_{IM5} = \ 4.5 & ; \Delta_{IM5} < 1.5 * BW_{Channel_CA} \\ & 6.0 & ; 1.5 * BW_{Channel_CA} \le \Delta_{IM5} < BW_{Channel_CA} / 2 + F_{OOB} \\ & M_A & ; \Delta_{IM5} \ge BW_{Channel_CA} / 2 + F_{OOB} \end{split}$$

For intra-band contiguous carrier aggregation bandwidth class B with non-contiguous resource allocation, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2A-1 is specified as follows

$$MPR = CEIL \{ M_A, 0.5 \}$$

Where M_A is defined as follows

$$\begin{split} M_A = & \ 10.5 - 17.5A \ ; \ 0 \leq A < 0.2 \\ 8.5 - 7.5A & \ ; \ 0.2 \leq A < 0.6 \\ 5.5 - 2.5A & \ ; \ 0.6 \leq A \leq 1 \end{split}$$

Where

$$A = N_{RB \ alloc} / N_{RB \ agg}$$

$$\begin{split} &\Delta_{IM5} = max(\mid F_{C_agg} - (3*F_{agg_alloc_low} - 2*F_{agg_alloc_high})\mid, \mid F_{C_agg} - (3*F_{agg_alloc_high} - 2*F_{agg_alloc_low})\mid) \\ &F_{C_agg} = (F_{edge_high} + F_{edge_low})/2 \end{split}$$

CEIL{ M_{A_1} 0.5} means rounding upwards to closest 0.5dB, i.e. MPR \in [3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5].

For intra-band non-contiguous carrier aggregation with one uplink carrier, the requirements in subclause 6.2.3 apply.

For intra-band non-contiguous carrier aggregation with two uplink carriers MPR is specified for E-UTRA CA configurations with a maximum possible $W_{GAP} \leq 35$ MHz; the allowed MPR is

$$MPR = CEIL \{M_N, 0.5\}$$

where M_N is defined as follows

$$\begin{array}{ll} M_{N}\!\!=& -0.125\;N+18.25 & ; \, 2 \leq N \leq 50 \\ \\ -0.0333\;N+13.67 & ; \, 50 < N \leq 200 \end{array}$$

where $N=N_{RB_alloc}$ is the number of allocated resource blocks. Clause 6.2.3 does not apply in addition. E-UTRA CA configurations with a maximum possible $W_{gap} > 35$ MHz and their corresponding MPR are intended to form part of a later release

For intra-band carrier aggregation, the MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum MPR over the two slots is then applied for the entire subframe.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band), the requirements specified in subclause 6.2.3 apply for the E-UTRA band supporting one component carrier, and for the E-UTRA band supporting two contiguous component carriers the requirements specified in subclause 6.2.3A apply.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5A apply.

6.2.3B UE maximum output power for modulation / channel bandwidth for UL-MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2B-1 is specified in Table 6.2.3-1. The requirements shall be met with UL-MIMO configurations defined in Table 6.2.2B-2. For UE supporting UL-MIMO, the maximum output power is measured as the sum of the maximum output power at each UE antenna connector.

For the UE maximum output power modified by MPR, the power limits specified in subclause 6.2.5B apply.

For single-antenna port scheme, the requirements in subclause 6.2.3 apply.

6.2.3D UE maximum output power for modulation / channel bandwidth for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.5D-1, this subclause specifies the allowed Maximum Power Reduction (MPR) power for ProSe physical channels and signals due to higher order modulation and transmit bandwidth configuration (resource blocks).

The allowed MPR for the maximum output power for ProSe physical channels PSDCH, PSCCH, PSSCH, and PSBCH shall be as specified in subclause 6.2.3 for PUSCH for the corresponding modulation and transmission bandwidth.

The allowed MPR for the maximum output power for ProSe physical signal PSSS shall be as be as specified in subclause 6.2.3 for PUSCH QPSK modulation for the corresponding transmission bandwidth.

The allowed MPR for the maximum output power for ProSe physical signal SSSS is specified in Table 6.2.3D-1.

Table 6.2.3D-1: Maximum Power Reduction (MPR) for SSSS for Power Class 1 and 3

Channel bandwidth	MPR for SSSS (dB)				
1.4 MHz					
3.0 MHz					
5.0 MHz	≤ 4				
10 MHz	≤ 4				
15 MHz	≤ 4				
20 MHz	≤ 4				

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the requirements in subclause 6.2.3D apply for ProSe transmission and the requirements in subclause 6.2.3 apply for uplink transmission.

6.2.4 UE maximum output power with additional requirements

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the output power as specified in Table 6.2.2-1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

For UE Power Class 1 and 3 the specific requirements and identified subclauses are specified in Table 6.2.4-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4-1 to 6.2.4-15 are in addition to the allowed MPR requirements specified in subclause 6.2.3.

Table 6.2.4-1: Additional Maximum Power Reduction (A-MPR)

Network Signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks (<i>N</i> _{RB})	A-MPR (dB)
NS_01	6.6.2.1.1	Table 5.5-1	1.4, 3, 5, 10, 15, 20	Table 5.6-1	N/A
			3	>5	≤ 1
		2, 4,10, 23, 25,	5	>6	≤ 1
NS_03	6.6.2.2.1	35, 36, 66	10	>6	≤ 1
		00, 00, 00	15	>8	≤ 1
			20	>10	≤ 1
NS_04	6.6.2.2.2, 6.6.3.3.19	41	5, 10, 15, 20	Table	6.2.4-4
		1	10,15,20	≥ 50 (NOTE1)	≤ 1 (NOTE1)
NS_05	6.6.3.3.1		15, 20	Table 6.2.4	-18 (NOTE2)
		65 (NOTE 3)	10,15,20	≥ 50	≤ 1 (NOTE 1)
		65 (NOTE 3)	15,20	Table 6.2.4	-18 (NOTE 2)
NS_06	6.6.2.2.3	12, 13, 14, 17	1.4, 3, 5, 10	Table 5.6-1	N/A
NS_07	6.6.2.2.3 6.6.3.3.2	13	10	Table	6.2.4-2
NS_08	6.6.3.3.3	19	10, 15	> 44	≤ 3
NS_09	6.6.3.3.4	21	10.15	> 40	≤ 1
143_09	0.0.3.3.4	21	10, 15	> 55	≤ 2
NS_10		20	15, 20	Table	6.2.4-3
NS_11	6.6.2.2.1 6.6.3.3.13	23	1.4, 3, 5, 10, 15, 20	Table	6.2.4-5
NS_12	6.6.3.3.5	26	1.4, 3, 5, 10, 15	Table	6.2.4-6
NS_13	6.6.3.3.6	26	5	Table	6.2.4-7
NS_14	6.6.3.3.7	26	10, 15		6.2.4-8
NS_15	6.6.3.3.8	26	1.4, 3, 5, 10,		6.2.4-9
110_10	0.0.0.0.0	20	15		6.2.4-10
NS_16	6.6.3.3.9	27	3, 5, 10	Table	, Table 6.2.4-12, 6.2.4-13
NS_17	6.6.3.3.10	28	5, 10	Table 5.6-1	N/A
NS_18	6.6.3.3.11	28	5	≥ 2	≤ 1
	0.0.3.3.11	20	10, 15, 20	≥ 1	≤ 4
NS_19	6.6.3.3.12	44	10, 15, 20	Table	6.2.4-14
NS_20	6.2.2 6.6.2.2.1 6.6.3.3.14	23	5, 10, 15, 20	Table	6.2.4-15
NS_21	6.6.2.2.1 6.6.3.3.15	30	5, 10	Table	6.2.4-16
NS 22	6.6.3.3.16	42, 43	5, 10, 15, 20	Table	6.2.4-17
NS_23	6.6.3.3.17	42, 43	5, 10, 15, 20		I/A
NS_24	6.6.3.3.19	65 (NOTE 4)	5, 10, 15, 20		6.2.4-19
NS_25	6.6.3.3.20	65 (NOTE 4)	5, 10, 15, 20		6.2.4-20
		,			
NS_32	-	-	- -	-	-

NOTE 1 Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1915.7 MHz) + 4 MHz + the channel BW assigned, where channel BW is as defined in subclause 5.6. For 10MHz channel bandwidth whose carrier frequency is larger than or equal to 1945 MHz or 15 MHz channel bandwidth whose carrier frequency is larger than or equal to 1947.5 MHz, no A-MPR applies.

NOTE 2 Applicable when carrier frequency is 1932.5 MHz for 15MHz channel bandwidth or 1930 MHz for 20MHz channel bandwidth case.

NOTE 3: Applicable when the E-UTRA carrier is within 1920-1980 MHz.

NOTE 4: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980MHz.

Table 6.2.4-2: A-MPR for "NS_07"

Parameters	Re	egion A	Regio	Region C	
RB _{start}		0 - 12	13 – 18	19 – 42	43 – 49
L _{CRB} [RBs]	6-8	1 to 5 and 9-50	≥8	≥18	≤2
A-MPR [dB]	≤ 8	≤ 12	≤ 12	≤ 6	≤ 3

NOTE 1; RB_{start} indicates the lowest RB index of transmitted resource blocks

NOTE 2; LCRB is the length of a contiguous resource block allocation

NOTE 3: For intra-subframe frequency hopping between two regions, notes 1 and 2 apply on a per slot basis.

NOTE 4; For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe.

Table 6.2.4-3: A-MPR for "NS_10"

Channel bandwidth [MHz]	Parameters	Region A
	RB _{start}	0 – 10
15	L _{CRB} [RBs]	1 -20
	A-MPR [dB]	≤2
	RB _{start}	0 – 15
20	L _{CRB} [RBs]	1 -20
	A-MPR [dB]	≤5

NOTE 1: RB_{start} indicates the lowest RB index of transmitted resource blocks

NOTE 2: L_{CRB} is the length of a contiguous resource block allocation

NOTE 3: For intra-subframe frequency hopping which intersects Region A, notes 1 and 2 apply on a per slot basis

NOTE 4: For intra-subframe frequency hopping which intersect Region A, the larger A-MPR value may be applied for both slots in the subframe

Table 6.2.4-4: A-MPR requirements for "NS_04" with bandwidth >5MHz

Channel bandwidth [MHz]			Parameters							
5	Fc [MHz]				≤ 2499.5			> 2499.5		
	RB _{start}			0 - 8		9 -	24	0 - 24		
	L _{CRB} [RBs]			> 0		>	0	> 0		
	A-MPR [dB]			≤ 2		(0	0		
10	Fc [MHz]				≤ 2504			> 2504		
	RB _{start}			0 - 8		9 - 35	36 - 49	0 - 49		
	L _{CRB} [RBs]	≤ 15	> 15 and < 25		≥ 25	N/A	> 0	> 0		
	RB _{start} + L _{CRB} [RBs]	N/A	N/A		N/A	≥ 45	N/A	N/A		
	A-MPR [dB]	≤ 3		≤ 1	≤ 2	≤ 1	0	0		
15	Fc [MHz]		≤ 2510.8					> 2510.8		
	RB _{start}	0 - 13				14 – 59	60 – 74	0 - 74		
	L _{CRB} [RBs]	≤ 18 o	r ≥ 36	> 18 a	and < 36	N/A	> 0	> 0		
	RB _{start} + L _{CRB} [RBs]	N/	/A N		N/A	≥ 62	N/A	N/A		
	A-MPR [dB]	≤ 1	3	:	≤ 1	≤ 1	0	0		
20	Fc [MHz]				≤ 2517.5			> 2517.5		
	RB _{start}			0 – 22		23 – 76	77 – 99	0 - 99		
	L _{CRB} [RBs]	≤ 18 o	r ≥ 40	> 18 a	and < 40	N/A	> 0	> 0		
	RB _{start} + L _{CRB} [RBs]	N/	A	1	N/A	≥ 86	N/A	N/A		
	A-MPR [dB]	≤ 1	3		≤ 1	≤ 1	0	0		

- NOTE 1: RB_{start} indicates the lowest RB index of transmitted resource blocks

 NOTE 2: L_{CRB} is the length of a contiguous resource block allocation

 NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis

 NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

Table 6.2.4-5: A-MPR for "NS_11"

Channel Bandwidth [MHz]	Parameters								
	Fc [MHz]	<20				≥2004			
3	L _{CRB} [RBs]	1-1				>5			
	A-MPR [dB]	≤!			000	≤1	0007		0007
	Fc [MHz]	<2004 2004 ≤ Fc <		2007	2	2007			
5	L _{CRB} [RBs]	1-2	25			6 & -25	8-12		>6
	A-MPR [dB]	≤7	7		≤	4	0		≤ 1
	Fc [MHz]	200)5 ≤	Fc <2	2015			2015	
40	RB _{start}		0	-49				0-49	
10	L _{CRB} [RBs]	1-50				1-50			
	A-MPR [dB]	≤ 12		0					
	Fc [MHz]	<2012.5							
	RB _{start}	0-4	5-21			22	-56	57-74	
	L _{CRB} [RBs]	≥1	7-50 0-6 & ≥		6 & ≥50	≤25	>25	>0	
	A-MPR [dB]	≤15	≤	7		≤10	0	≤6	≤15
15	Fc [MHz]					2012	.5		
	RB _{start}	0-12			13-	39	40-6	5	66-74
	L _{CRB} [RBs]	≥1		≥3	0	<30	≥ (69 – RB _{start})		≥1
	A-MPR [dB]	≤10		≤6	6	0	≤2		≤6.5
	Fc [MHz]					2010)		
	RB _{start}	0-12		1	3-29	29 30-68		68	69-99
20	L _{CRB} [RBs]	≥1	10	-60		1-9 & >60	1-24	≥25	≥1
	A-MPR [dB]	≤15	•	≤7		≤10	0	≤7	≤15

Table 6.2.4-6: A-MPR for "NS_12"

Channel bandwidth [MHz]	Parameters	Regi	Region B	
	RB _{start}	(0	1-2
1.4	L _{CRB} [RBs]	≤3	≥4	≥4
	A-MPR [dB]	≤3	≤6	≤3
	RB _{start}	0	-3	4-5
3	L _{CRB} [RBs]	1-	15	≥9
	A-MPR [dB]	≤4		≤3
	RB _{start}	0	-6	0-9
5	L _{CRB} [RBs]	≤	:8	≥9
	A-MPR [dB]	≤	:5	≤3
	RB _{start}	0-	15	0-22
10	L _{CRB} [RBs]	≤'	18	≥20
	A-MPR [dB]	≤4		≤2
	RB _{start}	0-30		0-30
15	L _{CRB} [RBs]	≤;	30	≥32
	A-MPR [dB]			≤3

Table 6.2.4-7: A-MPR for "NS_13"

Channel bandwidth [MHz]	Parameters	Region A		
	RB _{start}	0-2		
5	L _{CRB} [RBs]	≤5	≥18	
	A-MPR [dB]	≤3	≤2	

Table 6.2.4-8: A-MPR for "NS_14"

Channel bandwidth [MHz]	Parameters	Region A		
	RB _{start}	0		
10	L _{CRB} [RBs]	≤5	=50	
	A-MPR [dB]	≤3	≤1	
	RB _{start}	≥8	3	
15	L _{CRB} [RBs]	≤16	≥50	
	A-MPR [dB]	≤3	≤1	

Table 6.2.4-9: A-MPR for "NS_15" for E-UTRA highest channel edge > 845 MHz and ≤ 849 MHz

Channel bandwidth [MHz]	Parameters	Region A	Region B	Region C
1.4	RB _{end} [RB]			4-5
1.4	A-MPR [dB]			≤3
	RB _{end} [RB]	0-1	8-12	13-14
3	L _{CRB} [RB]	≤2	≥8	>0
	A-MPR [dB]	≤4	≤4	≤9
	RB _{end} [RB]	0-4	12-19	20-24
5	L _{CRB} [RB]	≤2	≥8	>0
	A-MPR [dB]	≤4	≤5	≤9
	RB _{end} [RB]	0-12	23-36	37-49
10	L _{CRB} [RB]	≤2	≥15	>0
	A-MPR [dB]	≤4	≤6	≤9
	RB _{end} [RB]	0-20	26-53	54-74
15	L _{CRB} [RB]	≤2	≥20	>0
	A-MPR [dB]	≤4	≤5	≤9

Table 6.2.4-10: A-MPR for "NS_15" for E-UTRA highest channel edge ≤ 845 MHz

Channel bandwidth [MHz]	Parameters	Region A	Region B	Region C
	RB _{end} [RB]			19-24
5	L _{CRB} [RB]			≥18
	A-MPR [dB]			≤2
	RB _{end} [RB]	0-4	29-44	45-49
10	L _{CRB} [RB]	≤2	≥24	>0
	A-MPR [dB]	≤4	≤4	≤9
	RB _{end} [RB]	0-12	44-61	62-74
15	L _{CRB} [RB]	≤2	≥20	>0
	A-MPR [dB]	≤4	≤5	≤9

Table 6.2.4-11: A-MPR for "NS_16" with channel lower edge at ≥807 MHz and <808.5 MHz

Channel bandwidth [MHz]	Parameter	Region A	Region B	Region C	Region D	Region E
	RB _{start}	0	1-2			
3 MHz	L _{CRB} [RBs]	≥12	12			
	A-MPR [dB]	≤2	≤1			
	RB _{start}	0-1	2	2-9	2-5	
5 MHz	L _{CRB} [RBs]	1 - 25	12	15-18	20	
	A-MPR [dB]	≤5	≤1	≤2	≤3	
	RB _{start}	0 - 8	0-	14	15-20	15-24
10 MHz	L _{CRB} [RBs]	1 - 12	15-20	≥24	≥30	24-27
	A-MPR [dB]	≤5	≤3	≤7	≤3	≤1

Table 6.2.4-12: A-MPR for "NS_16" with channel lower edge at ≥808.5 MHz and <812 MHz

Channel bandwidth [MHz]	Parameter	Region A	Region B	Region C	Region D	Region E
	RB _{start}	0	0-1	1-5		
5 MHz	L _{CRB} [RBs]	16-20	≥24	16-20		
	A-MPR [dB]	≤2	≤3	≤1		
	RB _{start}	0-	-6	0-10	0-14	11-20
10 MHz	L _{CRB} [RBs]	1-12	15-20	24-32	≥36	24-32
	A-MPR [dB]	≤5	≤2	≤4	≤5	≤1

Table 6.2.4-13: A-MPR for "NS_16" with channel lower edge at ≥812 MHz

Channel bandwidth [MHz]	Parameter	Region A	Region B	Region C	Region D
	RB _{start}	0 - 9	0	1-14	0-5
10 MHz	L _{CRB} [RBs]	27-32	36-40	36-40	≥45
	A-MPR [dB]	≤1	≤2	≤1	≤3

Table 6.2.4-14: A-MPR for "NS_19"

Channel bandwidth [MHz]	Parameters	Region A		Region A		Region B
	RB _{start}			0-6		
10	L _{CRB} [RBs]			≥40		
	A-MPR [dB]			≤1		
	RB _{start}	0	-6	7-20		
15	L _{CRB} [RBs]	≤18	≥36	≥42		
	A-MPR [dB]	≤2	≤3	≤2		
	RB _{start}	0-14		15-30		
20	L _{CRB} [RBs]	≤40	≥45	≥50		
	A-MPR [dB]	≤2	≤3	≤2		

Table 6.2.4-15: A-MPR for "NS_20"

Channel Bandwidth [MHz]	Parameters											
	Fc [MHz]	< 20	< 2007.5 2007.5 ≤ Fc < 2				2012	2.5	2012.5 ≤ F	c ≤ 2017.5		
5	RB _{start}	≤24			()-3			4-6	≤2	24	
3	L _{CRB} [RBs]	>	·0	1	5-19	2	≥20		≥18	1-2	25	
	A-MPR [dB]	≤	17		≤1		≤4		≤2	≤	0	
	Fc [MHz]						2005					
	RB _{start}		0-25				26-3	4		35-	49	
	L _{CRB} [RBs]		>0			8-15		>	15	>0		
10	A-MPR [dB]		≤16			≤2 ≤		≤5	≤ 6			
10	Fc [MHz]						2015	2015				
	RB _{start}		0	-5					6-10			
	L _{CRB} [RBs]		≥;	32					≥40			
	A-MPR [dB]		≤	4			≤2					
	Fc [MHz]						2012.5	5				
15	RB _{start}		0-14				15	5-24		25-39	61-74	
15	L _{CRB} [RBs]	1-9 & 4	0-75	10-	39	24	4-29		≥30	≥36	≤6	
	A-MPR [dB]	≤11		≤	3		≤1		≤7	≤5	≤6	
	Fc [MHz]						2010					
20	RB _{start}	0-21		22-3	1		32-3	38	39-49	50-68	69-99	
20	L _{CRB} [RBs]	>0	1-9 & 3	31-75	10-	30	≥1	5	≥24	≥25	>0	
	A-MPR [dB]	≤17	≤1:	2	≤(3	≤9)	≤7	≤5	≤16	

NOTE 1: When NS_20 is signaled the minimum requirements for the 10 MHz bandwidth are specified for E-UTRA UL carrier center frequencies of 2005 MHz or 2015 MHz.

NOTE 2: When NS_20 is signaled the minimum requirements for the 15 MHz channel bandwidth are specified for E-UTRA UL carrier center frequency of 2012.5 MHz.

Table 6.2.4-16: A-MPR for "NS_21"

Channel Bandwidth [MHz]	Parameters	Region A		Reç	gion B
	RB _{start}	0 – 6	0 – 6	N/A	N/A
10	RB _{end}	N/A	N/A	43 – 49	43 – 49
10	L _{CRB} [RBs]	1 – 2	3 – 12, 32 - 50	1 – 2	3 – 12, 32 - 50
	A-MPR [dB]	≤ 4	≤ 3	≤ 4	≤ 3

Table 6.2.4-17: A-MPR for "NS_22"

Channel bandwidth [MHz]	Parameters	Region A	Region B	Region C	Region D
5		No A-MPR is neede	ed for 5 MHz chan	nel bandwidth	
10	RB _{start}	0-13	0-17	≤ 6	≥12
	L _{CRB} [RBs]	> 36	33-36	≤ 32	≤ 32
	RBstart + LCRB [RBs]	N/A	N/A	N/A	≥44
	A-MPR [dB]	≤ 4	≤ 3	≤ 3	≤ 3
15	RB _{start}	0-24	0-38	≤ 14	≥ 23
	L _{CRB} [RBs]	> 50	37-50	≤ 36	≤ 36
	RBstart + LCRB [RBs]	N/A	N/A	N/A	≥59
	A-MPR [dB]	≤ 5	≤ 4	≤ 3	≤ 3
20	RB _{start}	0-35	0-51	≤ 21	≥ 31
	L _{CRB} [RBs]	> 64	49-64	≤ 48	≤ 48
	RBstart + LCRB [RBs]	N/A	N/A	N/A	≥79
	A-MPR [dB]	≤ 5	≤ 4	≤ 3	≤ 3

NOTE 1; RB_{start} indicates the lowest RB index of transmitted resource blocks NOTE 2; L_{CRB} is the length of a contiguous resource block allocation

NOTE 3: For intra-subframe frequency hopping between two regions, notes 1 and 2 apply on a per slot basis.

NOTE 4; For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe.

Table 6.2.4-18: A-MPR for "NS_05"

Channel Bandwidth [MHz]	Parameters								
	Fc [MHz]	Fc [MHz] 1932.5							
	RB _{start}	0-7		8 – 6	66			67-74	
15	L _{CRB} [RBs]	≥1	≤30	31 –	54	>54	≤	≤ 6	>6
	A-MPR [dB]	≤11	0	≤3	1	≤5	≤	<u>5</u>	≤1
	Fc [MHz]	1930							
	RB _{start}	0-23		24	4-75			7	6-99
20	L _{CRB} [RBs]	≥1	≤24	25 – 40	41 – 5	0 >	50	≤6	>6
	A-MPR [dB]	≤11	0	≤3	≤5	≤	≦10	≤5	≤1

Table 6.2.4-19: A-MPR for "NS_24"

Channel Bandwidth [MHz]	Parameters								
	Fc [MHz]		Fc > [1987.5]						
5	RB _{start}				0 -	24			
5	L _{CRB} [RBs]				0 -	24			
	A-MPR [dB]	≤ 10							
	Fc [MHz]		1975 < Fc ≤ 1985 1985 <fc≤1995 fc="">1995</fc≤1995>					Fc>1995	
	RB _{start}	0 - 1	2 - 14	15 - 26		36 - 49	() - 49	0 - 49
10	L _{CRB} [RBs]	> 10	≥ 35	N/A	≤ 2	> 11	() - 49	0 - 49
	RB _{end}	N/A	N/A	> 48	N/A	N/A		N/A	N/A
	A-MPR [dB]	≤ 2	≤ 2	1	≤ 3	≤ 1		≤ 9	≤ 17
	Fc [MHz]	1972.5 < Fc ≤ 1987.5 Fc > 1987.5						1987.5	
15	RB _{start}	0 - 11 12 - 74 0 - 74					- 74		
	L _{CRB} [RBs]	≤ 4	-5	> 45		> 3		0	- 74

	RB _{end}	N/A	N/A	≥ 45	N/A		
	A-MPR [dB]	≤2	≤ 8	≤ 7	≤ 17		
	Fc [MHz]	Fc > 1970					
20	RB _{start}	0 - 99					
20	L _{CRB} [RBs]	0 - 99					
	A-MPR [dB]	≤ 17					

Table 6.2.4-20: A-MPR for "NS_25"

Channel Bandwidth [MHz]		Parameters													
	Fc [MHz]						Fc >	[1997.	5]						
	RB _{start}		0 - 9						10 -	- 24					
5	L _{CRB} [RBs]			> 12							N	/A			
	RB _{end}			N/A							≥ 2	22			
	A-MPR [dB]			≤ 5							<u>≤</u>	2			
	Fc [MHz]	1975 < F	c ≤ 1985			1985	< Fc ≤	1995				F	c > 1995		
	RB _{start}	0-1	2-49		C)	1	- 18	19	9-49	0-6		7-15	16-49	
10	L _{CRB} [RBs]	> 10	N/A	≤ 2	:5	> 25	j >	25	1	N/A	N/A		> 20	N/A	
	RB _{end}	N/A	> 48	N/A	A	N/A	ı	N/A	>	42	N/A		N/A	> 35	
	A-MPR [dB]	≤ 1	≤ 1	≤ 1	1	≤ 5		≤ 5	:	≤ 1	≤ 10		≤ 7	≤ 11	
	Fc [MHz]				1972	2.5 < Fo	≥ 1987	'.5					Fc >	Fc > 1987.5	
	RB _{start}	0 -	4	5	- 30		31	- 62	63 - 74		63 - 74	0 - 74			
15	L _{CRB} [RBs]	≥ 1	5	≥	≥ 45			N/A			N/A		0	- 74	
	RB _{end}	N/A	Ą	١	N/A		>	71			N/A		1	N/A	
	A-MPR [dB]	≤ ∠	ļ	:	≤ 3			≤ 1			≤ 1		<u> </u>	13	
	Fc [MHz]				1970	< Fc ≤	1990						Fc > 1	990	
	RB _{start}	0	- 13	13 14 - 40)		4	1 - 99			0 - 99			
20	L _{CRB} [RBs]	1	V/A			≥ 32				N/A			0 - 9	9	
	RB _{end}	١	V/A			N/A				> 72			N/A	١	
	A-MPR [dB]		11			≤ 11			≤13			≤ 13			

For PRACH, PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For each subframe, the A-MPR is evaluated per slot and given by the maximum value taken over the transmission(s) within the slot; the maximum A-MPR over the two slots is then applied for the entire subframe.

For the UE maximum output power modified by A-MPR, the power limits specified in subclause 6.2.5 apply.

6.2.4A UE maximum output power with additional requirements for CA

Additional ACLR, spectrum emission and spurious emission requirements for carrier aggregation can be signalled by the network to indicate that the UE shall also meet additional requirements in a specific deployment scenario. To meet these additional requirements, Additional Maximum Power Reduction (A-MPR) is allowed for the CA Power Class as specified in Table 6.2.2A-1.

If for intra-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2.4 apply with the Network Signaling value indicated by the field *additionalSpectrumEmission*.

For intra-band contiguous aggregation with the UE configured for transmissions on two serving cells, the maximum output power reduction specified in Table 6.2.4A-1 is allowed for all serving cells of the applicable uplink CA configurations according to the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10*. Then clause 6.2.3A does not apply, i.e. the carrier aggregation MPR = 0dB, unless the value indicated is CA_NS_31. For uplink 64QAM, the applied maximum output power reduction is obtained by taking the maximum value of MPR requirements specified in Table 6.2.3A-1 and A-MPR requirements specified in Table 6.2.4A-1.

Table 6.2.4A-1: Additional Maximum Power Reduction (A-MPR) for intra-band contiguous CA

CA Network Signalling value	Requirements (subclause)	Uplink CA Configuration	A-MPR [dB] (subclause)
CA_NS_01	6.6.3.3A.1	CA_1C	6.2.4A.1
CA_NS_02	6.6.3.3A.2	CA_1C	6.2.4A.2
CA_NS_03	6.6.3.3A.3	CA_1C	6.2.4A.3
CA_NS_04	6.6.2.2A.1	CA_41C	6.2.4A.4
CA_NS_05	6.6.3.3A.4	CA_38C	6.2.4A.5
CA_NS_06	6.6.3.3A.5	CA_7C	6.2.4A.6
CA_NS_07	6.6.3.3A.6	CA_39C	6.2.4A.7
CA_NS_08	6.6.3.3A.7	CA_42C	6.2.4A.8
CA_NS_31	NOTE 1	Table 5.6A.1-1 (NOTE 1)	N/A
CA NS 32		Reserved	

NOTE 1: Applicable for uplink CA configurations listed in Table 5.6A.1-1 for which none of the additional requirements in subclauses 6.6.2.2A or 6.6.3.3A apply.

NOTE 2: The index of the sequence CA_NS corresponds to the value of additionalSpectrumEmissionSCell-r10.

If for intra-band non-contigous carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2.4 apply with the Network Signaling value indicated by the field *additionalSpectrumEmission*.

For intra-band non-contiguous carrier aggregation with the UE configured for transmissions on two serving cells, the maximum output power reduction specified in Table 6.2.4A-2 is allowed for all serving cells of the applicable uplink CA configurations according to the CA network signalling value indicated by the field additionalSpectrumEmissionSCell-r10. MPR as specified in subclause 6.2.3A is not allowed in addition, unless A-MPR is N/A

Table 6.2.4A-2: Additional Maximum Power Reduction (A-MPR) for intra-band non-contiguous CA

CA Network Signalling value	Additional requirements for sub-blocks in order of increasing uplink carrier frequency Requirements Requirements		Uplink CA Configuration	A-MPR for sub-blocks in order of increasing uplink carrier frequency A-MPR [dB]		
	(subclause)	(subclause)		(subclause)		
CA_NC_NS_01	6.6.2.2.1 (NS_03)	6.6.2.2.1 (NS_03)	CA_4A-4A	N/A		
•••						
CA_NC_NS_31	NOTE 1	NOTE 1	Table 5.6A.1-3 (NOTE 1)	N/A		
CA_NC_NS_32		Reserved				

NOTE 1: Applicable for uplink CA configurations listed in Table 5.6A.1-3 for which the additional requirements in subclause 6.6.2.1.1 (indicated by NS_01) applies in each sub-block.
 NOTE 2: The index of the sequence CA_NC_NS corresponds to the value of additionalSpectrumEmissionSCell-r10.

If for inter-band carrier aggregation the UE is configured for transmissions on a single serving cell, then subclauses 6.2.3 and 6.2.4 apply with the Network Signaling value indicated by the field *additionalSpectrumEmission*.

For inter-band carrier aggregation with the UE configured for transmissions on two serving cells the maximum output power reduction specified in Table 6.2.4-1 is allowed for each serving cell of the applicable uplink CA configuration according to the Network Signaling value indicated by the field *additionalSpectrumEmission* for the PCC and the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10* for the SCC. The value of *additionalSpectrumEmissionSCell-r10* is equal to that of *additionalSpectrumEmission* configured on the SCC. MPR as specified in subclause 6.2.3A is allowed in addition.

For PUCCH and SRS transmissions, the allowed A-MPR is according to that specified for PUSCH QPSK modulation for the corresponding transmission bandwidth.

For intra-band carrier aggregation, the A-MPR is evaluated per slot and given by the maximum value taken over the transmission(s) on all component carriers within the slot; the maximum A-MPR over the two slots is then applied for the entire subframe.

For combinations of intra-band and inter-band carrier aggregation with the UE configured for transmission on three serving cells (up to two contiguously aggregated carriers per band), the maximum output power reduction is specified as follows. For the band supporting one serving cell the maximum output power reduction specified in Table 6.2.4-1 is allowed according to the Network Signaling value indicated by the field *additionalSpectrumEmission* for the PCC and the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10* for the SCC. The value of *additionalSpectrumEmissionSCell-r10* is equal to that of *additionalSpectrumEmission* configured on the SCC. MPR as specified in subclause 6.2.3A is allowed in addition. For the band supporting intra-band contiguous aggregation with the UE configured for transmissions on two serving cells, the maximum output power reduction specified in Table 6.2.4A-1 is allowed for all serving cells of the applicable uplink CA configurations according to the CA network signalling value indicated by the field *additionalSpectrumEmissionSCell-r10*. Then clause 6.2.3A does not apply, i.e. the carrier aggregation MPR = 0dB, unless the value indicated is CA_NS_31. For uplink 64QAM, the applied maximum output power reduction is obtained by taking the maximum value of MPR requirements specified in Table 6.2.3A-1 and A-MPR requirements specified in Table 6.2.4A-1.

For the UE maximum output power modified by A-MPR specified in table 6.2.4A-1, the power limits specified in subclause 6.2.5A apply.

6.2.4A.1 A-MPR for CA_NS_01 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_01 the allowed maximum output power reduction applied to transmissions on the PCC and the SCC for contiguously aggregated signals is specified in table 6.2.4A.1-1.

CA_1C: CA_NS_01	RB _{start}	L _{CRB} [RBs]	RB _{start} + L _{CRB} [RBs]	A-MPR for QPSK, 16- QAM and 64-QAM [dB]
	0 – 23 and 176 – 199	> 0	N/A	≤ 12.0
100 RB / 100 RB	24 – 105	> 64	N/A	≤ 6.0
	106 – 175	N/A	> 175	≤ 5.0
	0 – 6 and 143	0 < L _{CRB} ≤ 10	N/A	≤ 11.0
75 RB / 75 RB	– 149	> 10	N/A	≤ 6.0
75 KB / 75 KB	7 – 90	> 44	N/A	≤ 5.0
	91 – 142	N/A	> 142	≤ 2.0

Table 6.2.4A.1-1: Contiguous allocation A-MPR for CA_NS_01

NOTE 1: RB_start indicates the lowest RB index of transmitted resource blocks

NOTE 2: L_CRB is the length of a contiguous resource block allocation

NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot hasis

NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

If the UE is configured to CA_1C and it receives IE CA_NS_01 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

$$A-MPR = CEIL \{M_{A_1} 0.5\}$$

Where M_A is defined as follows

$$\begin{array}{lll} M_A = & -22.5 \; A + 17 & ; \; 0 \leq A < 0.20 \\ & -11.0 \; A + 14.7 & ; \; 0.20 \leq A < 0.70 \\ & -1.7 \; A + 8.2 & ; \; 0.70 \leq A \leq 1 \end{array}$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

6.2.4A.2 A-MPR for CA_NS_02 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_02 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.2-1.

Table 6.2.4A.2-1: Contiguous allocation A-MPR for CA_NS_02

CA_1C: CA_NS_02	RB _{end}	L _{CRB} [RBs]	A-MPR for QPSK, 16- QAM and 64-QAM [dB]
	0 –20	> 0	≤ 4 dB
	21 – 46	> 0	≤ 3 dB
100 RB / 100 RB	47 – 99	> RB _{end} - 20	≤ 3 dB
	100 – 184	> 75	≤ 6 dB
	185 – 199	> 0	≤ 10 dB
	0 – 48	> 0	≤ 2 dB
	49 – 80	> RB _{end} - 20	≤ 3 dB
75 RB / 75 RB	81 – 129	> 60	≤ 5 dB
	130 – 149	> 84	≤ 6 dB
	130 – 149	1 – 84	≤ 2 dB

If the UE is configured to CA_1C and it receives IE CA_NS_02 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$A-MPR = CEIL \{M_A, 0.5\}$$

Where MA is defined as follows

$$\begin{array}{lll} M_A = & -22.5 \ A + 17 & ; \ 0 \leq A < 0.20 \\ & -11.0 \ A + 14.7 & ; \ 0.20 \leq A < 0.70 \\ & -1.7 \ A + 8.2 & ; \ 0.70 \leq A \leq 1 \end{array}$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

6.2.4A.3 A-MPR for CA_NS_03 for CA_1C

If the UE is configured to CA_1C and it receives IE CA_NS_03 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.3-1.

Table 6.2.4A.3-1: Contiguous allocation A-MPR for CA_NS_03

CA_1C: CA_NS_03	RB _{end}	L _{CRB} [RBs]	A-MPR for QPSK, 16- QAM and 64-QAM [dB]
	0 – 26	> 0	≤ 10 dB
	27 – 63	≥ RB _{end} - 27	≤ 6 dB
100 PP / 100 PP	27 – 63	< RB _{end} - 27	≤ 1 dB
100 RB / 100 RB	64 – 100	> RB _{end} - 20	≤ 4 dB
	101 – 171	> 68	≤ 7 dB
	172 – 199	> 0	≤ 10 dB
	0 – 20	> 0	≤ 10 dB
	21 – 45	> 0	≤ 4 dB
75 RB / 75 RB	46 – 75	> RB _{end} – 13	≤ 2 dB
/3 KD / /3 KD	76 – 95	> 45	≤ 5 dB
	96 – 149	> 43	≤ 8 dB
	120 – 149	1 - 43	≤ 6 dB

If the UE is configured to CA_1C and it receives IE CA_NS_03 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

$$A-MPR = CEIL \{M_{A_s} 0.5\}$$

Where M_A is defined as follows

$$M_A = -23.33A + 17.5$$
 ; $0 \le A < 0.15$ $-7.65A + 15.15$; $0.15 \le A \le 1$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

6.2.4A.4 A-MPR for CA_NS_04

If the UE is configured to CA_41C or any uplink inter-band CA configuration containing CA_41C and it receives IE CA_NS_04 the allowed maximum output power reduction applied to transmission on two component carriers for contiguously aggregated signals is specified in Table 6.2.4A.4-1.

Table 6.2.4A.4-1: Contigous Allocation A-MPR for CA_NS_04

CA Bandwidth Class C	RB _{Start}	L _{CRB} [RBs]	RB _{start} + L _{CRB} [RBs]	A-MPR for QPSK [dB]	A-MPR for 16QAM and 64QAM [dB]
50RB / 100 RB	0 – 44 and 105 – 149	>0	N/A	≤4dB	≤4dB
	45 – 104	N/A	>105	≤3dB	≤4dB
75 RB / 75 RB	0 – 44 and 105 – 149	>0	N/A	≤4dB	≤4dB
	45 – 104	N/A	>105	≤4dB	≤4dB
100 RB / 75 RB	0 – 49 and 125 – 174	>0	N/A	≤4dB	≤4dB
	50 - 124	N/A	>125	≤3dB	≤4dB
100 RB / 100 RB	0 - 59 and 140 - 199	>0	N/A	≤3dB	≤4dB
	60– 139	N/A	>140	≤3dB	≤4dB

NOTE 1: RB_{start} indicates the lowest RB index of transmitted resource blocks

NOTE 2: L_{CRB} is the length of a contiguous resource block allocation

NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis

NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

If the UE is configured to CA_41C or any uplink inter-band CA configuration containing CA_41C and it receives IE CA_NS_04 the allowed maximum output power reduction applied to transmissions on two serving cells assigned to Band 41 with non-contiguous resource allocation is defined as follows

A-MPR = CEIL
$$\{M_A, 0.5\}$$

Where M_A is defined as follows

$$\begin{array}{lll} M_A & = & 10.5, & 0 \! \leq \! A \! < \! 0.05 \\ & = -50.0A + 13.00, & 0.05 \! \leq \! A \! < \! 0.15 \\ & = -4.0A + 6.10, & 0.15 \! \leq \! A \! < \! 0.40 \\ & = -0.83A + 4.83, & 0.40 \! \leq \! A \! \leq \! 1 \end{array}$$

Where $A=N_{RB_alloc}\,/\,N_{RB_agg.}$

6.2.4A.5 A-MPR for CA_NS_05 for CA_38C

If the UE is configured to CA_38C and it receives IE CA_NS_05 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.5-1.

Table 6.2.4A.5-1: Contigous Allocation A-MPR for CA_NS_05

CA_38C	RB _{end}	L _{CRB} [RBs]	A-MPR for QPSK, 16- QAM and 64-QAM [dB]
	0 – 12	>0	≤ 5 dB
100RB/100RB	13 – 79	> RB _{end} – 13	≤ 2 dB
TOURD/TOURD	80 – 180	>60	≤ 6 dB
	181 – 199	> 0	≤ 11 dB
	0 – 70	> max (0, RB _{end} -10)	≤ 2 dB
	71- 108	> 60	≤ 5 dB
75RB/75RB	109 – 139	>0	≤ 5 dB
	140 – 149	≤ 70	≤ 2 dB
	140 – 149	>70	≤ 6 dB

NOTE 1: RB_{end} indicates the highest RB index of transmitted resource blocks

NOTE 2: L_{CRB} is the length of a contiguous resource block allocation

NOTE 3: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis

NOTE 4: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe

If the UE is configured to CA_38C and it receives IE CA_NS_05 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows

A-MPR = CEIL
$$\{M_A, 0.5\}$$

Where MA is defined as follows

$$M_A = -14.17 \ A + 16.50$$
 ; $0 \le A < 0.60$

$$-2.50 \text{ A} + 9.50$$
 ; $0.60 \le \text{A} \le 1$

Where $A = N_{RB \text{ alloc}} / N_{RB \text{ agg.}}$

6.2.4A.6 A-MPR for CA NS 06

If the UE is configured to CA_7C and it receives IE CA_NS_06 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.6-1.

Table 6.2.4A.6-1: Contiguous Allocation A-MPR for CA_NS_06

CA Bandwidth Class C	RB _{end}	L _{CRB} [RBs]	A-MPR for QPSK, 16- QAM and 64-QAM [dB]
	0 –22	>0	≤ 4 dB
	23 – 99	> max(0,RB _{end} - 25)	≤ 2 dB
100RB/100RB	100 – 142	> 75	≤ 3 dB
	143 – 177	>70	≤ 5 dB
	178 – 199	> 0	≤ 10 dB
	0 – 7	>0	≤ 5 dB
	8- 74	> max(0,RB _{end} - 10)	≤ 2 dB
75RB/75RB	75 – 109	>64	≤ 2 dB
	110 – 144	>35	≤ 6 dB
	145 – 149	>0	≤ 10 dB
	0 – 10	> 0	≤ 5 dB
50RB/100RB	11 – 75	> max(0, RB_End - 25)	≤ 2 dB
and	76 – 103	> 50	≤ 3 dB
100RB/50RB	104 – 144	> 25	≤ 6 dB
	145 – 149	> 0	≤ 10 dB
	0 – 15	> 0	≤ 5 dB
75RB/100RB	16 – 75	> max(0, RB_End – 15)	≤ 2 dB
and	76 – 120	> 50	≤ 3 dB
100RB/75RB	121 – 160	> 50	≤ 6 dB
	161 – 174	> 0	≤ 10 dB

If the UE is configured to CA_7C and it receives IE CA_NS_06 the allowed maximum output power reduction applied to transmissions on the PCell and the SCell with non-contiguous resource allocation is defined as follows:

A-MPR = CEIL
$$\{M_A, 0.5\}$$

Where MA is defined as follows

$$\begin{aligned} M_A = & -23.33A + 17.5 + 10A & ; 0 \leq A < 0.15 \\ & -7.65A + 15.15 + 1.18A + 1.32 & ; 0.15 \leq A \leq 1 \end{aligned}$$

Where $A = N_{RB_alloc} / N_{RB_agg.}$

6.2.4A.7 A-MPR for CA_NS_07

If the UE is configured to CA_39C or any uplink inter-band CA configuration containing CA_39C and it receives IE CA_NS_07 the allowed maximum output power reduction applied to transmission on two component carriers for contiguously aggregated signals is specified in Table 6.2.4A.7-1.

≤ 6

≤ 4

≤ 3

≤ 3

25 RB / 100 RB

and

100 RB / 25 RB

A-MPR for QPSK, 16-RB_{Start} CA_39C: CA_NS_07 L_{CRB} [RBs] QAM and 64-QAM[dB] 0 – 13 > 0 ≤ 11 14 - 50≤ 60 ≤ 3 75 RB / 100 RB > 60 14 - 100and ≤ 7 100 RB / 75 RB 101 – 155 > max(155 - RBstart, 0) ≤ 2 156 – 174 > 0 ≤ 5 0 - 5> 0 ≤ 11 ≤ 25 ≤ 3 6 - 4250 RB / 100 RB > 25 ≤ 6 and 43 – 80 > 50 ≤ 5 100 RB / 50 RB 81 - 138> 20 ≤ 2 139 - 149> 0 ≤ 5

Table 6.2.4A.7-1: Contiguous Allocation A-MPR for CA_NS_07

If the UE is configured to CA_39C or any uplink inter-band CA configuration containing CA_39C and it receives IE CA_NS_07 the allowed maximum output power reduction applied to transmissions on two serving cells assigned to Band 39 with non-contiguous resource allocation is defined as follows

0 - 32

33 - 60

61 - 124

A-MPR = CEIL
$$\{M_A, 0.5\}$$

Where M_A is defined as follows

$$M_A = -16.25A + 21$$
 ; $0 \le A < 0.80$

$$-2.50 \text{ A} + 10.00$$
 ; $0.80 \le A \le 1$

≥ 84

< 84

> 50

> 20

Where $A = N_{RB_alloc} \, / \, N_{RB_agg}$

6.2.4A.8 A-MPR for CA_NS_08

If the UE is configured to CA_42C and it receives IE CA_NS_08 the allowed maximum output power reduction applied to transmission on the PCC and the SCC for contiguously aggregated signals is specified in Table 6.2.4A.8-1.

Table 6.2.4A.8-1: Contiguous Allocation A-MPR for CA_NS_08

CA_42C: CA_NS_08	RB _{Start}	L _{CRB} [RBs]	A-MPR for QPSK, 16- QAM and 64- QAM[dB]
100RB/100RB	-	-	TBD
75 RB / 100 RB and 100 RB / 75 RB	-	-	TBD
50 RB / 100 RB and 100 RB / 50 RB	-	-	TBD
25 RB / 100 RB and 100 RB / 25 RB	-	-	TBD

6.2.4B UE maximum output power with additional requirements for UL-MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the A-MPR values specified in subclause 6.2.4 shall apply to the maximum output power specified in Table 6.2.2B-1. The requirements shall be met

with the UL-MIMO configurations specified in Table 6.2.2B-2. For UE supporting UL-MIMO, the maximum output power is measured as the sum of the maximum output power at each UE antenna connector. Unless stated otherwise, an A-MPR of 0 dB shall be used.

For the UE maximum output power modified by A-MPR, the power limits specified in subclause 6.2.5B apply.

For single-antenna port scheme, the requirements in subclause 6.2.4 apply.

6.2.4D UE maximum output power with additional requirements for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.5D-1, the allowed A-MPR for the maximum output power for ProSe physical channels PSDCH, PSCCH, PSSCH, and PSBCH shall be as specified in subclause 6.2.4 for PUSCH for the corresponding modulation and transmission bandwidth.

The allowed A-MPR for the maximum output power for ProSe physical signal PSSS and SSSS shall be as be as specified in subclause 6.2.4 for PUSCH QPSK modulation for the corresponding transmission bandwidth.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the requirements in subclause 6.2.4D apply for ProSe transmission and the requirements in subclause 6.2.4 apply for uplink transmission.

6.2.5 Configured transmitted power

The UE is allowed to set its configured maximum output power $P_{CMAX,c}$ for serving cell c. The configured maximum output power $P_{CMAX,c}$ is set within the following bounds:

 $P_{CMAX_L,c} \leq P_{CMAX,c} \leq P_{CMAX_H,c}$ with

$$\begin{split} P_{CMAX_L,c} = MIN \; \{ P_{EMAX,c} - \Delta T_{C,c}, \;\; P_{PowerClass} - MAX(MPR_c + A-MPR_c + \Delta T_{IB,c} + \Delta T_{C,c} + \Delta T_{ProSe}, P-MPR_c) \} \\ P_{CMAX \;\; H,c} = MIN \; \{ P_{EMAX,c}, \;\; P_{PowerClass} \} \end{split}$$

where

- $P_{EMAX,c}$ is the value given by IE *P-Max* for serving cell *c*, defined in [7];
- P_{PowerClass} is the maximum UE power specified in Table 6.2.2-1 without taking into account the tolerance specified in the Table 6.2.2-1;
- MPR $_c$ and A-MPR $_c$ for serving cell c are specified in subclause 6.2.3 and subclause 6.2.4, respectively;
- $\Delta T_{IB,c}$ is the additional tolerance for serving cell c as specified in Table 6.2.5-2; $\Delta T_{IB,c} = 0$ dB otherwise;
- $\Delta T_{C,c} = 1.5$ dB when NOTE 2 in Table 6.2.2-1 applies;
- $\Delta T_{C,c} = 0$ dB when NOTE 2 in Table 6.2.2-1 does not apply;
- $\Delta T_{ProSe} = 0.1$ dB when the UE supports ProSe Direct Discovery and/or ProSe Direct Communication on the corresponding E-UTRA ProSe band; $\Delta T_{ProSe} = 0$ dB otherwise.

P-MPR_c is the allowed maximum output power reduction for

- a) ensuring compliance with applicable electromagnetic energy absorption requirements and addressing unwanted emissions / self desense requirements in case of simultaneous transmissions on multiple RAT(s) for scenarios not in scope of 3GPP RAN specifications;
- b) ensuring compliance with applicable electromagnetic energy absorption requirements in case of proximity detection is used to address such requirements that require a lower maximum output power.

The UE shall apply P-MPR $_c$ for serving cell c only for the above cases. For UE conducted conformance testing P-MPR shall be $0~\mathrm{dB}$

NOTE 1: P-MPR_c was introduced in the P_{CMAX,c} equation such that the UE can report to the eNB the available maximum output transmit power. This information can be used by the eNB for scheduling decisions.

NOTE 2: P-MPR_c may impact the maximum uplink performance for the selected UL transmission path.

For each subframe, the $P_{CMAX_L,c}$ for serving cell c is evaluated per slot and given by the minimum value taken over the transmission(s) within the slot; the minimum $P_{CMAX_L,c}$ over the two slots is then applied for the entire subframe. $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

The measured configured maximum output power P_{UMAX,c} shall be within the following bounds:

$$P_{CMAX_L,c} - \ MAX\{T_{L,c}, T(P_{CMAX_L,c})\} \ \leq \ P_{UMAX,c} \leq \ P_{CMAX_H,c} + \ T(P_{CMAX_H,c}).$$

where the tolerance $T(P_{CMAX,c})$ for applicable values of $P_{CMAX,c}$ is specified in Table 6.2.5-1. The tolerance $T_{L,c}$ is the absolute value of the lower tolerance for the applicable operating band as specified in Table 6.2.2-1.

Table 6.2.5-1: P_{CMAX} tolerance

P _{CMAX,c} (dBm)	Tolerance T(P _{CMAX,c}) (dB)
23 < P _{CMAX,c} ≤ 33	2.0
$21 \le P_{CMAX,c} \le 23$	2.0
20 ≤ P _{CMAX,c} < 21	2.5
19 ≤ P _{CMAX,c} < 20	3.5
18 ≤ P _{CMAX,c} < 19	4.0
13 ≤ P _{CMAX,c} < 18	5.0
8 ≤ P _{CMAX,c} < 13	6.0
-40 ≤ P _{CMAX,c} < 8	7.0

For the UE which supports inter-band carrier aggregation configurations with the uplink assigned to one or two E-UTRA bands the $\Delta T_{IB,c}$ is defined for applicable bands in Table 6.2.5-2, Table 6.2.5-3 and Table 6.2.5-4.

Table 6.2.5-2: ΔT_{IB,c} (two bands)

Inter-band CA Configuration	E-UTRA Band	ΔT _{IB,c} [dB]
CA_1A-3A	1	0.3
G/CI/YO/Y	3	0.3
CA_1A-3C	1	0.3
_	3	0.3
CA_1A-5A	<u>1</u> 5	0.3 0.3
	<u> </u>	0.5
CA_1A-7A	7	0.6
	1	0.3
CA_1A-8A	8	0.3
00 40 440	1	0.3
CA_1A-11A	11	0.3
CA_1A-18A	1	0.3
CA_TA-TOA	18	0.3
CA_1A-19A	1	0.3
OA_1A-13A	19	0.3
CA_1A-20A	1	0.3
5.1.17.207	20	0.3
CA_1A-21A	1	0.3
\$1 2 111	21	0.3
CA_1A-26A	1	0.3
***	26	0.3
CA_1A-28A	1	0.3
	28	0.6
CA_1A-40A	1	0.5
_	40	0.5
CA_1A-41A ⁸	1	0.5
	41	0.5
CA_1A-41C ⁸	<u>1</u> 41	0.5 0.5
	1	0.3
CA_1A-42A	42	0.8
	1	0.3
CA_1A-42C	42	0.8
CA_1A-46A	1	0
	2	0.5
CA_2A-4A	4	0.5
04 04 04 44	2	0.5
CA_2A-2A-4A	4	0.5
CA 2A 4A 4A	2	0.5
CA_2A-4A-4A	4	0.5
CA_2A-2A-4A-	2	0.5
4A	4	0.5
CA_2A-5A	2	0.3
UN_ZA-UA	5	0.3
CA_2A-2A-5A	2	0.3
J. (, (5	0.3
CA_2C-5A	2	0.3
	5	0.3
CA_2A-12A	2	0.3
	12	0.3
CA_2A-2A-12A	2	0.3
	12	0.3
CA_2A-2A-12B	<u>2</u> 12	0.3 0.3
	2	0.3
CA_2A-12B	12	0.3
	2	0.3
CA_2C-12A	12	0.3
	2	0.3
CA_2A-13A	13	0.3
<u> </u>	10	0.0

CA 2A 2A 42A	2	0.3
CA_2A-2A-13A	13	0.3
CA_2A-17A	2	0.3
UA_2A-17A	17	0.8
CA_2A-28A	2	0.3
	28	0.3
CA_2A-29A	2	0.3
CA_2C-29A	2	0.3
CA_2A-30A	2	0.5
	30	0.3
CA_2C-30A	30	0.5 0.3
CA_2A-46A	2	0.3
	3	0.3
CA_3A-5A	5	0.3
01.00.71	3	0.3
CA_3C-5A	5	0.3
04 04 74	3	0.5
CA_3A-7A	7	0.5
CA 2A 7B	3	0.5
CA_3A-7B	7	0.5
CA_3A-7C	3	0.5
5/_0/\\\-10	7	0.5
CA_3C-7A	3	0.5
	7	0.5
CA_3A-8A	3	0.3
_	8	0.3
CA_3A-3A-8A	3 8	0.3
	3	0.3
CA_3A-19A	19	0.3
	3	0.3
CA_3A-20A	20	0.3
04 04 004	3	0.3
CA_3A-26A	26	0.3
CA 2A 27A	3	0.3
CA_3A-27A	27	0.3
CA_3A-28A	3	0.3
OA_3A-20A	28	0.3
CA_3A-31A	3	0.3
G/1_G/1 G 1/1	31	0.6
CA_3A-38A	3	0,5
_	38	0,5
CA_3A-40A	3	0.5
	40 3	0.5 0.5
CA_3A-40C	40	0.5
	3	0.5
CA_3A-41A		0.3 ¹⁰
	41	0.8 ¹¹
	3	0.5
CA_3A-41C		0.310
	41	0.8 ¹¹
CA_3A-42A	3	0.6
UN_UN-42A	42	0.8
CA_3A-42C	3	0.6
	42	0.8
CA_3A-46A	3	0
CA_4A-5A	4	0.3
	5 4	0.3
CA_4A-4A-5A	5	0.3
	4	0.5
CA_4A-7A	7	0.5
CA_4A-4A-7A	4	0.5
<u> </u>	_	0.0

		T
	7	0.5
CA_4A-12A	4	0.3
O/ _ // 12/ (12	0.8
CA_4A-4A-12A	4	0.3
OA_ 4 A-4A-12A	12	0.8
CA_4A-12B	4	0.3
CA_4A-12B	12	0.8
CA 4A 40A	4	0.3
CA_4A-13A	13	0.3
04 44 44 404	4	0.3
CA_4A-4A-13A	13	0.3
	4	0.3
CA_4A-17A	17	0.8
	4	0.3
CA_4A-27A	27	0.3
	4	0.3
CA_4A-28A	28	0.6
CA_4A-29A	4	0.3
UA_4A-29A	4	0.5
CA_4A-30A	•	
CA 4A 4CA	30	0.3
CA_4A-46A	4	0
CA_5A-7A	5	0.3
	7	0.3
CA_5A-12A	5	0.8
	12	0.4
CA_5A-12B	5	0.8
0/1_0/112B	12	0.4
CA_5A-13A	5	0.5
O/(_0/(10/(13	0.5
CA_5A-17A	5	0.8
CA_3A-17A	17	0.4
CA_5A-25A	5	0.3
CA_5A-25A	25	0.3
CA_5A-29A	5	0.5
	5	0.3
CA_5A-30A	30	0.3
21 -1 -11	5	0.3
CA_5A-38A	38	0.3
	5	0.3
CA_5A-40A	40	0.3
	5	0.3
CA_5A-40C	40	0.3
	7	0.3
CA_7A-8A	8	0.6
	7	0.0
CA_7A-12A		0.3
	12	
CA_7A-20A	7	0.3
	20	0.3
CA_7A-22A	7	0.5
	22	0.8
CA_7A-28A	7	0.3
	28	0.3
CA_7B-28A	7	0.3
0/_/ D-20/\	28	0.3
CA_7C-28A	7	0.3
UA_1U-20A	28	0.3
CA 7A 40A	7	0.5
CA_7A-40A	40	[0.6]
CA 74 400	7	0.5
CA_7A-40C	40	[0.6]
04 74 404	7	0.5
CA_7A-42A	42	0.8
CA_7A-42A-	7	0.5
42A	42	0.8
CA_7A-46A	7	0.0
J, (_, , (, +o, (<u> </u>	

CA_8A-11A	8	0.3
	11	0.4
CA_8A-20A	<u>8</u> 20	0.4
		0.4
CA_8A-40A	8 40	0.3
	8	0.3
CA_8A-41A	41	0.3
	8	0.3
CA_8A-41C	41	0.3
	11	0.3
CA_11A-18A	18	0.3
2	12	0.3
CA_12A-25A	25	0.3
04 404 004	12	0.3
CA_12A-30A	30	0.3
04 404 0049	18	0.5
CA_18A-28A ⁹	28	0.5
CA 40A 04A	19	0.3
CA_19A-21A	21	0.4
CA_19A-28A ⁹	19	0.5
UA_19A-28A	28	0.5
CA 10A 42A	19	0.3
CA_19A-42A	42	0.8
CA_19A-42C	19	0.3
CA_19A-42C	42	0.8
CA_20A-31A	20	0.5
	31	0.5
CA_20A-32A	20	0.3
CA_20A-38A	20	0.3
- O/ (_20/ (00/ (38	0.3
CA_20A-40A	20	0.3
	40	0.3
CA_20A-42A	20	0.3
	42	0.8
CA_20A-42A-	20	0.3
42A	42	0.8
CA_20A-67A	20	0.5 0.5
CA_21A-42A	21 42	
	21	0.8 0.5
CA_21A-42C	42	0.8
CA_23A-29A	23	0.3
	25	0.3
CA_25A-26A	26	0.3
0	25	0.5
CA_25A-41A ⁸	41	0.5
0	25	0.5
CA_25A-41C ⁸	41	0.5
04 5-4 ::-9	25	0.5
CA_25A-41D ⁸	41	0.5
04 004 :::	26	0.3
CA_26A-41A	41	0.3
CA 200A 44.0	26	0.3
CA_26A-41C	41	0.3
CA 20A 40A	28	0.3
CA_28A-40A	40	0.3
CA 20A 40C	28	0.3
CA_28A-40C	40	0.3
CA_28A-40D	28	0.3
UA_20A-40D	40	0.3
CA_28A-41A	28	0.3
UA_2UA-41A	41	0.3
CA_28A-41C	28	0.3
0/1_20/1-410	41	0.3

CA_28A-42A	28	0.5
UA_20A-42A	42	0.8
CA_28A-42C	28	0.5
	42	0.8
CA_29A-30A	30	0.3
CA 20A 40A	38	04
CA_38A-40A	40	04
CA_38A-40A-	38	04
40A	40	04
CA 20A 40C	38	04
CA_38A-40C	40	04
CA 20A 44A	39	04
CA_39A-41A	41	04
CA 20A 44A	39	0.5
CA_39A-41A —	41	0.5
CA 20A 44C	39	04
CA_39A-41C	41	04
CA 20A 41C	39	0.5
CA_39A-41C	41	0.5 ⁷
CA_39A-41D	39	04
CA_39A-41D	41	04
CA_39C-41A	39	04
CA_330-41A	41	04
CA_39C-41A	39	0.5
CA_330-41A	41	0.5
CA_39C-41C	39	04
CA_390-410	41	04
CA_41A-42A	41	04
UA_41A-42A	42	0.54
CA_41A-42C	41	04
UA_41A-42U	42	0.5 ⁴
CA_41C-42A	41	0^4
UA_41U-42A	42	0.54
CA_41C-42C	41	04
UA_41U-42U	42	0.54
CA_41A-46A	41	0
CA_42A-46A	42	[0.5]
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- NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations
- NOTE 2: The above additional tolerances also apply in non-aggregated operation for the supported E-UTRA operating bands that belong to the supported interband carrier aggregation configurations
- NOTE 3: In case the UE supports more than one of the above 2DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 2DL inter-band carrier aggregation configurations then:
 - When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the 2DL tolerances above, truncated to one decimal place for that operating band among the supported 2DL CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 2DL carrier aggregation configurations involving such band shall be applied
 - When the E-UTRA operating band frequency range is >1GHz, the applicable additional 2DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 2DL CA configurations
- NOTE 4: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx.
- NOTE 5: Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:
 - When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances

- are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied
- When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.
- NOTE 6: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.
- NOTE 7: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx.
- NOTE 8: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in the FDD band.
- NOTE 9: For Band 28, the requirements only apply for the restricted frequency range specified for this CA configuration (Table 5.5A-2).
- NOTE 10: The requirement is applied for UE transmitting on the frequency range of 2545-2690MHz.
- NOTE 11: The requirement is applied for UE transmitting on the frequency range of 2496-2545MHz.
- NOTE 12: For UE supporting E-UTRA band 65 and CA configurations including Band 1, the Band 65 $\Delta T_{IB,c}$ is the max(Band 65 $\Delta T_{IB,c}$, Band 1 $\Delta T_{IB,c}$)
- NOTE: The above additional tolerances do not apply to supported UTRA operating bands with frequency range below 1 GHz that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations when such bands are belonging only to band combination(s) where one band is <1GHz and another band is >1.7GHz and there is no harmonic relationship between the low band UL and high band DL. Otherwise the above additional tolerances also apply to supported UTRA operating bands that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.
- NOTE: To meet the $\Delta T_{IB,c}$ requirements for CA_3A-7A with state-of-the-art technology, an increase in power consumption of the UE may be required. It is also expected that as the state-of-the-art technology evolves in the future, this possible power consumption increase can be reduced or eliminated.

Table 6.2.5-3: $\Delta T_{IB,c}$ (three bands)

Inter-band CA Configuration	E-UTRA Band	ΔT _{IB,c} [dB]
	1	0.6
CA_1A-3A-7A	3	0.6
	7	0.6
	1	0.3
CA_1A-3A-8A	3	0.3
	8	0.3
	1	0.3
CA_1A-3A-5A	3	0.3
	5	0.3
	1	0.3
CA_1A-3A-19A	3	0.3
	19	0.3
	1	0.3
CA_1A-3A-20A	3	0.3
	20	0.3
	1	0.3
CA_1A-3A-26A	3	0.3
_	26	0.3
	1	0.3
CA_1A-3A-28A	3	0.3
	28	0.6
	1	0.5
CA_1A-3A-40A	3	0.5
0A_1A-3A-40A	40	0.5
	1	0.6
CA_1A-3A-42A	3	0.6
CA_1A-3A-42A	42	0.8
	1	0.6
CA 1A 2A 12C	•	
CA_1A-3A-42C	3	0.6
	42	0.8
00 40 50 70	1 -	0.5
CA_1A-5A-7A	5	0.3
	7	0.6
	11	0.5
CA_1A-5A-40A	5	0.3
	40	0.5
<u>_</u>	1	0.5
CA_1A-7A-8A	7	0.6
	8	0.6
	1	0.5
CA_1A-7A-20A	7	0.6
	20	0.3
	1	0.5
CA_1A-7A-28A	7	0.6
	28	0.6
	1	0.3
CA_1A-8A-11A	8	0.3
	11	0.4
	1	0.5
CA_1A-8A-40A	8	0.3
	40	0.5
	1	0.3
CA_1A-11A-18A	11	0.4
	18	0.3
	1	0.3
CA_1A-18A-28A	18	0.5
	28	0.5
	1	0.3
CA_1A-19A-21A	19	0.3
5/_//\ 15/\\Z1/\	21	0.4
CA_1A-19A-28A	1	
UA_1A-19A-20A	I	0.3

	40	1 05
<u> </u>	19	0.5
	28	0.5
CA 1A 10A 12A	10	0.3
CA_1A-19A-42A	19	0.3
	42	0.8
CA 1A 10A 10C	1	0.3
CA_1A-19A-42C	19 42	0.3
		0.8
0.0 4.0 04.0 40.0	1	0.3
CA_1A-21A-42A	21	0.5
	42	0.8
CA 4A 24A 42C	1	0.3
CA_1A-21A-42C	21	
	42	0.8
	2	0.5
CA_2A-2A-4A-12A	4	0.5
	12	0.8
	2	0.5
CA_2A-4A-5A	4	0.5
	5	0.3
	2	0.5
CA_2A-2A-4A-5A	4	0.5
	5	0.3
	2	0.5
CA_2A-4A-4A-5A	4	0.5
	5	0.3
	2	0.5
CA_2A-4A-12A	4	0.5
	12	0.8
	2	0.5
CA_2A-4A-4A-12A	4	0.5
	12	0.8
	2	0.5
CA_2A-4A-13A	4	0.5
	13	0.3
CA_2A-4A-29A	2	[0.5]
_	4	0.5
04 04 44 004	2	0.5
CA_2A-4A-30A	4	0.5
	30	0.3
04 04 54 404	2	0.3
CA_2A-5A-12A	5	0.8
	12	0.4
04 04 04 54 404	2	0.3
CA_2A-2A-5A-12A	5	0.8
	12	0.4
CA 2A EA 40D	2	0.3
CA_2A-5A-12B	5	0.8
	12	0.4
CA 24 54 404	2	0.3
CA_2A-5A-13A	5	0.5
+	13	0.5
CA_2A-5A-29A	2	0.3
	<u>5</u> 2	0.5
CA 24 54 204		0.5
CA_2A-5A-30A	5	0.3
	30	0.3
CA 20 5A 20A	2	0.5
CA_2C-5A-30A	5	0.3
	30	0.3
	2	0.5
OA OA 104 664	10	
CA_2A-12A-30A	12	0.3
CA_2A-12A-30A	30	0.3
CA_2A-12A-30A		1

<u> </u>		
	30	0.3
	2	0.5
CA_2A-29A-30A	30	0.3
	2	0.5
CA_2C-29A-30A		
_	30	0.3
	3	0.5
CA_3A-5A-40A	5	0.3
	40	0.5
	3	0.5
CA_3A-7A-8A	7	0.5
CA_3A-7A-0A		
	8	0.6
	3	0.5
CA_3A-7A-20A	7	0.5
	20	0.3
	3	0.5
CA_3A-7A-28A	7	0.5
UA_3A-1A-20A		0.3
	28	
	3	0.5
CA_3A-7C-28A	7	0.5
Γ	28	0.3
	3	0.5
CA_3A-7A-38A	7	0.5
OA_3A-1A-30A		
	38	0.5
<u> </u>	3	0.5
CA_3A-8A-40A	8	0.3
	40	0.5
	3	0.6
CA_3A-19A-42A	 19	0.3
0/1_0/(10/(42/(
	42	0.8
	3	0.6
CA_3A-19A-42C	19	0.3
	42	0.8
	3	0.5
CA_3A-28A-40A	28	0.3
0/(_0/(20/(40/(40	0.5
	3	0.5
CA_3A-28A-40C	28	0.3
	40	0.5
	3	1
CA_3A-41A-42A	41	0.3 ⁵ /0.8 ⁶
	42	0.8
 	4	0.3
CA_4A-5A-12A	5	0.8
	12	0.8
	4	0.3
CA_4A-4A-5A-12A	5	0.8
	12	0.8
	4	0.3
CA 4A 5A 43A		
CA_4A-5A-13A	5	0.5
	13	0.5
CA 4A-5A-29A	4	0.3
OA_4A-0A-28A	5	0.5
	4	0.5
CA_4A-5A-30A	5	0.3
CA_4A-3A-3UA		0.3
	30	
	4	0.5
CA_4A-7A-12A	7	0.5
	12	0.8
	4	0.5
CA_4A-12A-30A	 12	0.8
UA_4A-12A-3UA		0.3
	30	
CA_4A-29A-30A	4	0.5
	30	0.3
CA 74 94 204	7	0.3
CA_7A-8A-20A	8	0.6
	-	,

	20	[0.6]
	7	0.3
CA_7A-20A-38A	20	0.3
	38	0.3
	19	0.3
CA_19A-21A-42A	21	0.5
	42	0.8
	19	0.3
CA_19A-21A-42C	21	0.5
	42	0.8

- NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations
- NOTE 2: The above additional tolerances also apply in non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations
- NOTE 3: Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:
 - When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied
 - When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations
- NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order interband carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.
- NOTE 5: The requirement is specified for the frequency range of 2545-2690MHz.
- NOTE 6: The requirement is specified for the frequency range of 2496-2545MHz.
- NOTE 7: For UE supporting E-UTRA band 65 and CA configurations including Band 1, the Band 65 $\Delta T_{IB,c}$ is the max(Band 65 $\Delta T_{IB,c}$, Band 1 $\Delta T_{IB,c}$)

Table 6.2.5-4: ΔT_{IB,c} (four bands)

Inter-band CA Configuration	E-UTRA Band	ΔT _{IB,c} [dB]
	1	0.5
CA_1A-3A-5A-40A	3	0.5
CA_TA-3A-3A-40A	5	0.3
	40	0.5
	1	0.6
CA_1A-3A-7A-8A	3	0.6
0A_1A-3A-1A-0A	7	0.6
	8	0.6
	1	0.5
CA_1A-3A-8A-40A	3	0.5
0A_1A-3A-0A-40A	8	0.3
	40	0.5
	1	0.6
CA_1A-3A-19A-42A —	3	0.6
OA_1A-3A-19A-42A	19	0.3
	42	0.8
	1	0.6
CA 1A 3A 10A 13C	3	0.6
CA_1A-3A-19A-42C	19	0.3
	42	0.8
	1	0.3
CA_1A-19A-21A-42A	19	0.3
CA_1A-19A-21A-42A	21	0.5
	42	0.8
	1	0.3
CA 1A 10A 31A 13C	19	0.3
CA_1A-19A-21A-42C	21	0.5
	42	0.8
	2	0.5
CA 2A 4A 5A 42A	4	0.5
CA_2A-4A-5A-12A —	5	0.8
	12	0.8
	2	0.5
CA_2A-4A-5A-29A	4	0.5
	5	0.5
	2	0.5
CA 2A 4A 5A 20A	4	0.5
CA_2A-4A-5A-30A —	5	0.3
	30	0.3
	2	0.5
CA 2A 4A 42A 20A	4	0.5
CA_2A-4A-12A-30A	12	0.8
	30	0.3
	2	0.5
CA_2A-4A-29A-30A	4	0.5
	30	0.3
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NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

NOTE 2: The above additional tolerances also apply in non-aggregated operation for the supported E-UTRA operating bands that belong to the supported interband carrier aggregation configurations.

NOTE 3: Tolerances for a UE supporting multiple 4DL inter-band CA configurations are FFS.

NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

NOTE 5: For UE supporting E-UTRA band 65 and CA configurations including Band 1, the Band 65 $\Delta T_{IB,c}$ is the max(Band 65 $\Delta T_{IB,c}$, Band 1 $\Delta T_{IB,c}$)

NOTE: The above additional tolerances do not apply to supported UTRA operating bands with frequency range below 1 GHz that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations when such bands are belonging only to band combination(s) where one band is <1GHz and other bands are >1.7GHz and there is no harmonic relationship between the low band UL and high band DL. Otherwise the above additional tolerances also apply to supported UTRA operating bands that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

6.2.5A Configured transmitted power for CA

For uplink carrier aggregation the UE is allowed to set its configured maximum output power $P_{CMAX,c}$ for serving cell c and its total configured maximum output power P_{CMAX} .

The configured maximum output power $P_{CMAX,c}$ on serving cell c shall be set as specified in subclause 6.2.5.

For uplink inter-band carrier aggregation, MPR_c and A-MPR_c apply per serving cell c and are specified in subclause 6.2.3 and subclause 6.2.4, respectively. P-MPR_c accounts for power management for serving cell c. P_{CMAX,c} is calculated under the assumption that the transmit power is increased independently on all component carriers.

For uplink intra-band contiguous and non-contiguous carrier aggregation, $MPR_c = MPR$ and $A-MPR_c = A-MPR$ with MPR and A-MPR specified in subclause 6.2.3A and subclause 6.2.4A respectively. There is one power management term for the UE, denoted P-MPR, and P-MPR $_c = P-MPR$. $P_{CMAX,c}$ is calculated under the assumption that the transmit power is increased by the same amount in dB on all component carriers.

The total configured maximum output power P_{CMAX} shall be set within the following bounds:

$$P_{CMAX L} \le P_{CMAX} \le P_{CMAX H}$$

For uplink inter-band carrier aggregation with one serving cell c per operating band,

$$\begin{split} P_{CMAX_L} &= MIN \; \{10log_{10} \sum \; MIN \; [\; p_{EMAX,c} / \; (\Delta t_{C,c}), \; \; p_{PowerClass} / (mpr_c \cdot a - mpr_c \cdot \Delta t_{C,c} \cdot \Delta t_{IB,c} \cdot \Delta t_{ProSe}) \; , \; p_{PowerClass} / pmpr_c], \\ P_{PowerClass} \} \end{split}$$

$$P_{CMAX_H} = MIN\{10 \ log_{10} \sum p_{EMAX,c} \,,\, P_{PowerClass}\}$$

where

- $p_{EMAX,c}$ is the linear value of $P_{EMAX,c}$ which is given by IE *P-Max* for serving cell *c* in [7];
- P_{PowerClass} is the maximum UE power specified in Table 6.2.2A-1 without taking into account the tolerance specified
 in the Table 6.2.2A-1; p_{PowerClass} is the linear value of P_{PowerClass};
- mpr_c and a-mpr_c are the linear values of MPR_c and A-MPR_c as specified in subclause 6.2.3 and subclause 6.2.4, respectively;
- pmpr_c is the linear value of P-MPR_c;
- $\Delta t_{C,c}$ is the linear value of $\Delta T_{C,c}$. $\Delta t_{C,c} = 1.41$ when NOTE 2 in Table 6.2.2-1 applies for a serving cell c, otherwise $\Delta t_{C,c} = 1$;
- $\Delta t_{IB,c}$ is the linear value of the inter-band relaxation term $\Delta T_{IB,c}$ of the serving cell c as specified in Table 6.2.5-2; otherwise $\Delta t_{IB,c} = 1$;
- Δt_{ProSe} is the linear value of ΔT_{ProSe} and applies as specified in subclause 6.2.5.

For uplink intra-band contiguous and non-contiguous carrier aggregation,

$$P_{CMAX_L} = MIN \{10 \ log_{10} \sum p_{EMAX,c} \ -\Delta T_C \ , \ P_{PowerClass} - MAX(MPR + A-MPR + \Delta T_{IB,c} + \Delta T_C + \Delta T_{ProSe}, P-MPR) \ \}$$

$$P_{CMAX H} = MIN\{10 \log_{10} \sum p_{EMAX,c}, P_{PowerClass}\}$$

where

- $p_{EMAX,c}$ is the linear value of $P_{EMAX,c}$ which is given by IE *P-Max* for serving cell *c* in [7];
- P_{PowerClass} is the maximum UE power specified in Table 6.2.2A-1 without taking into account the tolerance specified in the Table 6.2.2A-1;
- MPR and A-MPR are specified in subclause 6.2.3A and subclause 6.2.4A respectively;
- $\Delta T_{\rm IB,c}$ is the additional tolerance for serving cell c as specified in Table 6.2.5-2;
- P-MPR is the power management term for the UE;
- ΔT_C is the highest value $\Delta T_{C,c}$ among all serving cells c in the subframe over both timeslots. $\Delta T_{C,c} = 1.5$ dB when NOTE 2 in Table 6.2.2A-1 applies to the serving cell c, otherwise $\Delta T_{C,c} = 0$ dB;
- ΔT_{ProSe} applies as specified in subclause 6.2.5.

For combinations of intra-band and inter-band carrier aggregation with UE configured for transmission on three serving cells (up to two contiguously aggregated carriers per operating band),

$$\begin{split} P_{CMAX_L} &= MIN \; \{10log_{10} \sum (p_{CMAX_L, \; Bi}), \; P_{PowerClass} \} \\ \\ P_{CMAX_H} &= MIN \{10 \; log_{10} \; \sum p_{EMAX,c} \; , \; P_{PowerClass} \} \end{split}$$

where

- $p_{EMAX,c}$ is the linear value of $P_{EMAX,c}$ which is given by IE *P-Max* for serving cell *c* in [7];
- P_{PowerClass} is the maximum UE power specified in Table 6.2.2A-0 without taking into account the tolerance specified in the Table 6.2.2A-0; p_{PowerClass} is the linear value of P_{PowerClass};
- p_{CMAX_L, Bi} is the linear values of P_{CMAX_L} as specified in corresponding operating band. P_{CMAX_L,c} specified for single carrier in subclause 6.2.5 applies for operating band supporting one serving cell. P_{CMAX_L} specified for uplink intra-band contiguous carrier aggregation in subclause 6.2.5A applies for operating band supporting two contiguous serving cells.

For each subframe, the P_{CMAX_L} is evaluated per slot and given by the minimum value taken over the transmission(s) within the slot; the minimum P_{CMAX_L} over the two slots is then applied for the entire subframe. $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

If the UE is configured with multiple TAGs and transmissions of the UE on subframe i for any serving cell in one TAG overlap some portion of the first symbol of the transmission on subframe i+1 for a different serving cell in another TAG, the UE minimum of $P_{\text{CMAX_L}}$ for subframes i and i+1 applies for any overlapping portion of subframes i and i+1. $P_{\text{PowerClass}}$ shall not be exceeded by the UE during any period of time.

The measured maximum output power P_{UMAX} over all serving cells shall be within the following range:

$$\begin{split} P_{CMAX_L} - MAX\{T_L,\,T_{LOW}(P_{CMAX_L})~\} & \leq ~P_{UMAX} \leq ~P_{CMAX_H} + ~T_{HIGH}(P_{CMAX_H}) \\ \\ P_{UMAX} = 10~log_{10} \sum p_{UMAX,c} \end{split}$$

where $p_{UMAX,c}$ denotes the measured maximum output power for serving cell c expressed in linear scale. The tolerances $T_{LOW}(P_{CMAX})$ and $T_{HIGH}(P_{CMAX})$ for applicable values of P_{CMAX} are specified in Table 6.2.5A-1 and Table 6.2.5A-2 for inter-band carrier aggregation and intra-band carrier aggregation, respectively. The tolerance T_L is the absolute value of the lower tolerance for applicable E-UTRA CA configuration as specified in Table 6.2.2A-0, Table 6.2.2A-1 and Table 6.2.2A-2 for inter-band carrier aggregation, intra-band contiguous carrier aggregation and intra-band non-contiguous carrier aggregation, respectively.

Table 6.2.5A-1: P_{CMAX} tolerance for uplink inter-band CA (two bands)

P _{CMAX} (dBm)	Tolerance T _{LOW} (P _{CMAX}) (dB)	Tolerance T _{HIGH} (P _{CMAX}) (dB)		
P _{CMAX} = 23	3.0	2.0		
22 ≤ P _{CMAX} < 23	5.0	2.0		
21 ≤ P _{CMAX} < 22	5.0	3.0		
20 ≤ P _{CMAX} < 21	6.0	4.0		
16 ≤ P _{CMAX} < 20	5.0			
11 ≤ P _{CMAc} < 16	6.0			
-40 ≤ P _{CMAX} < 11	7	.0		

Table 6.2.5A-2: P_{CMAX} tolerance

P _{CMAX} (dBm)	Tolerance T _{LOW} (P _{CMAX}) (dB)	Tolerance T _{HIGH} (P _{CMAX}) (dB)
$21 \le P_{CMAX} \le 23$	2.	.0
20 ≤ P _{CMAX} < 21	2.	5
19 ≤ P _{CMAX} < 20	3.	5
18 ≤ P _{CMAX} < 19	4.	0
13 ≤ P _{CMAX} < 18	5.	0
8 ≤ P _{CMAX} < 13	6.	0
-40 ≤ P _{CMAX} < 8	7.	0

6.2.5B Configured transmitted power for UL-MIMO

For UE supporting UL-MIMO, the transmitted power is configured per each UE.

The definitions of configured maximum output power $P_{CMAX,c}$, the lower bound $P_{CMAX_L,c}$, and the higher bound $P_{CMAX_H,c}$ specified in subclause 6.2.5 shall apply to UE supporting UL-MIMO, where

- $P_{PowerClass}$ and $\Delta T_{C,c}$ are specified in subclause 6.2.2B;
- MPR_{.c} is specified in subclause 6.2.3B;
- A-MPR_{,c} is specified in subclause 6.2.4B.

The measured configured maximum output power $P_{UMAX,c}$ for serving cell c shall be within the following bounds:

$$P_{CMAX_L,c} - \ MAX\{T_L, T_{LOW}(P_{CMAX_L,c})\} \ \leq \ P_{UMAX,c} \leq \ P_{CMAX_H,c} + \ T_{HIGH}(P_{CMAX_H,c})$$

where $T_{LOW}(P_{CMAX_L,c})$ and $T_{HIGH}(P_{CMAX_H,c})$ are defined as the tolerance and applies to $P_{CMAX_L,c}$ and $P_{CMAX_H,c}$ separately, while T_L is the absolute value of the lower tolerance in Table 6.2.2B-1 for the applicable operating band.

For UE with two transmit antenna connectors in closed-loop spatial amultiplexing scheme, the tolerance is specified in Table 6.2.5B-1. The requirements shall be met with UL-MIMO configurations specified in Table 6.2.2B-2.

Р _{смах,с} (dВm)					
P _{CMAX,c} =23	3.0	2.0			
22 ≤ P _{CMAX,c} < 23	5.0	2.0			
21 ≤ P _{CMAX,c} < 22	5.0	3.0			
20 ≤ P _{CMAX,c} < 21	6.0 4.0				
16 ≤ P _{CMAX,c} < 20	5.0				
11 ≤ P _{CMAX,c} < 16	6.0				
-40 ≤ P _{CMAX,c} < 11	7.	.0			

Table 6.2.5B-1: P_{CMAX,c} tolerance in closed-loop spatial multiplexing scheme

For single-antenna port scheme, the requirements in subclause 6.2.5 apply.

6.2.5C Configured transmitted power for Dual Connectivity

For dual connectivity inter-band deployment with one uplink serving cell per CG, the UE is allowed to set its configured maximum output power $P_{CMAX,c,i}$ on each serving cell of CG i, where i is in the set $\{1,2\}$, and its total configured maximum output power P_{CMAX} .

The configured maximum output power $P_{CMAX,c,i}$ on a serving cell c on cell group i shall be set within the following bounds:

$$P_{\text{CMAX_L},c,i} \leq P_{\text{CMAX_L},c,i} \leq P_{\text{CMAX_L},c,i}$$
 where $P_{\text{CMAX_L},c,i}$ and $P_{\text{CMAX_L},c,i}$ are $P_{\text{CMAX_L},c}$ and $P_{\text{CMAX_L},c}$, respectively for CG i , defined in subclause 6.2.5.

The total UE configured maximum output power P_{CMAX} shall be set within the following bounds:

$$P_{CMAX~L} \leq P_{CMAX} \leq P_{CMAX~H}$$

If the UE is configured in Dual Connectivity, the subframes in one CG that overlap with subframes in another CG in their respective slot 1 shall be paired together between CGs.

When synchronous transmissions occur between cell groups' uplink serving cells, P_{CMAX_L} and P_{CMAX_H} , are defined in subclause 6.2.5A for carrier aggregation inter-band case.

If the UE is configured in Dual Connectivity and synchronous transmissions of the UE on subframe p for a serving cell in one CG overlaps some portion of the first symbol of the transmission on subframe q+1 for a different serving cell in the other CG, the UE minimum of P_{CMAX_L} between subframes pairs (p, q) and (p+1, q+1) respectively applies for any overlapping portion of subframes (p, q) and (p+1, q+1). $P_{PowerClass}$ shall not be exceeded by the UE during any period of time.

When asynchronous overlapping transmissions occur, the leading CG is always taken as reference subframe i.e. whose subframe leads in time compared to the other subframe in the subframe pair. The reference subframe is the subframe where the calculated per UE P_{CMAX} is applied by the UE. If subframe p and subframe q are the subframe pair (p,q) between MCG and SCG respectively, then

- 1. if MCG leads, the (p,q) and (p,q-1) pairs are considered for P_{CMAX} definition i.e. for deriving the values of P_{CMAX_L} and P_{CMAX_H} .
- 2. if SCG leads, the (p-1,q) and (p,q) pairs are considered for P_{CMAX} definition i.e. for deriving the values of P_{CMAX_L} and P_{CMAX_H} .

The above P_{CMAX_L} and P_{CMAX_H} bounds are defined as follows.

For the reference subframe p duration (when subframe p in MCG leads):

$$P_{CMAX L} = MIN \{P_{CMAX L}(p,q), P_{CMAX L}(p,q-1)\}$$

$$P_{\text{CMAX H}} = \text{MAX} \{P_{\text{CMAX H}}(p,q), P_{\text{CMAX H}}(p,q-1)\}$$

For the reference subframe q duration (when subframe q in SCG leads):

$$P_{CMAX L} = MIN \{P_{CMAX L} (p-1,q), P_{CMAX L} (p,q)\}$$

$$P_{CMAX_H} = MAX \{P_{CMAX_H} (p-1,q), P_{CMAX_H} (p,q)\}$$

where P_{CMAX_L} and P_{CMAX_H} for each overlapping pairs of subframes (p,q), (p,q-1), (p-1,q) in the above equations are defined in subclause 6.2.5A for carrier aggregation inter-band case.

The UE measured configured maximum output power $P_{\text{UMAX}, c, i}$ of the uplink serving cell c of a CG i is defined in subclause 6.2.5.

The UE total measured configured maximum output power P_{UMAX} for a reference measurement subframe p (or q) duration over all serving cells of both defined CGs is defined as follows:

$$P_{\text{UMAX}} = 10 \log_{10} \sum p_{\text{UMAX}, c, i}$$

where $p_{\text{UMAX,c.i}}$ denotes the measured configured maximum output power for serving cell c in CG i expressed in linear scale.

$$P_{CMAX_L} - \ T_{LOW} \left(P_{CMAX_L} \right) \ \leq \ P_{UMAX} \leq \ P_{CMAX_H} + T_{HIGH} \left(P_{CMAX_H} \right)$$

The tolerance $T(P_{CMAX})$ is defined by the table below and applies to $P_{CMAX L}$ and $P_{CMAX H}$ separately.

Tolerance Tolerance P_{CMAX}(dBm) T_{LOW}(P_{CMAX_L})(dB) T_{HIGH} (P_{CMAX_H})(dB) $P_{CMAX} = 23$ 2.0 3.0 22 ≤P_{CMAX},< 23 5.0 2.0 $21 \le P_{CMAX} < 22$ 5.0 3.0 $20 \le P_{CMAX} < 21$ 6.0 4.0 $16 \le P_{CMAX} < 20$ 5.0 $11 \le P_{CMAX} < 16$ 6.0 -40 ≤ P_{CMAX} < 11 7.0

Table 6.2.5x-1: P_{CMAX} tolerance for inter-band Dual Connectivity

6.2.5D Configured transmitted power for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.5D-1, the configured maximum output power $P_{CMAX,c}$ and power boundary requirement specified in subclause 6.2.5 shall apply to UE supporting ProSe, where

- MPR_c is specified in subclause 6.2.3D;
- A-MPR $_c$ is specified in subclause 6.2.4D;
- $\Delta T_{\text{ProSe}} = 0.1 \text{ dB}.$

For $P_{\text{CMAX},PSSCH}$ and $P_{\text{CMAX},PSCCH}$, $P_{\text{EMAX},c}$ is the value given by IE P-Max for serving cell c, defined by [7], when present. $P_{\text{EMAX},c}$ is the value given by IE maxTxPower, defined by [7], when the UE is not associated with a serving cell on the ProSe carrier.

For $P_{\text{CMAX},PSDCH}$, $P_{\text{EMAX},c}$ is the value given by the IE discMaxTxPower in [7].

For $P_{\text{CMAX},PSBCH}$, $P_{\text{EMAX},c}$ is the value given by the IE maxTxPower in [7] when the ProSe UE is not associated with a serving cell on the ProSe carrier. When the UE is associated with a serving cell, then $P_{\text{EMAX},c}$ is the value given by the IE P-Max when PSBCH/SLSS transmissions is triggered for ProSe Direct communication as specified in [7], and is the value given by the IE discMaxTxPower in [7] otherwise.

For $P_{\text{CMAX},SSSS}$, the value is as calculated for $P_{\text{CMAX},PSBCH}$ and applying the MPR for SSSS as specified in Section 6.2.3D.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the configured maximum output power $P_{CMAX,c}$ for the

configured E-UTRA ProSe carrier is as specified in subclause 6.2.5D and $P_{CMAX,c}$ for the configured E-UTRA uplink carrier is as specified in subclause 6.2.5. The total UE configured maximum output power is specified as P_{CMAX} and shall be set within the following bounds:

$$P_{CMAX~L} \leq \, P_{CMAX} \, \leq \, P_{CMAX~H}$$

For synchronous ProSe and uplink transmissions, $P_{CMAX,L}$ and $P_{CMAX,H}$ is set as specified in subclause 6.2.5A for interband uplink carrier aggregation. The parameters $P_{EMAX,c}$, MPR_c , $A-MPR_c$, ΔT_{ProSe} for ProSe carrier are set as specified in subclause 6.2.5D.

For asynchronous ProSe and uplink transmissions, the carrier configured for uplink transmission is taken as the reference. If subframe p and subframe q are the subframe pair (p,q) for the uplink and ProSe carriers, respectively, then

- 1. if uplink carrier leads, the (p,q) and (p,q-1) pairs are considered for P_{CMAX} definition i.e. for deriving the values of $P_{CMAX L}$ and $P_{CMAX L}$
- 2. if ProSe carrier leads, the (p,q) and (p,q+I) pairs are considered for P_{CMAX} definition i.e. for deriving the values of $P_{CMAX L}$ and $P_{CMAX H}$

For the reference subframe p duration when uplink carrier leads:

$$\mathbf{P}_{\text{CMAX_L}} = \text{MIN} \left\{ \mathbf{P}_{\text{CMAX_L}} \; (p,q\text{-}1) \;, \mathbf{P}_{\text{CMAX_L}} \; (p,q) \right\}$$

$$P_{CMAX H} = MAX \{P_{CMAX H} (p,q-1), P_{CMAX H} (p,q)\}$$

For the reference subframe p duration when ProSe carrier leads:

$$P_{\text{CMAX L}} = \text{MIN} \{P_{\text{CMAX L}}(p,q), P_{\text{CMAX L}}(p,q+1)\}$$

$$\mathbf{P}_{\text{CMAX_H}} = \mathbf{MAX} \; \{ \mathbf{P}_{\text{CMAX_H}} \; (p,q) \; , \; \mathbf{P}_{\text{CMAX_H}} \; (p,q+1) \}$$

where P_{CMAX_L} and P_{CMAX_H} for each overlapping pairs of subframes (p,q), (p,q+1), (p,q-1) are as specified in subclause 6.2.5A for inter-band uplink carrier aggregation. The parameters $P_{EMAX,c}$, MPR_c , $A-MPR_c$, ΔT_{ProSe} for ProSe carrier are set as specified in subclause 6.2.5D.

For synchronous and asynchronous ProSe and uplink transmissions, the bounds on the measured maximum output power P_{UMAX} over all configured ProSe and uplink carriers is as specified in subclause 6.2.5A for inter-band uplink carrier aggregation.

6.3 Output power dynamics

6.3.1 (Void)

6.3.2 Minimum output power

The minimum controlled output power of the UE is defined as the broadband transmit power of the UE, i.e. the power in the channel bandwidth for all transmit bandwidth configurations (resource blocks), when the power is set to a minimum value.

6.3.2.1 Minimum requirement

The minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2.1-1.

Table 6.3.2.1-1: Minimum output power

	Channel bandwidth / Minimum output power / Measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Minimum output power	-40 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.2A UE Minimum output power for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands and intra-band contiguous and non-contiguous carrier aggregation, the minimum controlled output power of the UE is defined as the transmit power of the UE per component carrier, i.e., the power in the channel bandwidth of each component carrier for all transmit bandwidth configurations (resource blocks), when the power on both component carriers are set to a minimum value.

6.3.2A.1 Minimum requirement for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the minimum output power is defined per carrier and the requirement is specified in subclause 6.3.2.1. If two contiguous component carriers are assigned to one E-UTRA band, the requirements in subclause 6.3.2A.1 apply for those component carriers.

For intra-band contiguous and non-contiguous carrier aggregation the minimum output power is defined as the mean power in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2A.1-1.

Table 6.3.2A.1-1: Minimum output power for intra-band contiguous and non-contiguous CA UE

	CC Channel bandwidth / Minimum output power / Measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Minimum output power			-40 c	dBm		
Measurement bandwidth			4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.2B UE Minimum output power for UL-MIMO

For UE supporting UL-MIMO, the minimum controlled output power is defined as the broadband transmit power of the UE, i.e. the sum of the power in the channel bandwidth for all transmit bandwidth configurations (resource blocks) at each transmit antenna connector, when the UE power is set to a minimum value.

6.3.2B.1 Minimum requirement

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the minimum output power is defined as the sum of the mean power at each transmit connector in one sub-frame (1ms). The minimum output power shall not exceed the values specified in Table 6.3.2B.1-1.

Table 6.3.2B.1-1: Minimum output power

	Channel bandwidth / Minimum output power / Measurement bandwidth					
	1.4 MHz	1.4 3.0 5 10 15 20				
Minimum output power	-40 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

For single-antenna port scheme, the requirements in subclause 6.3.2 apply.

6.3.2C Void

<reserved for future use>

6.3.2D UE Minimum output power for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.5D-1, the requirements in subclause 6.3.2 apply for ProSe transmission.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the requirements in subclause 6.3.2A apply as specified for the corresponding inter-band aggregation with uplink assigned to two bands.

6.3.3 Transmit OFF power

Transmit OFF power is defined as the mean power when the transmitter is OFF. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During DTX and measurements gaps, the UE is not considered to be OFF.

6.3.3.1. Minimum requirement

The transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1ms) excluding any transient periods. The transmit OFF power shall not exceed the values specified in Table 6.3.3.1-1.

	Channel bandwidth / Transmit OFF power / Measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Transmit OFF power			-50 c	IBm		
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

Table 6.3.3.1-1: Transmit OFF power

6.3.3A UE Transmit OFF power for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands and intra-band contiguous and non-contiguous carrier aggregation, transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF on all component carriers. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During measurements gaps, the UE is not considered to be OFF.

6.3.3A.1 Minimum requirement for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, transmit OFF power requirement is defined per carrier and the requirement is specified in subclause 6.3.3.1. If two contiguous component carriers are assigned to one E-UTRA band, the requirements in subclause 6.3.3A.1 apply for those component carriers.

For intra-band contiguous and non-contiguous carrier aggregation the transmit OFF power is defined as the mean power in a duration of at least one sub-frame (1ms) excluding any transient periods. The transmit OFF power shall not exceed the values specified in Table 6.3.3A.1-1.

Table 6.3.3A.1-1: Transmit OFF power for intra-band contiguous and non-contiguos CA UE

	CC Channel bandwidth / Transmit OFF power / Measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Transmit OFF power			-50 c	dBm		
Measurement bandwidth			4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.3B UE Transmit OFF power for UL-MIMO

For UE supporting UL-MIMO, the transmit OFF power is defined as the mean power at each transmit antenna connector when the transmitter is OFF at all transmit antenna connectors. The transmitter is considered to be OFF when the UE is not allowed to transmit or during periods when the UE is not transmitting a sub-frame. During DTX and measurements gaps, the UE is not considered to be OFF.

6.3.3B.1 Minimum requirement

The transmit OFF power is defined as the mean power at each transmit antenna connector in a duration of at least one sub-frame (1ms) excluding any transient periods. The transmit OFF power at each transmit antenna connector shall not exceed the values specified in Table 6.3.3B.1-1.

Table 6.3.3B.1-1: Transmit OFF power per antenna port

	Channel bandwidth / Transmit OFF power/ Measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Transmit OFF power	-50 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.3D Transmit OFF power for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.5D-1, the Prose UE shall meet the Transmit OFF power at all times when the UE is not associated with a serving cell on the ProSe carrier and does not have knowledge of its geographical area or is provisioned with pre-configured radio parameters that are not associated with any known Geographical Area.

The requirements specified in subclause 6.3.3 shall apply to UE supporting ProSe when

- the UE is associated with a serving cell on the ProSe carrier, or
- the UE is not associated with a serving cell on the ProSe carrier and is provisioned with the preconfigured radio parameters for ProSe Direct Communications and/or ProSe Direct Discovery that are associated with known Geographical Area, or
- the UE is associated with a serving cell on a carrier different than the ProSe carrier, and the radio parameters for ProSe Direct Discovery on the ProSe carrier are provided by the serving cell, or
- the UE is associated with a serving cell on a carrier different than the ProSe carrier, and has a non-serving cell selected on the ProSe carrier that supports ProSe Direct Discovery and/or ProSe Direct Communication.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF on all component carriers. During measurement gaps and

transmission/reception gaps for ProSe, the UE is not considered to be OFF. Transmit OFF power requirement as specified in subclause 6.3.3 apply per carrier.

6.3.4 ON/OFF time mask

6.3.4.1 General ON/OFF time mask

The General ON/OFF time mask defines the observation period between Transmit OFF and ON power and between Transmit ON and OFF power. ON/OFF scenarios include; the beginning or end of DTX, measurement gap, contiguous, and non contiguous transmission

The OFF power measurement period is defined in a duration of at least one sub-frame excluding any transient periods. The ON power is defined as the mean power over one sub-frame excluding any transient period.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3

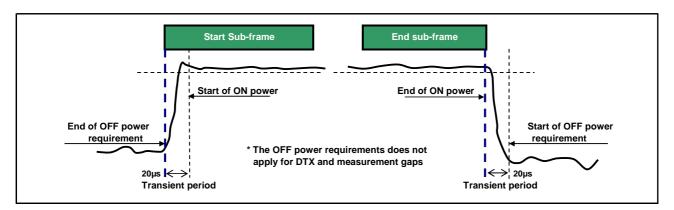


Figure 6.3.4.1-1: General ON/OFF time mask

6.3.4.2 PRACH and SRS time mask

6.3.4.2.1 PRACH time mask

The PRACH ON power is specified as the mean power over the PRACH measurement period excluding any transient periods as shown in Figure 6.3.4.2-1. The measurement period for different PRACH preamble format is specified in Table 6.3.4.2-1.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3

Table 6.3.4.2-1: PRACH ON power measurement period

PRACH preamble format	Measurement period (ms)
0	0.9031
1	1.4844
2	1.8031
3	2.2844
4	0.1479

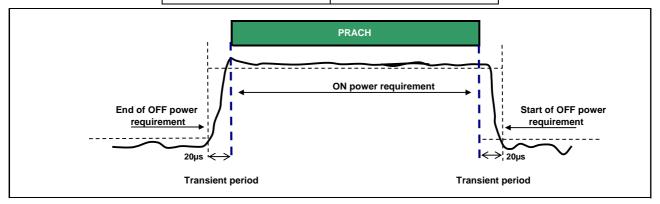


Figure 6.3.4.2-1: PRACH ON/OFF time mask

6.3.4.2.2 SRS time mask

In the case a single SRS transmission, the ON power is defined as the mean power over the symbol duration excluding any transient period. Figure 6.3.4.2.2-1

In the case a dual SRS transmission, the ON power is defined as the mean power for each symbol duration excluding any transient period. Figure 6.3.4.2.2-2

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3

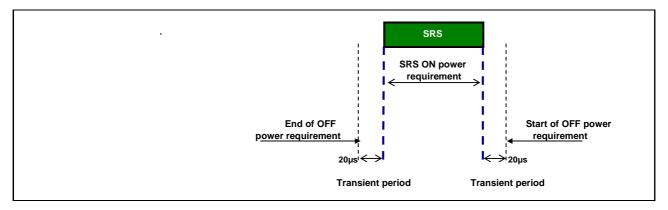


Figure 6.3.4.2.2-1: Single SRS time mask

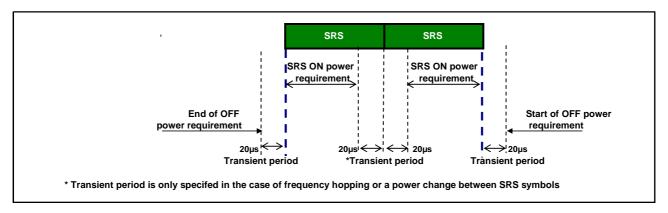


Figure 6.3.4.2.2-2: Dual SRS time mask for the case of UpPTS transmissions

6.3.4.3 Slot / Sub frame boundary time mask

The sub frame boundary time mask defines the observation period between the previous/subsequent sub–frame and the (reference) sub-frame. A transient period at a slot boundary within a sub-frame is only allowed in the case of Intra-sub frame frequency hopping. For the cases when the subframe contains SRS the time masks in subclause 6.3.4.4 apply.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3

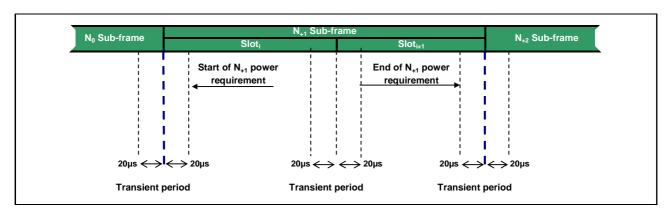


Figure 6.3.4.3-1: Transmission power template

6.3.4.4 PUCCH / PUSCH / SRS time mask

The PUCCH/PUSCH/SRS time mask defines the observation period between sounding reference symbol (SRS) and an adjacent PUSCH/PUCCH symbol and subsequent sub-frame.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3

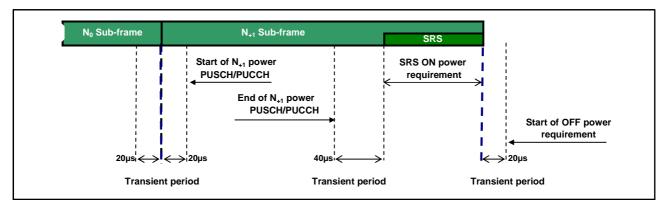


Figure 6.3.4.4-1: PUCCH/PUSCH/SRS time mask when there is a transmission before SRS but not after

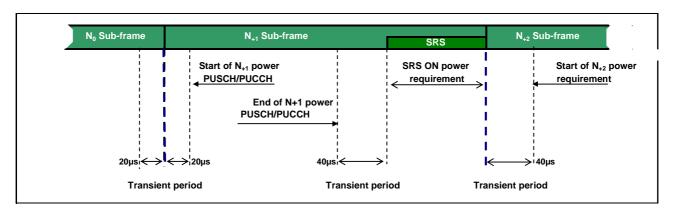


Figure 6.3.4.4-2: PUCCH/PUSCH/SRS time mask when there is transmission before and after SRS

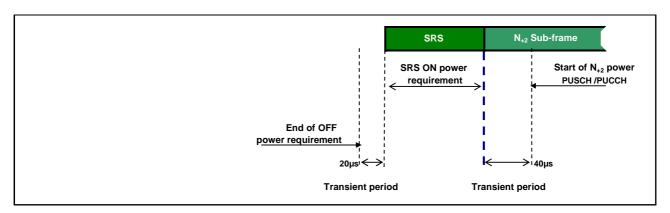


Figure 6.3.4.4-3: PUCCH/PUSCH/SRS time mask when there is a transmission after SRS but not before

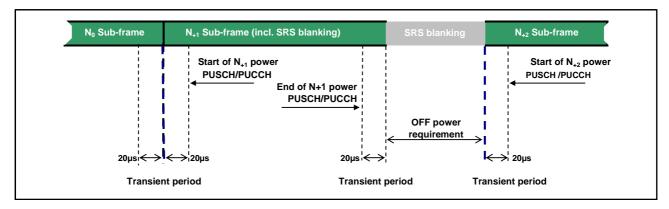


Figure 6.3.4.4-4: SRS time mask when there is FDD SRS blanking

6.3.4A ON/OFF time mask for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands and intra-band contiguous and non-contiguous carrier aggregation, the general output power ON/OFF time mask specified in subclause 6.3.4.1 is applicable for each component carrier during the ON power period and the transient periods. The OFF period as specified in subclause 6.3.4.1 shall only be applicable for each component carrier when all the component carriers are OFF.

6.3.4B ON/OFF time mask for UL-MIMO

For UE supporting UL-MIMO, the ON/OFF time mask requirements in subclause 6.3.4 apply at each transmit antenna connector.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the general ON/OFF time mask requirements specified in subclause 6.3.4.1 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2.

For single-antenna port scheme, the requirements in subclause 6.3.4 apply.

6.3.4D ON/OFF time mask for ProSe

For ProSe Direct Discovery and ProSe Direct Communications, additional requirements on ON/OFF time masks for ProSe physical channels and signals are specified in this clause.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the requirements in subclause 6.3.4D apply for ProSe transmission and the requirements in subclause 6.3.4 apply for uplink transmission.

6.3.4D.1 General time mask for ProSe

The General ON/OFF time mask defines the observation period between the Transmit OFF and ON power and between Transmit ON and OFF power for PSDCH, PSCCH, and PSSCH transmissions in a subframe wherein the last symbol is punctured to create a guard period.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3.

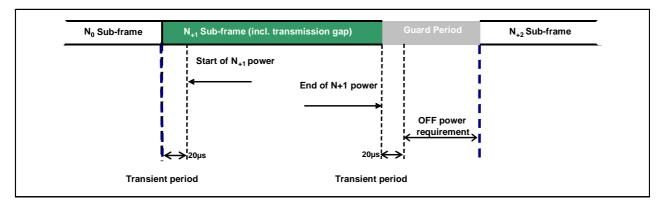


Figure 6.3.4D.1-1: PSDCH/PSCCH/PSSCH time mask

6.3.4D.2 PSSS/SSS time mask

The PSSS time mask / SSSS time mask defines the observation period between the Transmit OFF and ON power and between Transmit ON and OFF power for PSSS/SSSS transmissions in a subframe when not multiplexed with PSBCH in that subframe.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3.

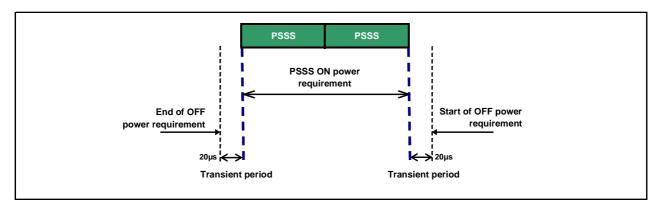


Figure 6.3.4D.2-1: PSSS time mask for normal CP transmission (when not time-multiplexed with PSBCH)

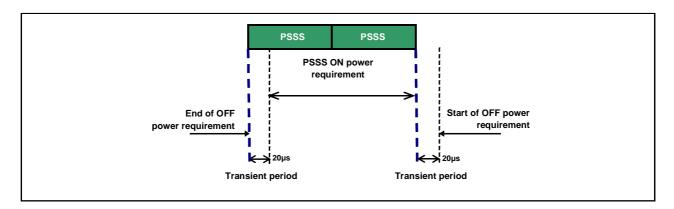


Figure 6.3.4D.2-2: PSSS time mask for extended CP transmission (when not time-multiplexed with PSBCH)

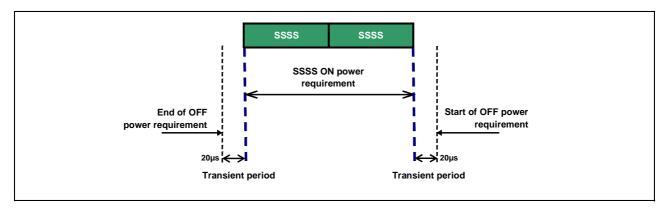


Figure 6.3.4D.2-3: SSSS time mask (when not time-multiplexed with PSBCH)

6.3.4D.3 PSSS / PSBCH time mask

The PSSS/SSSS/PSBCH time mask defines the observation period between SSSS and adjacent PSSS/PSBCH symbols in a subframe, with last symbol punctured to create a guard period.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3.

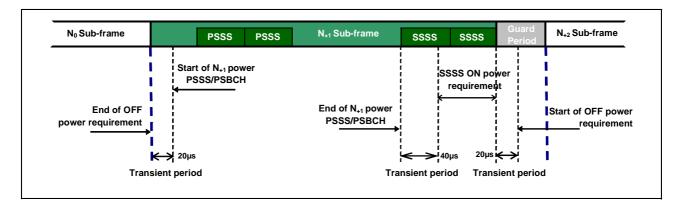


Figure 6.3.4D.3-1: PSSS/SSSS/PBCH time mask for normal CP transmission

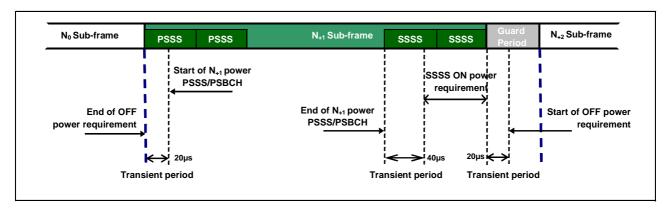


Figure 6.3.4D.3-2: PSSS/SSSS/PBCH time mask for extended CP transmission

6.3.4D.4 PSSCH / SRS time mask

The PSSCH/SRS time mask defines the observation period between sounding reference symbol (SRS) and an adjacent PSSCH symbol and subsequent sub-frame.

There are no additional requirements on UE transmit power beyond that which is required in subclause 6.2.2 and subclause 6.6.2.3.

The PSSCH/SRS time mask shall follow the PUSCH/PUCCH/SRS time mask as specified in subclause 6.3.4.4.

6.3.5 Power Control

6.3.5.1 Absolute power tolerance

Absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap larger than 20ms. This tolerance includes the channel estimation error (the absolute RSRP accuracy requirement specified in subclause 9.1 of TS 36.133)

In the case of a PRACH transmission, the absolute tolerance is specified for the first preamble. The absolute power tolerance includes the channel estimation error (the absolute RSRP accuracy requirement specified in subclause 9.1 of TS 36.133).

6.3.5.1.1 Minimum requirements

The minimum requirement for absolute power tolerance is given in Table 6.3.5.1.1-1 over the power range bounded by the Maximum output power as defined in subclause 6.2.2 and the Minimum output power as defined in subclause 6.3.2.

For operating bands under NOTE 2 in Table 6.2.2-1, the absolute power tolerance as specified in Table 6.3.5.1.1-1 is relaxed by reducing the lower limit by 1.5 dB when the transmission bandwidth is confined within F_{UL_low} and F_{UL_high} + 4 MHz or F_{UL_high} - 4 MHz and F_{UL_high} .

Table 6.3.5.1.1-1: Absolute power tolerance

Conditions	Tolerance
Normal	± 9.0 dB
Extreme	± 12.0 dB

6.3.5.2 Relative Power tolerance

The relative power tolerance is the ability of the UE transmitter to set its output power in a target sub-frame relatively to the power of the most recently transmitted reference sub-frame if the transmission gap between these sub-frames is ≤ 20 ms.

For PRACH transmission, the relative tolerance is the ability of the UE transmitter to set its output power relatively to the power of the most recently transmitted preamble. The measurement period for the PRACH preamble is specified in Table 6.3.4.2-1.

6.3.5.2.1 Minimum requirements

The requirements specified in Table 6.3.5.2.1-1 apply when the power of the target and reference sub-frames are within the power range bounded by the Minimum output power as defined in subclause 6.3.2 and the measured PUMAX as defined in subclause 6.2.5 (i.e, the actual power as would be measured assuming no measurement error). This power shall be within the power limits specified in subclause 6.2.5.

To account for RF Power amplifier mode changes 2 exceptions are allowed for each of two test patterns. The test patterns are a monotonically increasing power sweep and a monotonically decreasing power sweep over a range bounded by the requirements of minimum power and maximum power specified in subclauses 6.3.2 and 6.2.2. For these exceptions the power tolerance limit is a maximum of ± 6.0 dB in Table 6.3.5.2.1-1

Table 6.3.5.2.1-1 Relative power tolerance for transmission (normal conditions)

Power step ΔP (Up or down) [dB]	All combinations of PUSCH and PUCCH transitions [dB]	All combinations of PUSCH/PUCCH and SRS transitions between sub- frames [dB]	PRACH [dB]
ΔP < 2	±2.5 (NOTE 3)	±3.0	±2.5
2 ≤ ΔP < 3	±3.0	±4.0	±3.0
3 ≤ ΔP < 4	±3.5	±5.0	±3.5
4 ≤ ΔP ≤ 10	±4.0	±6.0	±4.0
10 ≤ ΔP < 15	±5.0	±8.0	±5.0
15 ≤ ΔP	±6.0	±9.0	±6.0

NOTE 1: For extreme conditions an additional ± 2.0 dB relaxation is allowed NOTE 2: For operating bands under NOTE 2 in Table 6.2.2-1, the relative power tolerance is relaxed by increasing the upper limit by 1.5 dB if the transmission bandwidth of the reference sub-frames is confined within FUL_low and FUL_low + 4 MHz or FUL_high - 4 MHz and FUL_high and the target sub-frame is not confined within any one of these frequency ranges; if the transmission bandwidth of the target sub-frame is confined within FUL_low and FUL_low + 4 MHz or FUL_high - 4 MHz and FUL_high and the reference sub-frame is not confined within any one of these frequency ranges, then the tolerance is relaxed by reducing the lower limit by 1.5 dB.

NOTE 3: For PUSCH to PUSCH transitions with the allocated resource blocks fixed in frequency and no transmission gaps other than those generated by downlink subframes, DwPTS fields or Guard Periods for TDD: for a power step $\Delta P \le 1$ dB, the relative power tolerance for transmission is ± 1.0 dB.

The power step (ΔP) is defined as the difference in the calculated setting of the UE Transmit power between the target and reference sub-frames with the power setting according to subclause 5.1 of [TS 36.213]. The error is the difference between ΔP and the power change measured at the UE antenna port with the power of the cell-specific reference signals kept constant. The error shall be less than the relative power tolerance specified in Table 6.3.5.2.1-1.

For sub-frames not containing an SRS symbol, the power change is defined as the relative power difference between the mean power of the original reference sub-frame and the mean power of the target subframe not including transient durations. The mean power of successive sub-frames shall be calculated according to Figure 6.3.4.3-1 and Figure 6.3.4.1-1 if there is a transmission gap between the reference and target sub-frames.

If at least one of the sub-frames contains an SRS symbol, the power change is defined as the relative power difference between the mean power of the last transmission within the reference sub-frame and the mean power of the first transmission within the target sub-frame not including transient durations. A transmission is defined as PUSCH, PUCCH or an SRS symbol. The mean power of the reference and target sub-frames shall be calculated according to Figures 6.3.4.1-1, 6.3.4.2-1, 6.3.4.4-1, 6.3.4.4-2 and 6.3.4.4-3 for these cases.

6.3.5.3 Aggregate power control tolerance

Aggregate power control tolerance is the ability of a UE to maintain its power in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in TS 36.213 are constant.

6.3.5.3.1 Minimum requirement

The UE shall meet the requirements specified in Table 6.3.5.3.1-1 for aggregate power control over the power range bounded by the minimum output power as defined in subclause 6.3.2 and the maximum output power as defined in subclause 6.2.2.

Table 6.3.5.3.1-1: Aggregate power control tolerance

TPC command UL channel		Aggregate power tolerance within 21 ms			
0 dB	PUCCH	±2.5 dB			
0 dB	PUSCH	±3.5 dB			
NOTE: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission.					

6.3.5A Power control for CA

The requirements apply for one single PUCCH, PUSCH or SRS transmission of contiguous PRB allocation per component carrier with power setting in accordance with Clause 5.1 of [6].

6.3.5A.1 Absolute power tolerance

The absolute power tolerance is the ability of the UE transmitter to set its initial output power to a specific value for the first sub-frame at the start of a contiguous transmission or non-contiguous transmission with a transmission gap on each active component carriers larger than 20ms. The requirement can be tested by time aligning any transmission gaps on the component carriers.

6.3.5A.1.1 Minimum requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the absolute power control tolerance is specified on each component carrier exceed the minimum output power as defined in subclause 6.3.2A and the total power is limited by maximum output power as defined in subclause 6.2.2A. The requirements defined in Table 6.3.5.1.1-1 shall apply on each component carrier with all component carriers active. The requirements can be tested by time aligning any transmission gaps on all the component carriers.

For intra-band contiguous carrier aggregation bandwidth class B and C and intra-band non-contiguous carrier aggregation the absolute power control tolerance per component carrier is given in Table 6.3.5.1.1-1.

6.3.5A.2 Relative power tolerance

6.3.5A.2.1 Minimum requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the relative power tolerance is specified when the power of the target and reference sub-frames on each component carrier exceed the minimum output power as defined in subclause 6.3.2A and the total power is limited by P_{UMAX} as defined in subclause 6.2.5A. The requirements shall apply on each component carrier with all component carriers active. The UE transmitter shall have the capability of changing the output power independently on all component carriers in the uplink and:

- a) the requirements for all combinations of PUSCH and PUCCH transitions per component carrier is given in Table 6.3.5.2.1-1.
- b) for SRS the requirements for combinations of PUSCH/PUCCH and SRS transitions between subframes given in Table 6.3.5.2.1-1 apply per component carrier when the target and reference subframes are configured for either simultaneous SRS or simultaneous PUSCH.
- c) for RACH the requirements apply for the primary cell and are given in Table 6.3.5.2.1-1.

For intra-band contiguous carrier aggregation bandwidth class B and C and intra-band non-contiguous carrier aggregation, the requirements apply when the power of the target and reference sub-frames on each component carrier exceed -20 dBm and the total power is limited by P_{UMAX} as defined in subclause 6.2.5A. For the purpose of these requirements, the power in each component carrier is specified over only the transmitted resource blocks.

The UE shall meet the following requirements for transmission on both assigned component carriers when the average transmit power per PRB is aligned across both assigned carriers in the reference sub-frame:

a) for all possible combinations of PUSCH and PUCCH transitions per component carrier, the corresponding requirements given in Table 6.3.5.2.1-1;

- b) for SRS transitions on each component carrier, the requirements for combinations of PUSCH/PUCCH and SRS transitions given in Table 6.3.5.2.1-1 with simultaneous SRS of constant SRS bandwidth allocated in the target and reference subrames;
- c) for RACH on the primary component carrier, the requirements given in Table 6.3.5.2.1-1 for PRACH.

For a) and b) above, the power step ΔP between the reference and target subframes shall be set by a TPC command and/or an uplink scheduling grant transmitted by means of an appropriate DCI Format.

For a), b) and c) above, two exceptions are allowed for each component carrier for a power per carrier ranging from -20 dBm to $P_{UMAX,c}$ as defined in subclause 6.2.5. For these exceptions the power tolerance limit is ± 6.0 dB in Table 6.3.5.2.1-1.

6.3.5A.3 Aggregate power control tolerance

Aggregate power control tolerance is the ability of a UE to maintain its power in non-contiguous transmission within 21 ms in response to 0 dB TPC commands with respect to the first UE transmission, when the power control parameters specified in [6] are constant on all active component carriers.

6.3.5A.3.1 Minimum requirements

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the aggregate power tolerance is specified on each component carrier exceed the minimum output power as defined in subclause 6.3.2A and the total power is limited by maximum output power as defined in subclause 6.2.2A. The requirements defined in Table 6.3.5.3.1-1 shall apply on each component carrier with all component carriers active. The requirements can be tested by time aligning any transmission gaps on both the component carriers.

For intra-band contiguous carrier aggregation bandwidth class B and C and intra-band non-contiguous carrier aggregation, the aggregate power tolerance per component carrier is given in Table 6.3.5.3.1-1 with either simultaneous PUSCH or simultaneous PUCCH-PUSCH (if supported by the UE) configured. The average power per PRB shall be aligned across both assigned carriers before the start of the test. The requirement can be tested with the transmission gaps time aligned between component carriers.

6.3.5B Power control for UL-MIMO

For UE supporting UL-MIMO, the power control tolerance applies to the sum of output power at each transmit antenna connector.

The power control requirements specified in subclause 6.3.5 apply to UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme. The requirements shall be met with UL-MIMO configurations specified in Table 6.2.2B-2, wherein

- The Maximum output power requirements for UL-MIMO are specified in subclause 6.2.2B
- The Minimum output power requirements for UL-MIMO are specified in subclause 6.3.2B
- The requirements for configured transmitted power for UL-MIMO are specified in subclause 6.2.5B.

For single-antenna port scheme, the requirements in subclause 6.3.5 apply.

6.3.5D Power Control for ProSe

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the requirements in subclause 6.3.5D apply for ProSe transmission and the requirements in subclause 6.3.5 apply for uplink transmission.

6.3.5D.1 Absolute power tolerance

For ProSe transmissions, the absolute power tolerance requirements specified in subclause 6.3.5.1 shall apply for each ProSe transmission.

6.4 Void

6.5 Transmit signal quality

6.5.1 Frequency error

The UE modulated carrier frequency shall be accurate to within ± 0.1 PPM observed over a period of one time slot (0.5 ms) compared to the carrier frequency received from the E-UTRA Node B

6.5.1A Frequency error for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the frequency error requirements defined in subclause 6.5.1 shall apply on each component carrier with all component carriers active.

For intra-band contiguous carrier aggregation the UE modulated carrier frequencies per band shall be accurate to within ± 0.1 PPM observed over a period of one timeslot compared to the carrier frequency of primary component carrier received from the E-UTRA in the corresponding band.

For intra-band non-contiguous carrier aggregation the requirements in Section 6.5.1 applies per component carrier.

6.5.1B Frequency error for UL-MIMO

For UE(s) supporting UL-MIMO, the UE modulated carrier frequency at each transmit antenna connector shall be accurate to within ± 0.1 PPM observed over a period of one time slot (0.5 ms) compared to the carrier frequency received from the E-UTRA Node B.

6.5.1D Frequency error for ProSe

The UE modulated carrier frequency for ProSe sidelink transmissions shall be accurate to within ± 0.1 PPM observed over a period of one time slot (0.5 ms) compared to the carrier frequency received from the synchronization source. The synchronization source can be E-UTRA Node B or a ProSe UE transmitting sidelink synchronization signals.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the requirements in subclause 6.5.1D apply for ProSe transmission and the requirements in subclause 6.5.1 apply for uplink transmission.

6.5.2 Transmit modulation quality

Transmit modulation quality defines the modulation quality for expected in-channel RF transmissions from the UE. The transmit modulation quality is specified in terms of:

- Error Vector Magnitude (EVM) for the allocated resource blocks (RBs)
- EVM equalizer spectrum flatness derived from the equalizer coefficients generated by the EVM measurement process
- Carrier leakage
- In-band emissions for the non-allocated RB

All the parameters defined in subclause 6.5.2 are defined using the measurement methodology specified in Annex F.

6.5.2.1 Error Vector Magnitude

The Error Vector Magnitude is a measure of the difference between the reference waveform and the measured waveform. This difference is called the error vector. Before calculating the EVM the measured waveform is corrected by the sample timing offset and RF frequency offset. Then the carrier leakage shall be removed from the measured waveform before calculating the EVM.

The measured waveform is further modified by selecting the absolute phase and absolute amplitude of the Tx chain. The EVM result is defined after the front-end IDFT as the square root of the ratio of the mean error vector power to the mean reference power expressed as a %.

The basic EVM measurement interval in the time domain is one preamble sequence for the PRACH and is one slot for the PUCCH and PUSCH in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the EVM measurement interval is reduced by one symbol, accordingly. The PUSCH or PUCCH EVM measurement interval is also reduced when the mean power, modulation or allocation between slots is expected to change. In the case of PUSCH transmission, the measurement interval is reduced by a time interval equal to the sum of 5 μ s and the applicable exclusion period defined in subclause 6.3.4, adjacent to the boundary where the power change is expected to occur. The PUSCH exclusion period is applied to the signal obtained after the front-end IDFT. In the case of PUCCH transmission with power change, the PUCCH EVM measurement interval is reduced by one symbol adjacent to the boundary where the power change is expected to occur.

6.5.2.1.1 Minimum requirement

The RMS average of the basic EVM measurements for 10 sub-frames excluding any transient period for the average EVM case, and 60 sub-frames excluding any transient period for the reference signal EVM case, for the different modulations schemes shall not exceed the values specified in Table 6.5.2.1.1-1 for the parameters defined in Table 6.5.2.1.1-2. For EVM evaluation purposes, [all PRACH preamble formats 0-4 and] all PUCCH formats 1, 1a, 1b, 2, 2a and 2b are considered to have the same EVM requirement as QPSK modulated.

Table 6.5.2.1.1-1: Minimum requirements for Error Vector Magnitude

Parameter	Unit	Average EVM Level	Reference Signal EVM Level
QPSK or BPSK	%	17.5	17.5
16QAM	%	12.5	12.5
64QAM	%	8	8

Table 6.5.2.1.1-2: Parameters for Error Vector Magnitude

Parameter	Unit	Level
UE Output Power	dBm	≥ -40
Operating conditions		Normal conditions

6.5.2.2 Carrier leakage

Carrier leakage is an additive sinusoid waveform that has the same frequency as a modulated waveform carrier frequency. The measurement interval is one slot in the time domain.

6.5.2.2.1 Minimum requirements

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.5.2.2.1-1.

Table 6.5.2.2.1-1: Minimum requirements for relative carrier leakage power

Parameters	Relative limit (dBc)	Applicable frequencies
Output power >10 dBm	-28	Carrier center frequency < 1 GHz
	-25	Carrier center frequency ≥ 1 GHz
0 dBm ≤ Output power ≤10 dBm	-25	
-30 dBm ≤ Output power ≤0 dBm	-20	
-40 dBm < Output power < -30 dBm	-10	

6.5.2.3 In-band emissions

The in-band emission is defined as the average across 12 sub-carrier and as a function of the RB offset from the edge of the allocated UL transmission bandwidth. The in-band emission is measured as the ratio of the UE output power in a non-allocated RB to the UE output power in an allocated RB.

The basic in-band emissions measurement interval is defined over one slot in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one SC-FDMA symbol, accordingly.

6.5.2.3.1 Minimum requirements

The relative in-band emission shall not exceed the values specified in Table 6.5.2.3.1-1.

Table 6.5.2.3.1-1: Minimum requirements for in-band emissions

Parameter description	Unit		Limit (NOTE 1)	Applicable Frequencies
General	dB	20	$ \text{ax} \left\{ -25 - 10 \cdot \log_{10} \left(N_{RB} / L_{CRB} \right), \\ $	Any non-allocated (NOTE 2)
		-28	Image frequencies when carrier center frequency < 1 GHz and Output power > 10 dBm	Imaga
IQ Image	dB	-25	Image frequencies when carrier center frequency < 1 GHz and Output power ≤ 10 dBm	Image frequencies (NOTES 2, 3)
	-2	-25	Image frequencies when carrier center frequency ≥ 1 GHz	(NOTES 2, 3)
		-28	Output power > 10 dBm and carrier center frequency < 1 GHz	
Carrier leakage	dBc	-25	Output power > 10 dBm and carrier center frequency ≥ 1 GHz	Carrier frequency
		-25	0 dBm ≤ Output power ≤10 dBm	(NOTES 4, 5)
		-20	-30 dBm ≤ Output power ≤ 0 dBm	
			-10	-40 dBm ≤ Output power < -30 dBm

- NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of P_{RB} 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. P_{RB} is defined in NOTE 10.
- NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one nonallocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.
- NOTE 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.
- NOTE 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.
- NOTE 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if N_{RB} is odd, or in the two RBs immediately adjacent to the DC frequency if N_{RB} is even, but excluding any allocated RB.
- NOTE 6: $L_{\it CRB}$ is the Transmission Bandwidth (see Figure 5.6-1).
- NOTE 7: N_{RB} is the Transmission Bandwidth Configuration (see Figure 5.6-1).
- NOTE 8: EVM is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.
- NOTE 9: Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB}=1$ or $\Delta_{RB}=-1$ for the first adjacent RB outside of the allocated bandwidth.
- NOTE 10: $P_{\it RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

6.5.2.4 EVM equalizer spectrum flatness

The zero-forcing equalizer correction applied in the EVM measurement process (as described in Annex F) must meet a spectral flatness requirement for the EVM measurement to be valid. The EVM equalizer spectrum flatness is defined in

terms of the maximum peak-to-peak ripple of the equalizer coefficients (dB) across the allocated uplink block. The basic measurement interval is the same as for EVM.

6.5.2.4.1 Minimum requirements

The peak-to-peak variation of the EVM equalizer coefficients contained within the frequency range of the uplink allocation shall not exceed the maximum ripple specified in Table 6.5.2.4.1-1 for normal conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 5 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 7 dB (see Figure 6.5.2.4.1-1).

The EVM equalizer spectral flatness shall not exceed the values specified in Table 6.5.2.4.1-2 for extreme conditions. For uplink allocations contained within both Range 1 and Range 2, the coefficients evaluated within each of these frequency ranges shall meet the corresponding ripple requirement and the following additional requirement: the relative difference between the maximum coefficient in Range 1 and the minimum coefficient in Range 2 must not be larger than 6 dB, and the relative difference between the maximum coefficient in Range 2 and the minimum coefficient in Range 1 must not be larger than 10 dB (see Figure 6.5.2.4.1-1).

Table 6.5.2.4.1-1: Minimum requirements for EVM equalizer spectrum flatness (normal conditions)

	Frequency range	Maximum ripple [dB]
F _{UL_Meas}	$_{s}$ - $F_{UL_Low} \ge 3$ MHz and F_{UL_High} - $F_{UL_Meas} \ge 3$ MHz	4 (p-p)
	(Range 1)	
F _{UL_Mea}	$_{as}$ - F_{UL_Low} < 3 MHz or F_{UL_High} - F_{UL_Meas} < 3 MHz	8 (p-p)
	(Range 2)	
NOTE 1:	$F_{\text{UL_Meas}}$ refers to the sub-carrier frequency for which evaluated	the equalizer coefficient is
NOTE 2:	$F_{\text{UL_Low}}$ and $F_{\text{UL_High}}$ refer to each E-UTRA frequency 5.5-1	band specified in Table

Table 6.5.2.4.1-2: Minimum requirements for EVM equalizer spectrum flatness (extreme conditions)

	Frequency range	Maximum Ripple [dB]
F _{UL_Mea}	s – F _{UL_Low} ≥ 5 MHz and F _{UL_High} – F _{UL_Meas} ≥ 5 MHz	4 (p-p)
	(Range 1)	
F _{UL_Mea}	$_{as}$ - F_{UL_Low} < 5 MHz or F_{UL_High} - F_{UL_Meas} < 5 MHz	12 (p-p)
	(Range 2)	
	$F_{\text{UL_Meas}}$ refers to the sub-carrier frequency for which evaluated	·
NOTE 2:	F_{UL_Low} and F_{UL_High} refer to each E-UTRA frequency $5.5\text{-}1$	band specified in Table

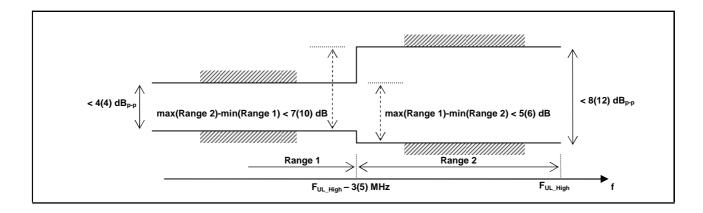


Figure 6.5.2.4.1-1: The limits for EVM equalizer spectral flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets).

6.5.2A Transmit modulation quality for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the requirements shall apply on each component carrier as defined in clause 6.5.2 with all component carriers active. If two contiguous component carriers are assigned to one E-UTRA band, the requirements in subclauses 6.5.2A.1, 6.5.2A.2, and 6.5.2A.3 apply for those component carriers.

The requirements in this clause apply with PCC and SCC in the UL configured and activated: PCC with PRB allocation and SCC without PRB allocation and without CSI reporting and SRS configured.

6.5.2A.1 Error Vector Magnitude

For the intra-band contiguous and non-contiguous carrier aggregation, the Error Vector Magnitude requirement should be defined for each component carrier. Requirements only apply with PRB allocation in one of the component carriers. Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

When a single component carrier is configured Table 6.5.2.1.1-1 apply.

The EVM requirements are according to Table 6.5.2A.1-1 if CA is configured in uplink.

Parameter Unit Average EVM Level per **Reference Signal EVM** CC Level % 17.5 QPSK or BPSK 17.5 16QAM % 12.5 12.5 64QAM % 8 8

Table 6.5.2A.1-1: Minimum requirements for Error Vector Magnitude

6.5.2A.2 Carrier leakage for CA

Carrier leakage is an additive sinusoid waveform that is confined within the aggrecated transmission bandwidth configuration. The carrier leakage requirement is defined for each component carrier and is measured on the component carrier with PRBs allocated. The measurement interval is one slot in the time domain.

6.5.2A.2.1 Minimum requirements

The relative carrier leakage power is a power ratio of the additive sinusoid waveform and the modulated waveform. The relative carrier leakage power shall not exceed the values specified in Table 6.5.2A.2.1-1.

Table 6.5.2A.2.1-1: Minimum requirements for Relative Carrier Leakage Power

Parameters	Relative Limit (dBc)
Output power >0 dBm	-25
-30 dBm ≤ Output power ≤0 dBm	-20
-40 dBm ≤ Output power < -30 dBm	-10

6.5.2A.3 In-band emissions

6.5.2A.3.1 Minimum requirement for CA

For intra-band contiguous carrier aggregation bandwidth class B and C, the requirements in Table 6.5.2A.3.1-1 and 6.5.2A.3.1-2 apply within the aggregated transmission bandwidth configuration with both component carrier (s) active and one single contiguous PRB allocation of bandwidth L_{CRB} at the edge of the aggregated transmission bandwidth configuration.

The inband emission is defined as the interference falling into the non allocated resource blocks for all component carriers. The measurement method for the inband emissions in the component carrier with PRB allocation is specified in annex F. For a non allocated component carrier a spectral measurement is specified.

For intra-band non-contiguous carrier aggregation the requirements for in-band emissions should be defined for each component carrier. Requirements only apply with PRB allocation in one of the component carriers according to Table 6.5.2.3.1.

Table 6.5.2A.3.1-1: Minimum requirements for in-band emissions (allocated component carrier)

Parameter	Unit		Limit	Applicable Frequencies
General dB $20 \cdot \log_{10} E$		$25 - 10 \cdot \log_{10} (N_{RB} / L_{CRB}),$ $EVM - 3 - 5 \cdot (\Delta_{RB} - 1) / L_{CRB},$	Any non-allocated (NOTE 2)	
		- 57 dBm	$/180 kHz - P_{RB} \Big\}$	
IQ Image	dB		-25	Exception for IQ image (NOTE 3)
Carrier		-25	Output power > 0 dBm	Expension for Consider fragments
Carrier dB	dBc	-20	-30 dBm ≤ Output power ≤ 0 dBm	Exception for Carrier frequency (NOTE 4)
leakage		-10	-40 dBm ≤ Output power < -30 dBm	(1101 = 4)

- NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of P_{RB} 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. P_{RB} is defined in NOTE 9. The limit is evaluated in each non-allocated RB.
- NOTE 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one nonallocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs
- NOTE 3: Exceptions to the general limit are allowed for up to $L_{\it CRBs}$ +1 RBs within a contiguous width of $L_{\it CRBs}$ +1 non-allocated RBs. The measurement bandwidth is 1 RB.
- NOTE 4: Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs. The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in the non-allocated RB to the measured total power in all allocated RBs.
- NOTE 5: L_{CRB} is the Transmission Bandwidth (see Figure 5.6-1) not exceeding $\left|N_{RB}/2-1\right|$
- NOTE 6: N_{RB} is the Transmission Bandwidth Configuration (see Figure 5.6-1) of the component carrier with RBs allocated.
- NOTE 7: EVM is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.
- NOTE 8: Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB}=1$ or $\Delta_{RB}=-1$ for the first adjacent RB outside of the allocated bandwidth).
- NOTE 9: $P_{\rm RB}$ is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

Table 6.5.2A.3.1-2: Minimum requirements for in-band emissions (not allocated component carrier)

Para- meter	Unit	Meas BW NOTE 1		Limit	remark	Applicable Frequencies
General	dB	BW of 1 RB (180KHz rectangular)	20 · log 10	$25 - 10 \cdot \log_{10}(N_{RB} / L_{CRB}),$ $EVM - 3 - 5 \cdot (\Delta_{RB} - 1) / L_{CRB},$ $e / 180 kHz - P_{RB}$	The reference value is the average power per allocated RB in the allocated component carrier	Any RB in the non allocated component carrier. The frequency raster of the RBs is derived when this component carrier is allocated with RBs
IQ Image	dB	BW of 1 RB (180KHz rectangular)		-25 NOTE 2	The reference value is the average power per allocated RB in the allocated component carrier	The frequencies of the $L_{\it CRB}$ contiguous non-allocated RBs are unknown. The frequency raster of the RBs is derived when this component carrier is allocated with RBs
		BW of 1 RB (180KHz		NOTE 3	The reference	The frequencies of
		rectangular)	-25	Output power > 0 dBm	value is the total power of the	the up to 2 non-allocated RBs are
Carrier leakage	dBc		-20	-30 dBm ≤ Output power ≤ 0 dBm	allocated RBs in the allocated component carrier	unknown. The frequency raster of the RBs is derived when this
			-10	-40 dBm ≤ Output power < -30 dBm	- Carrior	component carrier is allocated with RBs

NOTE1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.

NOTE 2: Exceptions to the general limit is are allowed for up to $L_{\it CRB}$ +1 RBs within a contiguous width of $L_{\it CRB}$ +1 non-allocated RBs.

NOTE 3: Two Exceptions to the general limit are allowed for up to two contiguous non-allocated RBs

NOTE 4: NOTES 1, 5, 6, 7, 8, 9 from Table 6.5.2A.3.1-1 apply for Table 6.5.2A.3.1-2 as well.

NOTE 5: Δ_{RB} for measured non-allocated RB in the non allocated component carrier may take non-integer values when the carrier spacing between the CCs is not a multiple of RB.

6.5.2B Transmit modulation quality for UL-MIMO

For UE supporting UL-MIMO, the transmit modulation quality requirements are specified at each transmit antenna connector.

For single-antenna port scheme, the requirements in subclause 6.5.2 apply.

The transmit modulation quality is specified in terms of:

- Error Vector Magnitude (EVM) for the allocated resource blocks (RBs)
- EVM equalizer spectrum flatness derived from the equalizer coefficients generated by the EVM measurement process
- Carrier leakage (caused by IQ offset)
- In-band emissions for the non-allocated RB

6.5.2B.1 Error Vector Magnitude

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the Error Vector Magnitude requirements specified in Table 6.5.2.1.1-1 which is defined in subclause 6.5.2.1 apply at each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2.

6.5.2B.2 Carrier leakage

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the Relative Carrier Leakage Power requirements specified in Table 6.5.2.2.1-1 which is defined in subclause 6.5.2.2 apply at each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2.

6.5.2B.3 In-band emissions

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the In-band Emission requirements specified in Table 6.5.2.3.1-1 which is defined in subclause 6.5.2.3 apply at each transmit antenna connector. The requirements shall be met with the uplink MIMO configurations specified in Table 6.2.2B-2.

6.5.2B.4 EVM equalizer spectrum flatness for UL-MIMO

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the EVM Equalizer Spectrum Flatness requirements specified in Table 6.5.2.4.1-1 and Table 6.5.2.4.1-2 which are defined in subclause 6.5.2.4 apply at each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2.

6.5.2D Transmit modulation quality for ProSe

The requirements in this clause apply to ProSe sidelink transmissions.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the requirements in subclause 6.5.2D apply for ProSe transmission and the requirements in subclause 6.5.2 apply for uplink transmission.

6.5.2D.1 Error Vector Magnitude

For ProSe sidelink physical channels PSDCH, PSCCH, PSSCH, and PSBCH, the Error Vector Magnitude requirements shall be as specified for PUSCH in subclause 6.5.2.1 for the corresponding modulation and transmission bandwidth. When ProSe transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the EVM measurement interval is reduced by one symbol, accordingly.

For PSBCH the duration over which EVM is averaged shall be 24 subframes.

This requirement is not applicable for ProSe physical signals PSSS and SSSS.

6.5.2D.2 Carrier leakage

The requirements of subcaluse 6.5.2.2 shall apply for ProSe transmissions.

6.5.2D.3 In-band emissions

For ProSe sidelink physical channels PSDCH, PSCCH, PSSCH, and PSBCH, the In-band emissions requirements shall be as specified for PUSCH in subclause 6.5.2.3 for the corresponding modulation and transmission bandwidth. When ProSe transmissions are shortened due to transmission gap of 1 symbol at the end of the subframe, the In-band emissions measurement interval is reduced by one symbol, accordingly.

6.5.2D.4 EVM equalizer spectrum flatness for ProSe

The requirements of subcaluse 6.5.2.4 shall apply for ProSe transmissions.

6.6 Output RF spectrum emissions

The output UE transmitter spectrum consists of the three components; the emission within the occupied bandwidth (channel bandwidth), the Out Of Band (OOB) emissions and the far out spurious emission domain.

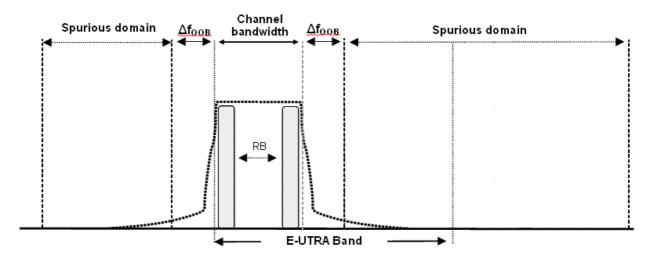


Figure 6.6-1: Transmitter RF spectrum

6.6.1 Occupied bandwidth

Occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied bandwidth for all transmission bandwidth configurations (Resources Blocks) shall be less than the channel bandwidth specified in Table 6.6.1-1

Occupied channel bandwidth / Channel bandwidth 20 1.4 3.0 5 10 15 MHz MHz MHz MHz MHz MHz Channel bandwidth 1.4 10 15 20 (MHz)

Table 6.6.1-1: Occupied channel bandwidth

6.6.1A Occupied bandwidth for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands the occupied bandwidth is defined per component carrier. Occupied bandwidth is the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on assigned channel bandwidth on the component carrier. The occupied bandwidth shall be less than the channel bandwidth specified in Table 6.6.1-1.

For intra-band contiguous carrier aggregation the occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated power of the transmitted spectrum. The OBW shall be less than the aggregated channel bandwidth defined in subclause 5.6A.

For intra-band non-contiguous carrier aggregation sub-block occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the sub-block. In case the sub-block consist of one component carrier the occupied bandwidth of the sub-block shall be less than the channel bandwidth specified in Table 6.6.1-1.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band), the occupied bandwidth is the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on each E-UTRA band. The OBW shall be less than the channel bandwidth as specified in Table 6.6.1-1 for the E-UTRA band supporting one component carrier. The OBW shall be less than the aggregated channel bandwidth as specified in subclause 5.6A for the E-UTRA band supporting two contiguous component carriers.

6.6.1B Occupied bandwidth for UL-MIMO

For UE supporting UL-MIMO, the requirements for occupied bandwidth is specified at each transmit antenna connector. The occupied bandwidth is defined as the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel at each transmit antenna connector.

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the occupied bandwidth at each transmitter antenna shall be less than the channel bandwidth specified in Table 6.6.1B-1. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2.

Occupied channel bandwidth / Channel bandwidth 3.0 5 10 15 20 1.4 MHz MHz MHz MHz MHz MHz Channel bandwidth 1.4 5 10 15 20 3 (MHz)

Table 6.6.1B-1: Occupied channel bandwidth

For single-antenna port scheme, the requirements in subclause 6.6.1 apply.

6.6.2 Out of band emission

The Out of band emissions are unwanted emissions immediately outside the assigned channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. This out of band emission limit is specified in terms of a spectrum emission mask and an Adjacent Channel Leakage power Ratio.

6.6.2.1 Spectrum emission mask

The spectrum emission mask of the UE applies to frequencies (Δf_{OOB}) starting from the \pm edge of the assigned E-UTRA channel bandwidth. For frequencies greater than (Δf_{OOB}) as specified in Table 6.6.2.1.1-1 the spurious requirements in subclause 6.6.3 are applicable.

6.6.2.1.1 Minimum requirement

The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1.1-1 for the specified channel bandwidth.

Spectrum emission limit (dBm)/ Channel bandwidth Measurement 1.4 Δf_{OOB} 3.0 5 10 (MHz) MHz MHz MHz MHz MHz MHz bandwidth ± 0-1 -10 -13 -15 -18 -20 -21 30 kHz -10 -10 -10 -10 -10 -10 1 MHz ± 1-2.5 -10 -25 -10 -10 -10 -10 1 MHz \pm 2.5-2.8 1 MHz -10 -10 -10 -10 -10 $\pm 2.8-5$ -13 1 MHz -25 -13 -13 ± 5-6 -13 1 MHz -25 -13 -13 -13 ± 6-10 1 MHz -25 -13 -13 ± 10-15 -25 -13 1 MHz ± 15-20 $\pm 20-25$ -25 1 MHz

Table 6.6.2.1.1-1: General E-UTRA spectrum emission mask

NOTE:

As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.1A Spectrum emission mask for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the spectrum emission mask of the UE is defined per component carrier while both component carriers are active and the requirements are specified in subclauses 6.6.2.1 and 6.6.2.2. If for some frequency spectrum emission masks of component carriers overlap then spectrum emission mask allowing higher power spectral density applies for that frequency. If for some frequency a component carrier spectrum emission mask overlaps with the channel bandwidth of another component carrier, then the emission mask does not apply for that frequency.

For intra-band contiguous carrier aggregation the spectrum emission mask of the UE applies to frequencies (Δf_{OOB}) starting from the \pm edge of the aggregated channel bandwidth (Table 5.6A-1) For intra-band contiguous carrier aggregation the bandwidth class B and C, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.1A-0 and Table 6.6.2.1A-1 for the specified channel bandwidth.

Table 6.6.2.1A-0: General E-UTRA CA spectrum emission mask for Bandwidth Class B

Spectrum emission limit [dBm]/BW _{Channel_CA}						
<u> </u>	25RB+50RB (14.95 MHz)	50RB+50RB (19.9 MHz)	Measurement bandwidth			
± 0-1	-20	-21	30 kHz			
± 1-5	-10	-10	1 MHz			
± 5-14.95	-13	-13	1 MHz			
± 14.95-19.90	-25	-13	1 MHz			
± 19.90-19.95	-25	-25	1 MHz			
± 19.95-24.90		-25	1 MHz			

Spectrum emission limit [dBm]/BW _{Channel_CA}									
Δf _{OOB} (MHz)	25RB+100RB (24.95MHz)	50RB+100RB (29.9 MHz)	75RB+75RB (30 MHz)	75RB+100RB (34.85 MHz)	100RB+100RB (39.8 MHz)	Measurement bandwidth			
± 0-1	-22	-22.5	-22.5	-23.5	-24	30 kHz			
± 1-5	-10	-10	-10	-10	-10	1 MHz			
± 5-24.95	-13	-13	-13	-13	-13	1 MHz			
± 24.95-29.9	-25	-13	-13	-13	-13	1 MHz			
± 29.9-29.95	-25	-25	-13	-13	-13	1 MHz			
± 29.95-30		-25	-13	-13	-13	1 MHz			
± 30-34.85		-25	-25	-13	-13	1 MHz			
± 34.85-34.9		-25	-25	-25	-13	1 MHz			
± 34.9-35			-25	-25	-13	1 MHz			
± 35-39.8				-25	-13	1 MHz			
± 39.8-39.85				-25	-25	1 MHz			
± 39.85-44.8					-25	1 MHz			

Table 6.6.2.1A-1: General E-UTRA CA spectrum emission mask for Bandwidth Class C

For intra-band non-contiguous carrier aggregation transmission the spectrum emission mask requirement is defined as a composite spectrum emissions mask. Composite spectrum emission mask applies to frequencies up to \pm Δf_{OOB} starting from the edges of the sub-blocks. Composite spectrum emission mask is defined as follows

- a) Composite spectrum emission mask is a combination of individual sub-block spectrum emissions masks
- b) In case the sub-block consist of one component carrier the sub-lock general spectrum emission mask is defined in subclause 6.6.2.1.1
- c) If for some frequency sub-block spectrum emission masks overlap then spectrum emission mask allowing higher power spectral density applies for that frequency
- d) If for some frequency a sub-block spectrum emission mask overlaps with the sub-block bandwidth of another sub-block, then the emission mask does not apply for that frequency.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band), the spectrum emission mask of the UE is defined per E-UTRA band while all component carriers are active. For the E-UTRA band supporting one component carrier the requirements in subclauses 6.6.2.1 and 6.6.2.2 apply. For the E-UTRA band supporting two contiguous component carriers the requirements specified in subclause 6.6.2.1A apply. If for some frequency spectrum emission masks of single component carrier and two contiguous component carriers overlap then spectrum emission mask allowing higher power spectral density applies for that frequency. If for some frequency spectrum emission masks of single component carrier or two contiguous component carriers overlap then the emission mask does not apply for that frequency.

6.6.2.2 Additional spectrum emission mask

This requirement is specified in terms of an "additional spectrum emission" requirement.

6.6.2.2.1 Minimum requirement (network signalled value "NS_03", "NS_11", "NS_20", and "NS_21")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_03", "NS_11", "NS_20" or "NS_21" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.1-1.

1										
	Spectrum emission limit (dBm)/ Channel bandwidth									
Δf _{OOB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth			
± 0-1	-10	-13	-15	-18	-20	-21	30 kHz			
± 1-2.5	-13	-13	-13	-13	-13	-13	1 MHz			
± 2.5-2.8	-25	-13	-13	-13	-13	-13	1 MHz			
± 2.8-5		-13	-13	-13	-13	-13	1 MHz			
± 5-6		-25	-13	-13	-13	-13	1 MHz			
± 6-10			-25	-13	-13	-13	1 MHz			
± 10-15				-25	-13	-13	1 MHz			
± 15-20					-25	-13	1 MHz			
± 20-25						-25	1 MHz			

Table 6.6.2.2.1-1: Additional requirements

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2.2 Minimum requirement (network signalled value "NS_04")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.2-1.

	Spectrum emission limit (dBm)/ Channel bandwidth							
Δf _{OOB} (MHz)	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth			
± 0-1	-15	-18	-20	-21	30 kHz			
± 1-2.5	-10	-10	-10	-10	1 MHz			
± 2.5-2.8	-10	-10	-10	-10	1 MHz			
± 2.8-5	-10	-10	-10	-10	1 MHz			
± 5-6	-13	-13	-13	-13	1 MHz			
± 6-9	-25	-13	-13	-13	1 MHz			
± 9-10	-25	-25	-13	-13	1 MHz			
± 10-13.5		-25	-13	-13	1 MHz			
± 13.5-15		-25	-25	-13	1 MHz			
± 15-18			-25	-13	1 MHz			
± 18-20			-25	-25	1 MHz			
± 20-25				-25	1 MHz			

Table 6.6.2.2.2-1: Additional requirements

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2.3 Minimum requirement (network signalled value "NS_06" or "NS_07")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "NS_06" or "NS_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3-1.

Spectrum emission limit (dBm)/ Channel bandwidth Δf_{OOB} 1 4 3.0 10 Measurement 5 (MHz) MHz MHz MHz MHz bandwidth -13 -13 -18 30 kHz $\pm 0 - 0.1$ -15 -13 -13 -13 -13 100 kHz $\pm 0.1-1$ -13 -13 -13 -13 1 MHz $\pm 1 - 2.5$ -25 -13 -13 -13 1 MHz $\pm 2.5 - 2.8$ 1 MHz -13 -13 -13 $\pm 2.8-5$ -25 -13 -13 1 MHz \pm 5-6 -25 -13 1 MHz $\pm 6-10$ -25 ± 10-15 1 MHz

Table 6.6.2.2.3-1: Additional requirements

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.2A Additional Spectrum Emission Mask for CA

This requirement is specified in terms of an "additional spectrum emission" requirement.

6.6.2.2A.1 Minimum requirement (network signalled value "CA_NS_04")

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

When "CA_NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2A-1.

Spectrum emission limit [dBm]/BW _{Channel_CA}								
Δf _{OOB} (MHz)	50+100RB (29.9 MHz)	75+75B (30 MHz)	75+100RB (34.85 MHz)	100+100RB (39.8 MHz)	Measurement bandwidth			
± 0-1	-22.5	-22.5	-23.5	-24	30 kHz			
± 1-5.5	-13	-13	-13	-13	1 MHz			
± 5.5-34.9	-25	-25	-25	-25	1 MHz			
± 34.9-35		-25	-25	-25	1 MHz			
± 35-39.85			-25	-25	1 MHz			
± 39.85-44.8				-25	1 MHz			

Table 6.6.2.2A-1: Additional requirements

NOTE: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.2.3 Adjacent Channel Leakage Ratio

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. ACLR requirements for one E-UTRA carrier are specified for two scenarios for an adjacent E-UTRA and /or UTRA channel as shown in Figure 6.6.2.3-1.

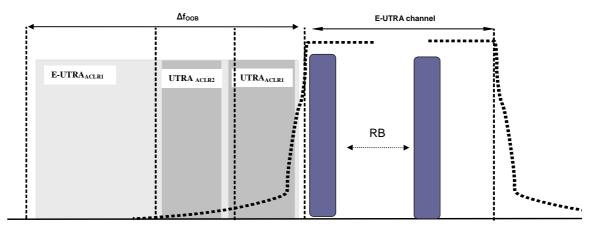


Figure 6.6.2.3-1: Adjacent Channel Leakage requirements for one E-UTRA carrier

6.6.2.3.1 Minimum requirement E-UTRA

E-UTRA Adjacent Channel Leakage power Ratio (E-UTRA_{ACLR}) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3.1-1 and Table 6.6.2.3.1-2. If the measured adjacent channel power is greater than -50 dBm then the E-UTRA_{ACLR} shall be higher than the value specified in Table 6.6.2.3.1-1 and Table 6.6.2.3.1-2.

Table 6.6.2.3.1-1: General requirements for E-UTRA_{ACLR}

	Channel bandwidth / E-UTRA _{ACLR1} / Measurement bandwidth					
	1.4	3.0	5	10	15	20
	MHz	MHz	MHz	MHz	MHz	MHz
E-UTRA _{ACLR1}	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB
E-UTRA channel Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
Adjacent channel	+1.4	+3.0	+5	+10	+15	+20
centre frequency	/	/	/	/	/	/
offset [MHz]	-1.4	-3.0	-5	-10	-15	-20

Table 6.6.2.3.1-2: Additional E-UTRA_{ACLR} requirements for Power Class 1

	Channel bandwidth / E-UTRA _{ACLR1} / Measurement bandwidth							
	1.4	1.4 3.0 5 10 15 20						
	MHz	MHz	MHz	MHz	MHz	MHz		
E-UTRA _{ACLR1}			37 dB	37 dB				
E-UTRA channel								
Measurement			4.5 MHz	9.0 MHz				
bandwidth								
Adjacent channel			+5	+10				
centre frequency			/	/				
offset [MHz]			-5	-10				
NOTE 1: E-UTRA _{ACLR1} shall be applicable for >23dBm								

6.6.2.3.1A Void

6.6.2.3.1Aa Void

6.6.2.3.2 Minimum requirements UTRA

UTRA Adjacent Channel Leakage power Ratio (UTRA_{ACLR}) is the ratio of the filtered mean power centred on the assigned E-UTRA channel frequency to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

UTRA Adjacent Channel Leakage power Ratio is specified for both the first UTRA adjacent channel (UTRA $_{ACLR1}$) and the 2^{nd} UTRA adjacent channel (UTRA $_{ACLR2}$). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor α =0.22. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.2-1. If the measured UTRA channel power is greater than –50dBm then the UTRA $_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3.2-1.

Table 6.6.2.3.2-1: Requirements for UTRA_{ACLR1/2}

	Channel bandwidth / UTRA _{ACLR1/2} / Measurement bandwidth								
	1.4	3.0	5	10	15	20			
	MHz	MHz	MHz	MHz	MHz	MHz			
UTRA _{ACLR1}	33 dB	33 dB	33 dB	33 dB	33 dB	33 dB			
Adjacent channel centre frequency offset [MHz]	0.7+BW _{UTRA} /2 / -0.7- BW _{UTRA} /2	1.5+BW _{UTRA} /2 / -1.5- BW _{UTRA} /2	+2.5+BW _{UTRA} /2 / -2.5-BW _{UTRA} /2	+5+BW _{UTRA} /2 / -5-BW _{UTRA} /2	+7.5+BW _{UTRA} /2 / -7.5-BW _{UTRA} /2	+10+BW _{UTRA} /2 / -10-BW _{UTRA} /2			
UTRA _{ACLR2}	-	-	36 dB	36 dB	36 dB	36 dB			
Adjacent channel centre frequency offset [MHz]	-	-	+2.5+3*BW _{UTRA} /2 / -2.5-3*BW _{UTRA} /2	+5+3*BW _{UTRA} /2 / -5-3*BW _{UTRA} /2	+7.5+3*BW _{UTRA} /2 / -7.5-3*BW _{UTRA} /2	+10+3*BW _{UTRA} /2 / -10-3*BW _{UTRA} /2			
E-UTRA channel Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz			
UTRA 5MHz channel Measurement bandwidth (NOTE 1)	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz			
UTRA 1.6MHz channel measurement bandwidth (NOTE 2)	1.28 MHz	1.28 MHz	1.28 MHz	1.28MHz	1.28MHz	1.28MHz			

NOTE 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.

NOTE 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.

6.6.2.3.2A Minimum requirement UTRA for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the UTRA Adjacent Channel Leakage power Ratio (UTRA_{ACLR}) is the ratio of the filtered mean power centred on the assigned channel bandwidth on the component carrier to the filtered mean power centred on an adjacent channel frequency. The UTRA Adjacent Channel Leakage power Ratio is defined per carrier and the requirement is specified in subclause 6.6.2.3.2.

For intra-band contiguous carrier aggregation the UTRA Adjacent Channel Leakage power Ratio (UTRA $_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

For intra-band non-contiguous carrier aggregation when all sub-blocks consist of one component carrier the UTRA Adjacent Channel Leakage power Ratio (UTRA $_{ACLR}$) is the ratio of the sum of the filtered mean powers centered on the assigned sub-block frequencies to the filtered mean power centred on an adjacent(s) UTRA channel frequency. UTRA $_{ACLR1/2}$ requirements are applicable for all sub-blocks and are specified in Table 6.6.2.3.2A-2. UTRA $_{ACLR1}$ is required to be met in the sub-block gap when the gap bandwidth Wgap is $5MHz \le Wgap < 15MHz$. Both UTRA $_{ACLR1}$ and UTRA $_{ACLR2}$ are required to be met in the sub-block gap when the gap bandwidth Wgap is $15MHz \le Wgap$.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band), the UTRA Adjacent Channel Leakage power Ratio (UTRA $_{ACLR}$) is defined as follows. For the E-UTRA band supporting one component carrier, the UTRA Adjacent Channel Leakage power Ratio (UTRA $_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel bandwidth of the component carrier to the filtered mean power centred on an adjacent(s) UTRA channel frequency and the requirements specified in subclause 6.6.2.3.2 apply. For the E-UTRA band supporting two contiguous component carriers the UTRA Adjacent Channel Leakage power Ratio (UTRA $_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent(s) UTRA channel frequency and the requirements specified in subclause 6.6.2.3.2A apply.

UTRA Adjacent Channel Leakage power Ratio is specified for both the first UTRA adjacent channel (UTRA_{ACLR1}) and the 2^{nd} UTRA adjacent channel (UTRA_{ACLR2}). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor α =0.22. The assigned aggregated channel bandwidth power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.2A-1 for intraband contiguous carrier aggregation or 6.6.2.3.2A-2 for intraband non-contiguous carrier aggregation. If the measured UTRA channel power is greater than –50dBm then the UTRA_{ACLR} shall be higher than the value specified in Table 6.6.2.3.2A-1 for intraband contiguous carrier aggregation or 6.6.2.3.2A-2 for intraband non-contiguous carrier aggregation.

Table 6.6.2.3.2A-1: Requirements for UTRA_{ACLR1/2}

	CA bandwidth class / UTRA _{ACLR1/2} / measurement bandwidth						
	CA bandwidth class B and C						
UTRA _{ACLR1}	33 dB						
Adjacent channel centre frequency offset (in MHz)	+ BW _{Channel_CA} /2 + BW _{UTRA} /2 / - BW _{Channel_CA} / 2 - BW _{UTRA} /2						
UTRA _{ACLR2}	36 dB						
Adjacent channel centre frequency offset (in MHz)	+ BW _{Channel_CA} /2 + 3*BW _{UTRA} /2 / - BW _{Channel_CA} /2 - 3*BW _{UTRA} /2						
CA E-UTRA channel Measurement bandwidth	BW _{Channel_CA} - 2* BW _{GB}						
UTRA 5MHz channel Measurement bandwidth (NOTE 1)	3.84 MHz						
UTRA 1.6MHz channel measurement bandwidth (NOTE 2)	1.28 MHz						
NOTE 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum. NOTE 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.							

Table 6.6.2.3.2A-2: Requirements for intraband non-contiguous CA UTRA_{ACLR1/2}

	UTRA _{ACLR1/2} / measurement bandwidth						
UTRA _{ACLR1}	33 dB						
Adjacent channel centre frequency offset (in MHz)	+ F _{edge,block,high} + BW _{UTRA} /2 / - F _{edge,block,low} - BW _{UTRA} /2						
UTRA _{ACLR2}	36 dB						
Adjacent channel centre frequency offset (in MHz)	+ F _{edge,block,high} + 3*BW _{UTRA} /2 / - F _{edge,block,low} - 3*BW _{UTRA} /2						
Sub-block measurement bandwidth	BW _{Channel,block} - 2* BW _{GB}						
UTRA 5 MHz channel Measurement bandwidth (NOTE 1)	3.84 MHz						
UTRA 1.6 MHz channel measurement bandwidth (NOTE 2)	1.28 MHz						
	NOTE 1: Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum. NOTE 2: Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.						

6.6.2.3.3A Minimum requirements for CA E-UTRA

For intra-band contiguous carrier aggregation the carrier aggregation E-UTRA Adjacent Channel Leakage power Ratio (CA E-UTRA $_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent aggregated channel bandwidth at nominal channel spacing. The assigned aggregated channel bandwidth power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3.3A-1. If the measured adjacent channel power is greater than - 50dBm then the E-UTRA $_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3.3A-1.

Table 6.6.2.3.3A-1: General requirements for CA E-UTRA_{ACLR}

	CA bandwidth class / CA E-UTRA _{ACLR} / Measurement bandwidth
	CA bandwidth class B and C
CA E-UTRA _{ACLR}	30 dB
CA E-UTRA channel Measurement bandwidth	BW _{Channel_CA} - 2* BW _{GB}
Adjacent channel centre frequency offset (in MHz)	+ BWchannel_CA / - BWchannel_CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, E-UTRA Adjacent Channel Leakage power Ratio (E-UTRA_{ACLR}) is the ratio of the filtered mean power centred on the assigned channel bandwidth on a component carrier to the filtered mean power centred on an adjacent channel frequency. The E-UTRA Adjacent Channel Leakage power Ratio is defined per carrier and the requirement is specified in subclause 6.6.2.3.1.

For intra-band non-contiguous carrier aggregation when all sub-blocks consist of one component carrier the E-UTRA Adjacent Channel Leakage power Ratio (E-UTRA $_{ACLR}$) is the ratio of the sum of the filtered mean powers centred on the assigned sub-block frequencies to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. In case the sub-block gap bandwidth Wgap is smaller than of the sub-block bandwidth then for that sub-block no E-UTRA $_{ACLR}$ requirement is set for the gap. In case the sub-block gab bandwidth Wgap is smaller than either of the sub-block bandwidths then no E-UTRA $_{ACLR}$ requirement is set for the gap. The assigned E-UTRA sub-block power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidths specified in Table 6.6.2.3.3A-2. If the measured adjacent channel power is greater than -50dBm then the E-UTRA $_{ACLR}$ shall be higher than the value specified in Table 6.6.2.3.3A-2.

/

- 15

- 20

CC and adjacent channel bandwidth / E-UTRA_{ACLR} / Measurement bandwidth 1.4 MHz 3 MHz 5 MHz 10 MHz 15 MHz 20 MHz E-UTRA_{ACLR1} 30 dB 30 dB 30 dB 30 dB 30 dB 30 dB CC and adjacent channel 1.08 2.7 4.5 9 13.5 18 measurement bandwidth [MHz] Adjacent channel + 3 + 5 + 15 + 1.4 +10+ 20

/

- 5

- 10

/

- 3

Table 6.6.2.3.3A-2: General requirements for non-contiguous intraband CA E-UTRA_{ACLR}

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band), the E-UTRA Adjacent Channel Leakage power Ratio (E-UTRA $_{ACLR}$) is defined as follows. For the E-UTRA band supporting one component carrier, the E-UTRA Adjacent Channel Leakage power Ratio (UTRA $_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel bandwidth of the component carrier to the filtered mean power centred on an adjacent channel frequency and the requirements in subclause 6.6.2.3.1 apply. For the E-UTRA band supporting two contiguous component carriers the E-UTRA Adjacent Channel Leakage power Ratio (E-UTRA $_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent(s) aggregated channel bandwidth at nominal channel spacing and the requirements of CA E-UTRA $_{ACLR}$ specified in subclause 6.6.2.3.3A apply.

6.6.2.4 Void

6.6.2.4.1 Void

centre frequency

offset [MHz]

6.6.2A Void

<reserved for future use>

6.6.2B Out of band emission for UL-MIMO

- 1.4

For UE supporting UL-MIMO, the requirements for Out of band emissions resulting from the modulation process and non-linearity in the transmitters are specified at each transmit antenna connector.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.6.2 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2.

For single-antenna port scheme, the requirements in subclause 6.6.3 apply.

6.6.2C Void

<reserved for future use>

6.6.2D Out of band emission for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.5D-1, the requirements in subclause 6.6.2 apply.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the requirements in subclause 6.6.2 apply per E-UTRA ProSe sidelink and E-UTRA uplink transmission as specified for the corresponding inter-band aggregation with uplink assigned to two bands.

6.6.3 Spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude out of band emissions unless otherwise stated. The spurious emission limits are specified in terms of general requirements inline with SM.329 [2] and E-UTRA operating band requirement to address UE co-existence.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

6.6.3.1 Minimum requirements

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth. The spurious emission limits in Table 6.6.3.1-2 apply for all transmitter band configurations (NRB) and channel bandwidths.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 6.6.3.1-1: Boundary between E-UTRA out of band and spurious emission domain

Channel bandwidth	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
OOB	2.8	6	10	15	20	25
boundary						
F _{OOB} (MHz)						

Table 6.6.3.1-2: Spurious emissions limits

Frequency Range	Maximum Level	Measurement bandwidth	NOTE				
9 kHz ≤ f < 150 kHz	-36 dBm	1 kHz					
150 kHz ≤ f < 30 MHz	-36 dBm	10 kHz					
30 MHz ≤ f < 1000 MHz	-36 dBm	100 kHz					
1 GHz ≤ f < 12.75 GHz	-30 dBm	1 MHz					
12.75 GHz ≤ f < 5 th harmonic of the upper frequency edge of the UL operating band in GHz	-30 dBm	1 MHz	1				
NOTE 1: Applies for Band 22, Band 42 and Band 43							

6.6.3.1A Minimum requirements for CA

This clause specifies the spurious emission requirements for carrier aggregation.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the spurious emission requirement Table 6.6.3.1-2 apply for the frequency ranges that are more than F_{OOB} as defined in Table 6.6.3.1-1 away from edges of the assigned channel bandwidth on a component carrier. If for some

frequency a spurious emission requirement of individual component carrier overlaps with the spectrum emission mask or channel bandwidth of another component carrier then it does not apply.

NOTE: For inter-band carrier aggregation with uplink assigned to two E-UTRA bands the requirements in Table 6.6.3.1-2 could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the requirements for remaining applicable frequencies in Table 6.6.3.1-2 would be considered to be verified by the measurements verifying the one uplink inter-band CA spurious emission requirement.

For intra-band contiguous carrier aggregation the spurious emission limits apply for the frequency ranges that are more than FOOB (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth (Table 5.6A-1). For frequencies Δ fOOB greater than FOOB as specified in Table 6.6.3.1A-1 the spurious emission requirements in Table 6.6.3.1-2 are applicable.

Table 6.6.3.1A-1: Boundary between E-UTRA out of band and spurious emission domain for intraband contiguous carrier aggregation

CA Bandwidth Class	OOB boundary F _{OOB} (MHz)
Α	Table 6.6.3.1-1
В	BW _{Channel_CA} + 5
С	BW _{Channel_CA} + 5

For intra-band non-contiguous carrier aggregation transmission the spurious emission requirement is defined as a composite spurious emission requirement. Composite spurious emission requirement applies to frequency ranges that are more than F_{OOB} away from the edges of the sub-blocks. Composite spurious emission requirement is defined as follows

- a) Composite spurious emission requirement is a combination of individual sub-block spurious emission requirements
- b) In case the sub-block consist of one component carrier the sub-lock spurious emission requirement and F_{OOB} are defined in subclause 6.6.3.1
- c) If for some frequency an individual sub-block spurious emission requirement overlaps with the general spectrum emission mask or the sub-block bandwidth of another sub-block then it does not apply

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band), the spurious emission requirement is defined as follows. For the E-UTRA band supporting one component carrier the requirements in Table 6.6.3.1-2 apply for frequency ranges that are more than FOOB (MHz) from the edges of assigned channel bandwidth as defined in Table 6.6.3.1-1. For the E-UTRA band supporting two contiguous component carriers the requirements in Table 6.6.3.1-2 apply for frequency ranges that are more than FOOB (MHz) from the edges of assigned aggregated channel bandwidth as defined in Table 6.6.3.1A-1. If for some frequency a spurious emission requirement of a single component carrier or two contiguous component carriers overlap with the spurious emission requirement or channel bandwidth of another component carrier or two contiguously aggregated carriers then it does not apply.

6.6.3.2 Spurious emission band UE co-existence

This clause specifies the requirements for the specified E-UTRA band, for coexistence with protected bands.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 6.6.3.2-1: Requirements

		Spurious	em	ission			
E-UTRA Band	Protected band		ency MHz	range :)	Maximum Level (dBm)	MBW (MHz)	NOTE
1	E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 65, 67	$F_{DL_{low}}$	-	F _{DL_high}	-50	1	
	E-UTRA Band 3, 34	F_{DL_low}	-	F _{DL_high}	-50	1	15
	Frequency range	1839.9	-	1879.9	-50	1	15
	Frequency range	1880		1895	-40	1	15, 27
	Frequency range	1895		1915	-15.5	5	15, 26, 27
	Frequency range	1915		1920	+1.6	5	15, 26, 27
2	E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 30, 41, 42, 66	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 2, 25	F_{DL_low}	-	F _{DL_high}	-50	1	15
	E-UTRA Band 43	F_{DL_low}	-	F_{DL_high}	-50	1	2
3	E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 65, 67	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 3	F_{DL_low}	-	F_{DL_high}	-50	1	15
	E-UTRA Band 11, 18, 19, 21	F_{DL_low}	-	F_{DL_high}	-50	1	13
	E-UTRA Band 22, 42	F_{DL_low}	-	F_{DL_high}	-50	1	2
	Frequency range	1884.5	-	1915.7	-41	0.3	13
4	E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66	F _{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 42	F_{DL_low}	-	F_{DL_high}	-50	1	2
5	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 65, 66	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 26	859	-	869	-27	1	
	E-UTRA Band 41	F_{DL_low}	-	F _{DL_high}	-50	1	2
6	E-UTRA Band 1, 9, 11, 34	F_{DL_low}	-	F _{DL_high}	-50	1	
	Frequency range	860	-	875	-37	1	
	Frequency range	875	-	895	-50	1	
	Frequency range	1884.5	-	1919.6	-41	0.3	7
	, , ,	1884.5	-	1915.7		0.0	8
7	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 66, 67	F _{DL_low}	1	F_{DL_high}	-50	1	
	Frequency range	2570	-	2575	+1.6	5	15, 21, 26
	Frequency range	2575	-	2595	-15.5	5	15, 21, 26
-	Frequency range	2595	-	2620	-40	1	15, 21
8	E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 45, 65, 67	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA band 3, 7, 22, 41, 42, 43	F _{DL_low}	-	F _{DL_high}	-50	1	2
	E-UTRA Band 8	F _{DL_low}	-	F _{DL_high}	-50	1	15
	E-UTRA Band 11, 21	F _{DL_low}	-	F _{DL_high}	-50	1	23
	Frequency range	860	-	890	-40	1	15, 23
9	Frequency range	1884.5	-	1915.7	-41	0.3	8, 23
9	E-UTRA Band 1, 11, 18, 19, 21, 26, 28, 34	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 42	F_{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	945	-	960	-50	1	
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	1884.5	-	1915.7	-41	0.3	8
	Frequency range	2545	L- ⁻	2575	-50	1	
	Frequency range	2595	-	2645	-50	1	

	T = =	1		1	ı	1	ı
10	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 22, 42	F_{DL_low}	-	F _{DL_high}	-50	1	2
11	E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42, 65	F_{DL_low}	-	F_{DL_high}	-50	1	
	Frequency range	945	-	960	-50	1	
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	1884.5	-	1915.7	-41	0.3	8
	Frequency range	2545	-	2575	-50	1	
	Frequency range	2595	-	2645	-50	1	
12	E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 4, 10, 66	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	2
	E-UTRA Band 12	F_{DL_low}	-	F _{DL_high}	-50	1	15
13	E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 26, 27, 29, 41, 66	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 14	F_{DL_low}	-	F _{DL_high}	-50	1	15
	E-UTRA Band 24, 30	F_{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	769	-	775	-35	0.00625	15
	Frequency range	799	-	805	-35	0.00625	11, 15
14	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 66	F _{DL_low}	-	F _{DL_high}	-50	1	,
	Frequency range	769	-	775	-35	0.00625	12, 15
	Frequency range	799	-	805	-35	0.00625	11, 12, 15
17	E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 30, 41	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 4, 10, 66	F_{DL_low}	-	F _{DL_high}	-50	1	2
	E-UTRA Band 12	F_{DL_low}	-	F _{DL_high}	-50	1	15
18	E-UTRA Band 1, 11, 21, 34, 42, 65	F _{DL low}	-	F _{DL high}	-50	1	
	Frequency range	758	-	799	-50	1	
	Frequency range	799	-	803	-40	1	15
	Frequency range	860	-	890	-40	1	
	Frequency range	945	-	960	-50	1	
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	1884.5	-	1915.7	-41	0.3	8
	Frequency range	2545	-	2575	-50	1	
	Frequency range	2595	_	2645	-50	1	
19	E-UTRA Band 1, 11, 21, 28, 34, 42, 65	F _{DL_low}	-	F _{DL_high}	-50	1	
	Frequency range	945	<u> </u>	960	-50	1	
	Frequency range	1839.9	-	1879.9	-50 -50	1	
	Frequency range	1884.5	-	1915.7	-41	0.3	8
	1						~
	Frequency range	2545	-	2575	-50	1	
	Frequency range Frequency range	2545 2595	-	2575 2645	-50 -50	1	

		1		Т		1	
20	E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 20	F _{DL_low}	-	F _{DL_high}	-50	1	15
	E-UTRA Band 38, 42	F _{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	758	-	788	-50	1	
21	E-UTRA Band 1, 18, 19, 28, 34, 42, 65	F _{DL_low}	-	F _{DL_high}	-50	1	
	Frequency range	945	-	960	-50	1	
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	1884.5	-	1915.7	-41	0.3	8
	Frequency range	2545	-	2575	-50	1	
	Frequency range	2595	-	2645	-50	1	
22	E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67	F_{DL_low}	-	F _{DL_high}	-50	1	
	Frequency range	3510	-	3525	-40	1	15
	Frequency range	3525	-	3590	-50	1	
23	E-UTRA Band 4, 5, 10, 12, 13, 14, 17,	_				4	
24	23, 24, 26, 27, 29, 30, 41, 66 E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17,	F _{DL_low}	-	F _{DL_high}	-50	1	
	23, 24, 25, 26, 29, 30, 41, 66	F _{DL_low}	-	F_{DL_high}	-50	1	
25	E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 30, 41, 42, 66	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 2	F_{DL_low}	-	F _{DL_high}	-50	1	15
	E-UTRA Band 25	F _{DL_low}	-	F _{DL_high}	-50	1	15
	E-UTRA Band 43	F _{DL_low}	-	F _{DL_high}	-50	1	2
26	E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 23, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 65, 66	F _{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 41	F_{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	703	-	799	-50	1	
	Frequency range	799	-	803	-40	1	15
	Frequency range	945	-	960	-50	1	
	Frequency range	1839.9	_	1879.9	-50	1	
	Frequency range	1884.5	_	1915.7	-41	0.3	8
27	E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 23, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66	F _{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 28	F _{DL low}	-	790	-50	1	
	Frequency range	799	-	805	-35	0.00625	
28	E-UTRA Band 1, 4, 10, 22, 42, 43, 65	F _{DL_low}	-	F _{DL_high}	-50	1	2
	E-UTRA Band 1	F _{DL_low}	_	F _{DL_high}	-50	1	19, 25
	E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20,	_					.0, 20
	25, 26, 27, 31, 34, 38, 40, 41, 66	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 11, 21	F_{DL_low}	-	F_{DL_high}	-50	1	19, 24
	Frequency range	470	-	694	-42	8	15, 35
	Frequency range	470	-	710	-26.2	6	34
	Frequency range	662		694	-26.2	6	15
	Frequency range	758		773	-32	1	15
	Frequency range	773	-	803	-50	1	
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	1884.5	-	1915.7	-41	0.3	8, 19
30	E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 38, 41, 66	F_{DL_low}	-	F_{DL_high}	-50	1	
31	E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 65, 67	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 3	F _{DL_low}	-	F _{DL_high}	-50	1	2
		320.1					
33	E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32,	F_{DL_low}	-	F _{DL_high}	-50	1	5
	34, 38, 40, 42, 43, 65, 67 E-UTRA Band 3	F _{DL_low}	-	F _{DL_high}	-50	1	15
34	E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20,						
	21, 22, 26, 28, 31, 32, 33, 38,39, 40, 41, 42, 43, 44, 45, 65, 67	F_{DL_low}	-	F_{DL_high}	-50	1	5
	Frequency range	1884.5		1915.7	-41	0.3	8
	Frequency range	1839.9	-	1879.9	-50	1	-
35							

Frequency range	36							
Section Sect								
Frequency range Frequency range E-UTRA Band 1, 8, 22, 26, 34, 40, 41, 42, 43, 42, 44, 45 Frequency range Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1805 Frequency range 1807 Frequency range 1807 Frequency range 1808 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency range 1900 1915 Frequency r		14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33,	F _{DL_low}		F _{DL_high}	-50	1	
Section Sect		Frequency range	2620	-	2645	-15.5	5	15, 22, 26
A2, 44, 45 FoL.low - FoL		Frequency range	2645	-	2690	-40	1	15, 22
Frequency range Frequency range Frequen	39		F_{DL_low}	-	F _{DL_high}	-50	1	
Frequency range Freque		Frequency range	1805		1855	-40	1	32
## Company of the com		Frequency range	1855		1875	-15.5	5	15,26,32
27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 65, 67		Frequency range	1875		1880	-15.5	5	15,26,33
14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 65, 66 E-UTRA Band 9, 11, 18, 19, 21 F _{DL_low} F _{DL_lo}		27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 65, 67	F_{DL_low}	-	F_{DL_high}	-50	1	
Frequency range	41	14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34,	$F_{DL_{low}}$	-	F _{DL_high}	-50	1	
Frequency range Frequency range 1884.5 1915.7 -41 0.3 8, 30 42 E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 65, 66, 67 Frequency range 1884.5 - 1915.7 -41 0.3 8 E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 65, 66, 67 E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 65, 66, 67 E-UTRA Band 22 FDL_low - FDL_high -50 1 3 44 E-UTRA Band 3, 5, 8, 34, 39, 41 FDL_low - FDL_high -50 1 E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42, 44 FDL_low - FDL_high -50 1 E-UTRA Band 3, 5, 8, 34, 39, 40, 41, 42, 44 FDL_low - FDL_high -50 1 E-UTRA Band 3 FDL_low - FDL_high -50 1 E-UTRA Band 3 FDL_low - FDL_high -50 1 E-UTRA Band 3 FDL_low - FDL_high -50 1 15 E-UTRA Band 3 FDL_low - FDL_high -50 1 15 E-UTRA Band 3 FDL_low - FDL_high -50 1 15 E-UTRA Band 3 FDL_low - FDL_high -50 1 15 E-UTRA Band 3 FDL_low - FDL_high -50 1 15 E-UTRA Band 3 FDL_low - FDL_high -50 1 15 E-UTRA Band 3 FDL_low - FDL_high -50 1 15 E-UTRA Band 34 FDL_low - FDL_high -50 1 36 E-UTRA Band 34 FDL_low - FDL_high -50 1 36 E-UTRA Band 34 FDL_low - FDL_high -50 1 36 E-UTRA Band 34 FDL_low - FDL_high -50 1 36 E-UTRA Band 34 FDL_low - FDL_high -50 1 51 51 52 51 52 52 52 52 66 E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 41, 43, 66		E-UTRA Band 9, 11, 18, 19, 21	F_{DL_low}	-	F_{DL_high}	-50	1	30
### 12 ##		Frequency range	1839.9		1879.9	-50	1	30
18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 65, 66, 67 Foll_low - Foll_low - Foll_low - - Foll_low - - Foll_low - <td< td=""><td></td><td>Frequency range</td><td>1884.5</td><td></td><td>1915.7</td><td>-41</td><td>0.3</td><td>8, 30</td></td<>		Frequency range	1884.5		1915.7	-41	0.3	8, 30
## Fullow Follow	42	18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33,	F _{DL_low}	-	F _{DL_high}	-50	1	
25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 65, 66, 67 E-UTRA Band 22 FDL_low - FDL_low - FDL_high [-50] [1] 3 44 E-UTRA Band 1, 40, 42, 45 E-UTRA Band 3, 5, 8, 34, 39, 41 FDL_low - FDL_low - FDL_high - 50 E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65 E-UTRA Band 3 E-UTRA Band 3 E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 E-UTRA Band 34 FDL_low - FDL_high - 50 1 15 E-UTRA Band 34 FDL_low - FDL_high - 50 1 E-UTRA Band 34 FDL_low - FDL_high - 50 1 15 E-UTRA Band 34 FDL_low - FDL_high - 50 1 E-UTRA Band 34 FDL_low - FDL_high - 50 1 E-UTRA Band 34 FOL_low - FDL_high - 50 1 E-UTRA Band 34 FOL_low - FDL_high - 50 1 E-UTRA Band 34 FOL_low - FDL_high - 50 1 36 FOL_high - 50 1 56 E-UTRA Band 34 FOL_low - FDL_high - 50 1 36 FOL_high - 50 1 36 E-UTRA Band 34 FOL_low - FDL_high - 50 1 36 FOL_high - 50 1 50 1 50 FOL_high - 50 1 50 FOL_high - 50 1 50 FOL_high - 50 1 50 FOL_high - 50 1 50 FOL_high - 50 1 FOL_high -		Frequency range	1884.5	-	1915.7	-41	0.3	8
## E-UTRA Band 1, 40, 42, 45 ## E-UTRA Band 3, 5, 8, 34, 39, 41 ## E-UTRA Band 3, 5, 8, 34, 39, 41 ## E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 ## E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65 ## E-UTRA Band 3 ## E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 ## E-UTRA Band 34 ## Follow - Follow	43	25, 26, 27, 28, 31,32, 33, 34, 38, 40, 65,	F _{DL_low}	-	F_{DL_high}	-50	1	
E-UTRA Band 3, 5, 8, 34, 39, 41 E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 65 E-UTRA Band 3, 5, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65 E-UTRA Band 3 E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 E-UTRA Band 34 FDL_low FDL_low FDL_high		E-UTRA Band 22	F_{DL_low}	-	F_{DL_high}	[-50]	[1]	3
## BE-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 ## BE-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65 ## BE-UTRA Band 3 ## BE-UTRA Band 3 ## BE-UTRA Band 3 ## BE-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 ## BE-UTRA Band 34 ## BE-	44	E-UTRA Band 1, 40, 42, 45	F _{DL_low}	-	F _{DL_high}	-50	1	2
## BE-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42.44 ## BE-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 65 ## BE-UTRA Band 3 ## BE-UTRA Band 3 ## BE-UTRA Band 3 ## BE-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 ## BE-UTRA Band 34 ## BE-		E-UTRA Band 3, 5, 8, 34, 39, 41	F_{DL_low}	-	F _{DL_high}	-50	1	
38, 40, 42, 43, 65 E-UTRA Band 3 FDL_low FDL_low FDL_low FDL_high FDL_	45	42.44	F_{DL_low}	-		-50	1	
E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41 F _{DL_low} - F _{DL_high} -50 1 E-UTRA Band 34 F _{DL_low} - F _{DL_high} -50 1 36 Frequency range 1884.5 - 1915.7 -41 0.3 37 Frequency range 1900 - 1915 -15.5 5 15, 26, 27 Frequency range 1915 - 1920 +1.6 5 15, 26, 27 66 E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66	65		F_{DL_low}	-	F_{DL_high}	-50	1	
41 FDL_low - FDL_high -50 1 E-UTRA Band 34 FDL_low - FDL_high -50 1 36 Frequency range 1884.5 - 1915.7 -41 0.3 37 Frequency range 1900 - 1915 -15.5 5 15, 26, 27 Frequency range 1915 - 1920 +1.6 5 15, 26, 27 66 E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66			F_{DL_low}	-	F_{DL_high}	-50	1	15
Frequency range 1884.5 - 1915.7 -41 0.3 37 Frequency range 1900 - 1915 -15.5 5 15, 26, 27 Frequency range 1915 - 1920 +1.6 5 15, 26, 27 66 E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66		- , , , , , , , , , , , , , , , , , , ,	F _{DL_low}	-				
Frequency range Frequency range 1900 - 1915 -15.5 5 15, 26, 27 Frequency range 1915 - 1920 +1.6 5 15, 26, 27 E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66 FDL_low - FDL_high -50 1		E-UTRA Band 34	F_{DL_low}	-	F_{DL_high}	-50	1	36
Frequency range 1915 - 1920 +1.6 5 15, 26, 27 66 E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66 - F _{DL_low} - F _{DL_high} -50 1		Frequency range	1884.5	-	1915.7	-41	0.3	37
66 E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 66		Frequency range	1900	-	1915	-15.5	5	15, 26, 27
17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41, F _{DL_low} - F _{DL_high} -50 1		Frequency range	1915	_	1920	+1.6	5	15, 26, 27
E-UTRA Band 42 F _{DL_low} - F _{DL_high} -50 1 2	66	17, 23, 24, 25, 26, 27, 28, 29, 30, 38, 41,	F _{DL_low}	-	F _{DL_high}	-50	1	
		E-UTRA Band 42	F_{DL_low}	-	F_{DL_high}	-50	1	2

NOTE 1: F_{DL_low} and F_{DL_high} refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x L_{CRB} x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 4: N/A

NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 6: N/A

NOTE 7: Applicable when co-existence with PHS system operating in 1884.5-1919.6MHz. NOTE 8: Applicable when co-existence with PHS system operating in 1884.5-1915.7MHz.

NOTE 9: N/A

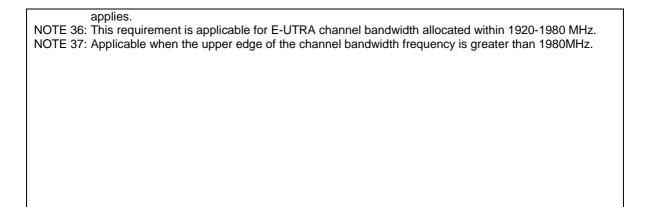
NOTE 10: N/A

NOTE 11: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD NOTE 12: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation <

0.5 dB

- NOTE 13: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.
- NOTE 14: N/A
- NOTE 15: These requirements also apply for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.
- NOTE 16: N/A
- NOTE 17: N/A
- NOTE 18: N/A
- NOTE 19: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
- NOTE 20: N/A
- NOTE 21: This requirement is applicable for any channel bandwidths within the range 2500 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
- NOTE 22: This requirement is applicable for any channel bandwidths within the range 2570 2615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2605.5 2607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2597 2605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

 For carriers with channel bandwidth overlapping the frequency range 2615 2620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE *P-Max*.
- NOTE 23: This requirement is applicable only for the following cases:
 for carriers of 5 MHz channel bandwidth when carrier centre frequency (F_c) is within the range 902.5 MHz $\leq F_c <$ 907.5 MHz with an uplink transmission bandwidth less than or equal to 20 RB for carriers of 5 MHz channel bandwidth when carrier centre frequency (F_c) is within the range 907.5 MHz $\leq F_c \leq$ 912.5 MHz without any restriction on uplink transmission bandwidth. for carriers of 10 MHz channel bandwidth when carrier centre frequency (F_c) is $F_c =$ 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with RB_{start} > 3.
- NOTE 24: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
- NOTE 25: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
- NOTE 26: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
- NOTE 27: This requirement is applicable for any channel bandwidths within the range 1920 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
- NOTE 28: N/A
- NOTE 29: N/A
- NOTE 30: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
- NOTE 31: N/A
- NOTE 32: This requirement is applicable for an uplink transmission bandwidth less than or equal to [54 RB] for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1887.5 1889.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1890 1898 MHz.
- NOTE 33: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to [54 RB] for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1892.5 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1895 1903 MHz.
- NOTE 34: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart < 48.
- NOTE 35: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz



6.6.3.2A Spurious emission band UE co-existence for CA

This clause specifies the requirements for the specified carrier aggregation configurations for coexistence with protected bands.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

For inter-band carrier aggregation with the uplink assigned to two E-UTRA bands, the requirements in Table 6.6.3.2A-0 apply on each component carrier with all component carriers are active.

NOTE: For inter-band carrier aggregation with uplink assigned to two E-UTRA bands the requirements in Table 6.6.3.2A-0 could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the requirements for remaining applicable frequencies in Table 6.6.3.2A-0 would be considered to be verified by the measurements verifying the one uplink inter-band CA UE to UE co-existence requirements.

Table 6.6.3.2A-0: Requirements for uplink inter-band carrier aggregation (two bands)

		Spurio	us	emission			
E-UTRA CA Configuration	Protected band		ency MH	/ range z)	Maximum Level (dBm)	MBW (MHz)	NOTE
CA_1A-3A	E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 38, 40, 41, 43, 44, 65, 67	F _{DL_low}	ı	F_{DL_high}	-50	1	
	E-UTRA band 3, 34	F_{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA band 11,18,19, 21	F_{DL_low}	-	F_{DL_high}	-50	1	10
	E-UTRA band 22, 42	F_{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	1884.5	-	1915.7	-41	0.3	10
	Frequency range	1880		1895	-40	1	3,12
	Frequency range	1895		1915	-15.5	5	3, 12, 13
	Frequency range	1915		1920	+1.6	5	3, 12, 13
CA_1A-5A	E-UTRA Band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43, 65	F_{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA band 3,34	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	3
	E-UTRA band 26	859	-	869	-27	1	
	E-UTRA band 41	F_{DL_low}	-	F_{DL_high}	-50	1	2
CA_1A-7A	E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31,32, 40, 42, 43, 65, 67	F _{DL_low}	ı	F_{DL_high}	-50	1	
	E-UTRA band 3, 34	F_{DL_low}	-	F _{DL_high}	-50	1	3
	Frequency range	1880		1895	-40	1	3,12
	Frequency range	1895		1915	-15.5	5	3, 12, 13
	Frequency range	1915		1920	+1.6	5	3, 12, 13
	Frequency range	2570	-	2575	+1.6	5	3, 13, 14
	Frequency range	2575	-	2595	-15.5	5	3, 13, 14
	Frequency range	2595	-	2620	-40	1	3, 14
CA_1A-8A	E-UTRA Band 1, 20, 26, 28, 31, 32, 38, 40, 65, 67	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA band 3, 34	F_{DL_low}	-	F_{DL_high}	-50	1	2,3
	E-UTRA band 7	F_{DL_low}	-	F_{DL_high}	-50	1	2
	E-UTRA Band 8	F_{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA band 11, 21	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	11
	E-UTRA band 22, 41, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	2
	Frequency range	860	-	890	-40	1	3, 11
	Frequency range	1884.5	-	1915.7	-41	0.3	4, 11
	Frequency range	1880		1895	-40	1	3,12
	Frequency range	1895		1915	-15.5	5	3, 12, 13
	Frequency range	1915		1920	+1.6	5	3, 12, 13
CA_1A-18A	E-UTRA Band 1, 11, 21, 42, 65	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 34	F_{DL_low}	-	F_{DL_high}	-50	1	3
	Frequency range	758	-	799	-50	1	
	Frequency range	799	-	803	-40	1	3
	Frequency range	860	-	890	-40	1	3
	Frequency range	945	-	960	-50	1	3
	Frequency range	1884.5	-	1915.7	-41	0.3	3, 4, 7
	Frequency range	1839.9	_	1879.9	-50	1	3
	Frequency range	2545	-	2575	-50	1	
	Frequency range	2595	-	2645	-50	1	
CA_1A-19A	E-UTRA Band 1, 11, 21, 28, 42, 65	F_{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 34	F_{DL_low}	-	F_{DL_high}	-50	1	3
	Frequency range	860	-	890	-40	1	3, 8
	Frequency range	945	-	960	-50	1	3
	Frequency range	1884.5		1915.7	-41	0.3	3, 4, 7
	Frequency range	1839.9	-	1879.9	-50	1	3
	Frequency range	2545	Ŀ	2575	-50	1	
	Frequency range	2595		2645	-50	1	
CA_1A-21A	E-UTRA Band 11	F_{DL_low}	-	F _{DL_high}	-35	1	3, 16

	E-UTRA Band 1, 18, 19, 28, 34,	_		_	-50	1	
	42, 65	F _{DL_low}	-	F _{DL_high}	-50	1	16
	E-UTRA Band 21	F _{DL_low}	-	F _{DL_high}		1	16
	Frequency range	1884.5	-	1915.7	-41	0.3	4
	Frequency range	945	-	960	-50	1	
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	2545	-	2575	-50	1	
	Frequency range	2595	-	2645	-50	1	
CA_1A-26A	E-UTRA Band 1,5, 7, 11, 18, 19, 20, 21, 22, 26, 27, 31, 38, 40, 42,				-50	1	
	43, 44, 65	F_{DL_low}	-	F _{DL_high}			
	Frequency range	1880	-	1895	-40	1	3, 12
	Frequency range	1895	-	1915	-15.5	5	3, 12, 13
	Frequency range	1915	-	1920	+1.6	5	3, 12, 13
	Frequency range	1884.5	-	1915.7	-41	0.3	7
	Frequency range	945	-	960	-50	1	
	E-UTRA Band 41	F _{DL low}	-	F _{DL_high}	-50	1	2
	E-UTRA Band 3, 34	F _{DL low}	-	F _{DL high}	-50	1	3
	Frequency range	703	_	799	-50	1	
		799		803	-40	1	3
	Fraguency range	1839.9		1879.9	-50	1	3
CA_1A-28A	Frequency range E-UTRA Band 5, 7, 8, 18, 19, 20,	1003.3	Ť	1013.3			
0/_1/\ 20/\	26, 27, 31, 32, 38, 40, 41	F _{DL_low}	-	F _{DL_high}	-50	1	0
	E-UTRA Band 22, 42, 43	F _{DL_low}	-	F _{DL_high}	-50	1	2
	E-UTRA Band 3, 34	F _{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA Band 11, 21	F _{DL_low}	-	F _{DL_high}	-50	1	5, 21
	E-UTRA Band 1, 65	F_{DL_low}	-	F _{DL_high}	-50	1	5, 6
	Frequency range	470	-	694	-42	8	3, 22
	Frequency range	470	-	710	-26.2	6	Z
	Frequency range	758	-	773	-32	1	3
	Frequency range	773	-	803	-50	1	
	Frequency range	662	-	694	-26.2	6	3
	Frequency range	1880		1895	-40	1	3,12
	Frequency range	1895		1915	-15.5	5	3, 12, 13
	Frequency range	1915		1920	+1.6	5	3, 12, 13
	Frequency range	1839.9	-	1879.9	-50	1	3
	Frequency range	1884.5	-	1915.7	-41	0.3	5
CA_1A-42A	E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 44, 65, 67	F _{DL_low}	_	F_{DL_high}	-50	1	
	E-UTRA Band 3, 34	F _{DL low}	_	F _{DL_high}	-50	1	3
	Frequency range	1880		1895	-40	1	3,12
	Frequency range	1895		1915	-15.5	5	3, 12, 13
	Frequency range	1915		1920	+1.6	5	3, 12, 13
	Frequency range	1839.9		1879.9	-50	1	3
	' '		-		-41	0.3	
CA_2A-4A	Frequency range E-UTRA Band 4, 5, 10, 12, 13,	1884.5	-	1915.7	-41	0.5	3, 4, 7
UA_2A-4A	14, 17, 22, 23, 24, 26, 27, 28, 29,				-50	1	
	30, 41, 66	F_{DL_low}	-	F _{DL_high}			
	E-UTRA Band 2, 25	F_{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA Band 42, 43	F _{DL low}	-	F _{DL_high}	-50	1	2
CA_2A-5A	E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 28, 29, 30, 42	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 2, 25	F _{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA Band 26	859	L-	869	-27	1	
	E-UTRA Band 41, 43	F_{DL_low}	-	F _{DL_high}	-50	1	2
CA_2A-12A	E-UTRA Band 5, 13, 14, 17, 23, 24, 26, 27, 30, 41	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 2, 12, 25	F _{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA Band 4, 10	F _{DL_low}	-	F _{DL_high}	-50	1	2
CA_2A-13A	E-UTRA Band 4, 5,10,12,13,17,	F _{DL low}	-	F _{DL_high}	-50	1	_
	22, 23, 26, 27, 29, 41, 42, 66			_			2
	E-UTRA Band 2,14, 25 E-UTRA Band 24, 30, 43	F _{DL_low}	ŀ	F _{DL_high}	-50 -50	1	3 2
1	L-0 I NA Dallu 24, 30, 43	$F_{DL_{low}}$		F_{DL_high}	-30	<u> </u>	

I	Frequency range	769	l _	775	-35	0.00625	3
	Frequency range	799	_	805	-35	0.00625	3, 9
CA_3A-5A	E-UTRA Band 1, 5, 7, 8, 22, 28,						0, 0
0/1_0/10/1	31, 38, 40, 42, 43, 65	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	
	E-UTRA band 3,34	F_{DL_low}	-	F_{DL_high}	-50	1	3
	E-UTRA band 26	859	-	869	-27	1	
CA_3A-7A	E-UTRA Band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 40, 43, 44, 65, 67	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA band 3	F_{DL_low}	-	F_{DL_high}	-50	1	3
	E-UTRA band 22, 42	F_{DL_low}	-	F_{DL_high}	-50	1	2
	Frequency range	2570	-	2575	+1.6	5	3, 13, 14
	Frequency range	2575	-	2595	-15.5	5	3, 13, 14
	Frequency range	2595	-	2620	-40	1	3, 14
CA_3A-8A	E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 44, 65, 67	F _{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA band 3, 8	F_{DL_low}	-	F_{DL_high}	-50	1	2, 3
	E-UTRA band 11, 21	F_{DL_low}	-	F_{DL_high}	-50	1	10,11
	E-UTRA band 7, 22, 41, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	2
	Frequency range	1884.5	-	1915.7	-41	0.3	4, 10, 11
	Frequency range	860	Ŀ	890	-40	1	3,11,17
CA_3A-19A	E-UTRA Band 1, 11, 21, 28, 65	F_{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 34	F_{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA Band 42	F_{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	860	-	890	-40	1	3, 8
	Frequency range	945	-	960	-50	1	3
	Frequency range	1884.5	-	1915.7	-41	0.3	3, 4, 7
	Frequency range	1839.9	-	1879.9	-50	1	3
	Frequency range	2545	-	2575	-50	1	
	Frequency range	2595	-	2645	-50	1	
CA_3A-20A	E-UTRA Band 1, 7, 8, 31, 32, 33, 34, 40, 43, 65, 67	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 3, 20	F_{DL_low}	-	F_{DL_high}	-50	1	3
	E-UTRA Band 22, 38, 42	F_{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	758	-	788	-50	1	
CA_3A-26A	E-UTRA Band 1, 5, 7, 26, 34, 39, 40, 43, 65	F_{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA band 3	F_{DL_low}	-	F_{DL_high}	-50	1	3
	E-UTRA band 11, 18, 19, 21	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	10
	E-UTRA band 22, 41, 42	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	2
	Frequency range	1884.5	-	1915.7	-41	0.3	4, 10
	F	703	-	799	-50	1	
	Frequency range	799	-	803	-40	1	3
	Frequency range	851	-	859	-53	0.00625	15
	E-UTRA Band 27	F_{DL_low}	-	859	-32	1	15
	Frequency range	945	-	960	-50	1	
	Frequency range	1839.9	-	1879.9	-50	1	
CA_4A-5A	E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29, 30, 43	F _{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 26	859	<u> </u>	869	-27	1	
	E-UTRA band 41, 42	F _{DL_low}	<u> </u>	F _{DL_high}	-50	1	2
CA_4A-7A	E-UTRA Band 2, 4, 5, 7, 10, 12, 13, 14, 17, 26, 27, 28, 29, 30, 43, 66	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA band 42	F _{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	2570	-	2575	+1.6	5	3, 13, 14
	Frequency range	2575	-	2595	-15.5	5	3, 13, 14
	Frequency range	2595	-	2620	-40	1	3, 14
CA_4A-12A	E-UTRA Band 2, 5, 7,13, 14, 17,	_		_			-,
		F_{DL_low}	ı -	F_{DL_high}	-50	1	
· · · · · · · · · · · · · · · · ·	22, 23, 24, 25, 26, 27, 30, 41, 43 E-UTRA Band 4, 10. 42, 66		-	F _{DL high}	-50	1	2
		F _{DL_low}	-	F _{DL_high}	-50 -50	1	2

	10,12,13,17, 22, 23,25, 26, 27, 29, 41, 43, 66						
	E-UTRA Band 14	F _{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA Band 24, 30, 42	F _{DL_low}	_	F _{DL_high}	-50	1	2
	Frequency range	769	_	775	-35	0.00625	3
	Frequency range	799	_	805	-35	0.00625	3, 9
CA_4A-17A	E-UTRA Band 2, 5, 7,13, 14, 17, 22, 23, 24, 25, 26, 27, 30, 41, 43	F _{DL_low}	-	F _{DL_high}	-50	1	0, 0
	E-UTRA Band 4, 10. 42, 66	F _{DL_low}	-	F _{DL_high}	-50	1	2
	E-UTRA Band 12	F _{DL_low}	-	F _{DL high}	-50	1	3
CA_5A-7A	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 12, 13, 14, 17, 22, 28, 29, 30, 31, 40, 42, 43, 65, 66	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA band 26	859	-	869	-27	1	
	Frequency range	2570	-	2575	+1.6	5	3, 13, 14
	Frequency range	2575	_	2595	-15.5	5	3, 13, 14
	Frequency range	2595	-	2620	-40	1	3, 14
CA_5A-12A	E-UTRA Band 2, 5, 13, 14, 17, 22, 23, 24, 25, 30, 31, 42, 43	F _{DL_low}	-	F _{DL_high}	-50	1	•
	E-UTRA band 4, 10, 41, 66	F_{DL_low}	-	F _{DL_high}	-50	1	2
	E-UTRA band 26	859	-	869	-27	1	
	E-UTRA band 12	$F_{DL_{low}}$	-	F _{DL_high}	-50	1	3
CA_5A-17A	E-UTRA Band 2, 5, 13, 14, 17, 22, 23, 24, 25, 30, 31, 42, 43	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA band 4, 10, 41, 66	$F_{DL_{low}}$	-	F _{DL_high}	-50	1	2
	E-UTRA band 26	859	-	869	-27	1	
	E-UTRA band 12	F_{DL_low}	-	F _{DL_high}	-50	1	3
CA_7A-20A	E-UTRA Band 1,3, 7, 8, 22, 28, 31, 32, 33, 34, 40, 43, 65, 67	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 20	F_{DL_low}	-	F _{DL_high}	-50	1	3
	E-UTRA Band 42	F_{DL_low}	-	F _{DL_high}	-50	1	2
	Frequency range	2570	-	2575	+1.6	5	3, 13, 14
	Frequency range	2575	-	2595	-15.5	5	3, 13, 14
	Frequency range	2595	-	2620	-40	1	3, 14
CA_7A-28A	E-UTRA Band 2, 3, 5, 7, 8, 20, 26, 27, 31, 34, 40	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 1, 4, 10, 22, 42, 43, 65, 66	F _{DL_low}	-	F_{DL_high}	-50	1	2
	E-UTRA Band 1	F_{DL_low}	-	F_{DL_high}	-50	1	5, 6
	Frequency range	758	-	773	-32	1	3
	Frequency range	773	-	803	-50	1	
	Frequency range	2570	-	2575	+1.6	5	3, 13, 14
	Frequency range	2575	-	2595	-15.5	5	3, 13, 14
	Frequency range	2595	-	2620	-40	1	3, 14
CA_18A-28A	E-UTRA Band 11, 21	F_{DL_low}	-	F_{DL_high}	-50	1	5, 21
	E-UTRA Band 1, 65	F_{DL_low}	-	F_{DL_high}	-50	1	5, 6
	E-UTRA Band 42, 43	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	2
	E-UTRA Band 34	$F_{DL_{low}}$	-	F _{DL_high}	-50	1	
	Frequency range	470	-	710	-26.2	6	23
	Frequency range	758	-	773	-32	1	3
	Frequency range	773	-	799	-50	1	
	Frequency range	799	-	803	-40	1	3
	Frequency range	860	-	890	-40	1	3, 8
	Frequency range	945	-	960	-50	1	3
	Frequency range	1884.5	-	1915.7	-41	0.3	
	Frequency range	1839.9	-	1879.9	-50	1	3
	Frequency range	2545	-	2575	-50	1	
	Frequency range	2595	-	2645	-50	1	
CA_19A-21A	E-UTRA Band 1, 18, 19, 28, 34, 42, 65	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 11	F_{DL_low}	-	F_{DL_high}	-50	1	3, 16
	E-UTRA Band 21	F_{DL_low}	-	F _{DL_high}	-50	1	16
	Frequency range	860	-	890	-40	1	3, 8
	Frequency range	945	-	960	-50	1	

	Frequency range	1884.5	-	1915.7	-41	0.3	4
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	2545	-	2575	-50	1	
	Frequency range	2595	-	2645	-50	1	
CA 39A-41A	E-UTRA Band 1, 8, 26, 34, 40, 42, 44	F_{DL_low}	-	F _{DL_high}	-50	1	
	Frequency range	1805	-	1855	[-40]	1	19
	Frequency range	1855	-	1875	[-15.5]	5	3, 13,19
	Frequency range	1875	-	1880	[-15.5]	5	3, 13, 20
CA 39A-41C	E-UTRA Band 1, 8, 26, 34, 40, 42, 44	F _{DL low}	-	F _{DL high}	-50	1	
	Frequency range	1805	-	1855	[-40]	1	19
	Frequency range	1855	-	1875	[-15.5]	5	3, 13,19
	Frequency range	1875	-	1880	[-15.5]	5	3, 13, 20
CA 39C-41A	E-UTRA Band 34, 40, 42, 44	F_{DL_low}	-	F _{DL_high}	-50	1	

- NOTE 1: F_{DL_low} and F_{DL_high} refer to each E-UTRA frequency band specified in Table 5.5-1
- NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x L_{CRB} x 180kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
- NOTE 3: These requirements also apply for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.
- NOTE 4: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
- NOTE 5: Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.
- NOTE 6: As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 3rd harmonic totally or partially overlaps the measurement bandwidth (MBW).
- NOTE 7: Applicable when NS_05 in section 6.6.3.3.1 is signalled by the network.
- NOTE 8: Applicable when NS_08 in subclause 6.6.3.3.3 is signalled by the network
- NOTE 9: Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD.
- NOTE10: This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.
- NOTE 11: This requirement is applicable only for the following cases:
 - for carriers of 5 MHz channel bandwidth when carrier centre frequency (F_c) is within the range 902.5 MHz $\leq F_c < 907.5$ MHz with an uplink transmission bandwidth less than or equal to 20 RB
 - for carriers of 5 MHz channel bandwidth when carrier centre frequency (F_c) is within the range 907.5 MHz $\leq F_c \leq$ 912.5 MHz without any restriction on uplink transmission bandwidth.
 - for carriers of 10 MHz channel bandwidth when carrier centre frequency (F_c) is F_c = 910 MHz with an uplink transmission bandwidth less than or equal to 32 RB with RB_{start} > 3.
- NOTE 12: This requirement is applicable for any channel bandwidths within the range 1920 1980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1927.5 1929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1930 1938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
- NOTE13: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
- NOTE 14: This requirement is applicable for any channel bandwidths within the range 2500 2570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2560.5 2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2552 2560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.
- NOTE 15: Applicable when NS_15 in subclause 6.6.3.3.8 is signalled by the network.
- NOTE 16: Applicable when NS 09 in subclause 6.6.3.3.4 is signalled by the network
- NOTE 17: This requirement is applicable only when Band 3 transmission frequency is less than or equal to 1765 MHz.
- NOTE 18: This requirement applies when the E-UTRA carrier is confined within 2545-2575MHz or 2595-2645MHz and the channel bandwidth is 10 or 20 MHz
- NOTE 19: This requirement is applicable for an uplink transmission bandwidth less than or equal to [54 RB] for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1887.5 1889.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1890 -

1898 MHz.

- NOTE 20: This requirement is only applicable for carriers with bandwidth confined within 1885-1920 MHz (requirement for carriers with at least 1RB confined within 1880 1885 MHz is not specified). This requirement applies for an uplink transmission bandwidth less than or equal to [54 RB] for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1892.5 1894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1895 1903 MHz.
- NOTE 21: As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see Figure 5.6-1) for which the 2nd harmonic totally or partially overlaps the measurement bandwidth (MBW).
- NOTE 22: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.
- NOTE 23: This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with RBstart > 1 and RBstart < 48.

Table 6.6.3.2A-1: Requirements for intraband carrier aggregation

E-	Spurious emission						
UTRA CA Config uration	Protected band	Frequency range (MHz)		Maximum Level (dBm)	MBW (MHz)	NOTE	
CA_1C	E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 65, 67	F _{DL low}	-	F _{DL high}	-50	1	
CA_3C	Frequency range E-UTRA Band 1, 7, 8, 20, 26, 27, 28, 31,	1839.9	-	1879.9	-50 -50	1	
	32, 33, 34, 38, 41, 43, 44, 65, 67 E-UTRA Band 3	F _{DL_low}	-	F _{DL_high}	-50	1	10
CA_7C	E-UTRA Band 22, 42 E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28,	F _{DL_low}	-	F _{DL_high}	-50 -50	1	2
CA_8B	29, 30. 31, 32, 33, 34, 40, 42, 43, 65, 67 E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40	F _{DL_low}	-	F_{DL_high} F_{DL_high}	-50	1	
	E-UTRA band 3	F _{DL_low}	-	F _{DL_high}	-50	1	2
	E-UTRA band 7	F _{DL_low}	-	F_{DL_high}	-50	1	2
	E-UTRA Band 8	F_{DL_low}	-	F_{DL_high}	-50	1	10
	E-UTRA Band 22, 41, 42, 43	F_{DL_low}		F_{DL_high}	-50	1	2
CA_38C	E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 65, 67	$F_{DL_{low}}$	_	F _{DL_high}	-50	1	
CA_39C	E-UTRA Band 22, 34, 40, 41, 42, 44	F_{DL_low}	-	F_{DL_high}	-50	1	
CA_40C	E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 32, 33, 34, 38, 39, 41, 42, 43, 44, 65, 67	F _{DL low}	-	F _{DL high}	-50	1	
CA_41C	E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 65, 66	F_{DL_low}	_	F _{DL high}	-50	1	
CA_42C	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 65, 66, 67	F _{DL_low}	_	F _{DL_high}	-50	1	
	Frequency range	1884.5	-	1915.7	-41	0.3	

NOTE 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.5-1

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x L_{CRB} x 180kHz), where N is 2, 3, 4, [5] for the 2nd, 3rd, 4th [or 5th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval

NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 4: N/A

NOTE 5: N/A

NOTE 6: N/A

NOTE 7: N/A

NOTE 8: N/A NOTE 9: N/A

NOTE 10: The requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

NOTE 11: N/A

NOTE 12: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 13: N/A

NOTE 14: N/A

Spurious emission E-UTRA CA Protected band Frequency range **MBW** NOTE Maximum Configur (MHz) Level (MHz) ation (dBm) E-UTRA Band 2, 4, 5, 7, 10, 12, CA_4A-13, 14, 17, 22, 23, 24, 25, 26, 27, -50 1 F_{DL_low} F_{DL_high} 28, 29, 30, 41, 43, 66 4A E-UTRA Band 42 F_{DL_low} F_{DL_high} -50

Table 6.6.3.2A-2: Requirements for intraband non-contiguous CA

F_{DL_low} and F_{DL_high} refer to each E-UTRA frequency band specified in Table 5.5-1 NOTE 1:

NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd or 3rd harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x LCRB x 180kHz), where N is 2 or 3 for the 2nd or 3rd harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

6.6.3.3 Additional spurious emissions

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

6.6.3.3.1 Minimum requirement (network signalled value "NS 05")

When "NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Frequency band Channel bandwidth / Spectrum Measurement NOTE (MHz) emission limit (dBm) bandwidth 5 20 10 15 MHz MHz MHz MHz 1884.5 ≤ f ≤1915.7 -41 -41 -41 -41 300 KHz 1

Table 6.6.3.3.1-1: Additional requirements (PHS)

Table 6.6.3.3.1-2: Void

6.6.3.3.2 Minimum requirement (network signalled value "NS 07")

When "NS 07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.2-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.2-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth			
	10 MHz				
769 ≤ f ≤ 775	-57	6.25 kHz			
NOTE: The emissions measurement shall be sufficiently power averaged to ensure standard standard deviation < 0.5 dB.					
standard standard deviation < 0.5 dB.					

6.6.3.3.3 Minimum requirement (network signalled value "NS_08")

When "NS 08" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.3-1: Additional requirement

Frequency band	Channel ban	Measurement bandwidth		
(MHz)	5MHz	10MHz	15MHz	
860 ≤ f ≤ 890	-40	-40	-40	1 MHz

6.6.3.3.4 Minimum requirement (network signalled value "NS_09")

When "NS 09" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.4-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.4-1: Additional requirement

Frequency band (MHz)	Channel ban	Measurement bandwidth		
	5MHz	10MHz	15MHz	
1475.9 ≤ f ≤ 1510.9	-35	-35	-35	1 MHz

NOTE 1: Void.

NOTE 2: To improve measurement accuracy, A-MPR values for NS_09 specified in Table 6.2.4-1 in subclause 6.2.4 are derived based on 100 kHz RBW.

6.6.3.3.5 Minimum requirement (network signalled value "NS_12")

standard deviation < 0.5 dB.

When "NS 12" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.5-1: Additional requirements

Channel bandwidth / Spectrum emission limit (dBm) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz	Measurement bandwidth					
-42	6.25 kHz					
NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 814.2 MHz. NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a						
	Spectrum emission limit (dBm) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz -42 ant applies for E-UTRA carriers with lower chan lHz.					

6.6.3.3.6 Minimum requirement (network signalled value "NS_13")

When "NS 13" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.6-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.6-1: Additional requirements

Frequency band (MHz)		Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth			
		1.4, 3, 5 MHz				
806	≤ f ≤ 816	-42	6.25 kHz			
NOTE 1:	NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 819 MHz.					
NOTE 2:	OTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.					

6.6.3.3.7 Minimum requirement (network signalled value "NS_14")

When "NS 14" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.7-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.7-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth				
	10 MHz, 15 MHz					
806 ≤ f ≤ 816	-42	6.25 kHz				
-	NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 824 MHz.					
NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.						

6.6.3.3.8 Minimum requirement (network signalled value "NS_15")

When "NS 15" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.8-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.8-1: Additional requirements

Frequency band	Channel bandwidth /	Measurement			
(MHz)	Spectrum emission limit	bandwidth			
	(dBm)				
	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz				
851 ≤ f ≤ 859	-53	6.25 kHz			
NOTE 1: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.					

6.6.3.3.9 Minimum requirement (network signalled value "NS_16")

When "NS_16" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.9-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.9-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 1.4, 3, 5, 10 MHz	Measurement bandwidth	NOTE
790 ≤ f ≤ 803	-32	1 MHz	

6.6.3.3.10 Minimum requirement (network signalled value "NS_17")

When "NS_17" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.10-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.10-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 5, 10 MHz	Measurement bandwidth	NOTE
470 ≤ f ≤ 710	-26.2	6 MHz	1
NOTE 1: Applicable when the assigned E-UTRA carrier is confined within 718 MHz		3 MHz	
and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.			

6.6.3.3.11 Minimum requirement (network signalled value "NS_18")

When "NS_18" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.11-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.11-1: Additional requirements

Freque ban (MH:	ď	Channel bandwidth / Spectrum emission limit (dBm) 5, 10, 15, 20 MHz	Measurement bandwidth	NOTE
692-6	98	-26.2	6 MHz	

6.6.3.3.12 Minimum requirement (network signalled value "NS_19")

When "NS_19" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.12-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.12-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 3, 5, 10, 15, 20 MHz	Measurement bandwidth	NOTE
662 ≤ f ≤ 694	-25	8 MHz	

6.6.3.3.13 Minimum requirement (network signalled value "NS_11")

When "NS_11" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.13-1. These requirements also apply for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.

Table 6.6.3.3.13-1: Additional requirements

Frequency band	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
(MHz)	1.4, 3, 5, 10, 15, 20 MHz	
E-UTRA Band 2	-50	1 MHz
1998 ≤ f ≤ 1999	-21	1 MHz
1997 ≤ f < 1998	-27	1 MHz
1996 ≤ f < 1997	-32	1 MHz
1995 ≤ f < 1996	-37	1 MHz
1990 ≤ f < 1995	-40	1 MHz

6.6.3.3.14 Minimum requirement (network signalled value "NS_20")

When "NS_20" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.14-1. These requirements also apply for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.

Table 6.6.3.3.14-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 5, 10, 15, 20 MHz	Measurement bandwidth
1990 ≤ f < 1999	-40	1 MHz
1999 ≤ f ≤ 2000	-40	NOTE 1
NOTE 1: The measurement bandwidth is 1% of the applicable E-UTRA channel bandwidth.		

6.6.3.3.15 Minimum requirement (network signalled value "NS_21")

When "NS_21" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.15-1. These requirements also apply for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.

Table 6.6.3.3.15-1: Additional requirements

Frequency band	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
(MHz)	5, 10 MHz	
2200 ≤ f < 2288	-40	1 MHz
2288 ≤ f < 2292	-37	1 MHz
2292 ≤ f < 2296	-31	1 MHz
2296 ≤ f < 2300	-25	1 MHz
2320 ≤ f < 2324	-25	1 MHz
2324 ≤ f < 2328	-31	1 MHz
2328 ≤ f < 2332	-37	1 MHz
2332 ≤ f ≤ 2395	-40	1 MHz

6.6.3.3.16 Minimum requirement (network signalled value "NS_22")

When "NS 22" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.16-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.16-1: Additional requirement

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	5, 10, 15, 20 MHz	
3400 ≤ f ≤ 3800	-23 (NOTE 1, NOTE 3)	5 MHz
	-40 (NOTE 2)	1 MHz
NOTE 1: This require	ment applies within an offset between 5 MHz a	and 25 MHz
from the lov	ver and from the upper edge of the channel band	dwidth,
whenever these frequencies overlap with the specified frequ		uency band.
NOTE 2: This requirement applies from 3400 MHz to 25 MHz below		the lower
E-UTRA channel edge and from 25 MHz above the upper E-UTRA		
channel edge to 3800 MHz.		
NOTE 3: This emission limit might imply risk of harmful interference to in the protected operating band		o UE(s) operating

6.6.3.3.17 Minimum requirement (network signalled value "NS_23")

When "NS 23" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.17-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.17-1: Additional requirement

Frequency band (MHz)		Channel bandwidth / Spectrum emission limit (dBm)	MBW
	- /	5, 10, 15, 20 MHz	
3400 :	≤ f ≤ 3800	-23 (NOTE 1, NOTE 4)	5 MHz
		-40 (NOTE 2)	1 MHz
NOTE 1: This requirement applies within an offset between 5 MHz 25 MHz + F _{offset_NS_23} from the lower and from the upper channel bandwidth, whenever these frequencies overlap frequency band.		set_NS_23 from the lower and from the upper edgwidth, whenever these frequencies overlap wit	es of the
NOTE 2:	lower E-UTRA	ent applies from 3400 MHz to 25 MHz + F _{offse} A channel edge and from 25 MHz + F _{offset_NS_2} : A channel edge to 3800 MHz.	
	5 MHz for 10 9 MHz for 15 12 MHz for 20	MHz channel BW, MHz channel BW, MHz channel BW and O MHz channel BW. In limit might imply risk of harmful interference	e to UE(s)
		he protected operating band	(-)

6.6.3.3.18 Void

Table 6.6.3.3.18-1: Void

6.6.3.3.19 Minimum requirement (network signalled value "NS_04")

When "NS 04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.19-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.19-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 5, 10, 15, 20 MHz	Measurement bandwidth
2490.5 ≤ f < 2496	-13	1 MHz
0 < f < 2490.5	-25	1 MHz

6.6.3.3.20 Minimum requirement (network signalled value "NS_24")

When "NS_24" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.20-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.20-1: Additional requirements

	Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 5 MHz, 10 MHz, 15 MHz, 20 MHz	Measurement bandwidth
	Band 34	-50	MHz
NOTE 1: This requirement applies at a frequency offset equal or larger than 5 Mb the upper edge of the channel bandwidth, whenever these frequencies with the specified frequency band.			

6.6.3.3.21 Minimum requirement (network signalled value "NS_25")

When "NS_25" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.21-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.21-1: Additional requirements

NOTE 1: This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band.

6.6.3.3A Additional spurious emissions for CA

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell reconfiguration message.

NOTE:

For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

6.6.3.3A.1 Minimum requirement for CA_1C (network signalled value "CA_NS_01")

When "CA_NS_01" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

Table 6.6.3.3A.1-1: Additional requirements (PHS)

Protected band	Frequenc	Frequency range (MHz)		Maximum Level (dBm)	MBW (MHz)	NOTE	
E-UTRA band 34	FDL_low	-	FDL_high	-50	1		
Frequency range	1884.5	-	1915.7	-41	0.3	1	
NOTE 1: Applicable	NOTE 1: Applicable when the aggregated channel bandwidth is confined within frequency range 1940 – 1980 MHz						

6.6.3.3A.2 Minimum requirement for CA 1C (network signalled value "CA NS 02")

When "CA_NS_02" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.2-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

Table 6.6.3.3A.2-1: Additional requirements

Protected band	Frequency range (MHz)		nge (MHz)	Maximum Level (dBm)	MBW (MHz)	NOTE
E-UTRA band 34	F_{DL_low}	-	F _{DL_high}	-50	1	
Frequency range	1900	-	1915	-15.5	5	1, 2
Frequency range	1915	•	1920	+1.6	5	1, 2

NOTE 1: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.14-1 from the edge of the channel bandwidth.

NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

6.6.3.3A.3 Minimum requirement for CA_1C (network signalled value "CA_NS_03")

When "CA_NS_03" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.3-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

Table 6.6.3.3A.3-1: Additional requirements

Protected band	Frequency range (MHz)		nge (MHz)	Maximum Level (dBm)	MBW (MHz)	NOTE
E-UTRA band 34	F_{DL_low}	ı	F _{DL_high}	-50	1	
Frequency range	1880	ı	1895	-40	1	
Frequency range	1895	ı	1915	-15.5	5	1, 2
Frequency range	1915	ı	1920	+1.6	5	1, 2

NOTE 1: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.

NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

6.6.3.3A.4 Minimum requirement for CA_38C (network signalled value "CA_NS_05")

When "CA_NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.4-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth. This requirement is applicable for carriers with aggregated channel bandwidths confined in 2570 - 2615 MHz.

Table 6.6.3.3A.4-1: Additional requirements

Protected band	Frequenc	y rar	nge (MHz)	Maximum Level (dBm)	MBW (MHz)	NOTE
Frequency range	2620	-	2645	-15.5	5	1, 2, 3
Frequency range	2645	-	2690	-40	1	1, 3
						· /= 4: · · ·

- NOTE 1: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.
- NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.
- NOTE 3: This requirement is applicable for carriers with aggregated channel bandwidths confined in 2570-2615 MHz.

6.6.3.3A.5 Minimum requirement for CA_7C (network signalled value "CA_NS_06")

When "CA_NS_06" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.5-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

Table 6.6.3.3A.5-1: Additional requirements

Protected band	Frequency range (MHz)		nge (MHz)	Maximum Level (dBm)	MBW (MHz)	NOTE
Frequency range	2570	-	2575	+1.6	5	1, 2
Frequency range	2575	-	2595	-15.5	5	1, 2
Frequency range	2595	-	2620	-40	1	

NOTE 1: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.14-1 from the edge of the channel bandwidth.

NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

6.6.3.3A.6 Minimum requirement for CA_39C and CA_39C-41A (network signalled value "CA_NS_07")

When "CA_NS_07" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.6-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

Table 6.6.3.3A.6-1: Additional requirements

Protected band	Frequenc	ncy range (MHz)		Maximum Level (dBm)	MBW (MHz)	NOTE
Frequency range	1805	1	1855	[-40]	1	
Frequency range	1855	-	1875	[-15.5]	5	2, 3
Frequency range	1875	-	1880	[-15.5] ¹	5	2, 3

- NOTE 1: This requirement is applicable for carriers with aggregated channel bandwidths confined in 1885-1920 MHz.
- NOTE 2: The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.
- NOTE 3: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

6.6.3.3A.7 Minimum requirement for CA_42C (network signalled value "CA_NS_08")

When "CA_NS_08" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.7-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

Table 6.6.3.3A.6-1: Additional requirements

Protected band	Frequency range (MHz)		nge (MHz)	Maximum Level (dBm)	MBW (MHz)		
43	$F_{DL_{low}}$	-	F _{DL_high}	[-50]	1		
NOTE: The [-50] dBm/MHz in 6.6.3.3A.6-1 is for unsynchronized operation. To meet these							
requirements some re	estriction will b	e nee	eded for either	the operating band or protec	ted band.		

6.6.3A Void

<reserved for future use>

6.6.3B Spurious emission for UL-MIMO

For UE supporting UL-MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products are specified at each transmit antenna connector.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.6.3 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-1.

For single-antenna port scheme, the general requirements in subclause 6.6.3 apply.

6.6.3C Void

<reserved for future use>

6.6.3D Spurious emission for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.5D-1, the requirements in subclause 6.6.3 apply.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, the UE co-existence requirements in Table 6.6.3.2A-0 in subclause 6.6.3.2A apply as specified for the corresponding inter-band aggregation with uplink assigned to two bands.

6.6A Void

6.6B Void

6.7 Transmit intermodulation

The transmit intermodulation performance is a measure of the capability of the transmitter to inhibit the generation of signals in its non linear elements caused by presence of the wanted signal and an interfering signal reaching the transmitter via the antenna.

6.7.1 Minimum requirement

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or eNode B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product when an interfering CW signal is added at a level below the wanted signal at each of the transmitter antenna port with the other antenna port(s) if any is terminated. Both the wanted signal power and the intermodulation product power are measured through E-UTRA rectangular filter with measurement bandwidth shown in Table 6.7.1-1.

The requirement of transmitting intermodulation is prescribed in Table 6.7.1-1.

BW Channel (UL) 5MHz 10MHz 15MHz 20MHz Interference Signal 5MHz 10MHz 10MHz 20MHz 15MHz 30MHz 20MHz 40MHz Frequency Offset Interference CW Signal -40dBc Level Intermodulation Product -29dBc -35dBc -29dBc -35dBc -29dBc -35dBc -29dBc -35dBc 4.5MHz 9.0MHz 13.5MHz Measurement bandwidth 4.5MHz 9.0MHz 13.5MHz 18MHz 18MHz

Table 6.7.1-1: Transmit Intermodulation

6.7.1A Minimum requirement for CA

User Equipment(s) transmitting in close vicinity of each other can produce intermodulation products, which can fall into the UE, or eNode B receive band as an unwanted interfering signal. The UE intermodulation attenuation is defined by the ratio of the mean power of the wanted signal to the mean power of the intermodulation product on both component carriers when an interfering CW signal is added at a level below the wanted signal at each of the transmitter antenna port with the other antenna port(s) if any is terminated. Both the wanted signal power and the intermodulation product power are measured through rectangular filter with measurement bandwidth shown in Table 6.7.1A-1.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the requirement is specified in Table 6.7.1-1 which shall apply on each component carrier with both component carriers active.

For intra-band contiguous carrier aggregation the requirement of transmitting intermodulation is specified in Table 6.7.1A-1.

CA bandwidth class(UL)	B and C		
Interference Signal Frequency Offset	BW _{Channel_CA} 2*BW _{Channel_CA}		
Interference CW Signal Level	-40dBc		
Intermodulation Product	-29dBc	-35dBc	
Measurement bandwidth	BW _{Channel_CA} - 2* BW _{GB}		

Table 6.7.1A-1: Transmit Intermodulation

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band) transmit intermodulations is defined as follows. For the E-UTRA band supporting one component carrier the requirement specified in Table 6.7.1-1 apply. For the E-UTRA band supporting two contiguous component carriers the requirements specified in Table 6.7.1A-1 apply.

6.7.1B Minimum requirement for UL-MIMO

For UE supporting UL-MIMO, the transmit intermodulation requirements are specified at each transmit antenna connector and the wanted signal is defined as the sum of output power at each transmit antenna connector.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in subclause 6.7.1 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2.

For single-antenna port scheme, the requirements in subclause 6.7.1 apply.

- 6.8 Void
- 6.8.1 Void
- 6.8A Void

6.8B Time alignment error for UL-MIMO

For UE(s) with multiple transmit antenna connectors supporting UL-MIMO, this requirement applies to frame timing differences between transmissions on multiple transmit antenna connectors in the closed-loop spatial multiplexing scheme.

The time alignment error (TAE) is defined as the average frame timing difference between any two transmissions on different transmit antenna connectors.

6.8B.1 Minimum Requirements

For UE(s) with multiple transmit antenna connectors, the Time Alignment Error (TAE) shall not exceed 130 ns.

7 Receiver characteristics

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).

The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective sections below.

With the exception of subclause 7.3, the requirements shall be verified with the network signalling value NS_01 configured (Table 6.2.4-1).

All the parameters in clause 7 are defined using the UL reference measurement channels specified in Annexes A.2.2 and A.2.3, the DL reference measurement channels specified in Annex A.3.2 and using the set-up specified in Annex C.3.1.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers (one component carrier per sub-block), an in-gap test refers to the case when the interfering signal is located at a negative offset with respect to the assigned channel frequency of the highest carrier frequency and located at a positive offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers (one component carrier per sub-block), an out-of-gap test refers to the case when the interfering signal(s) is (are) located at a positive offset with respect to the assigned channel frequency of the highest carrier frequency, or located at a negative offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers with channel bandwidth larger than or equal to 5 MHz (one component carrier per sub-block), the existing adjacent channel selectivity requirements, in-band blocking requirements (for each case), and narrow band blocking requirements apply for in-gap tests only if the corresponding interferer frequency offsets with respect to the two measured carriers satisfy the following condition in relation to the sub-block gap size $W_{\rm gap}$ for at least one of these carriers j, j = 1, 2, so that the interferer frequency position does not change the nature of the core requirement tested:

 $Wgap \ge 2 \cdot |FInterferer (offset)_j| - BWChannel(_j)$

where $F_{Interferer (offset),j}$ is the interferer frequency offset with respect to carrier j as specified in subclause 7.5.1, subclause 7.6.1 and subclause 7.6.3 for the respective requirement and $BW_{Channel(j)}$ the channel bandwidth of carrier j. The interferer frequency offsets for adjacent channel selectivity, each in-band blocking case and narrow- band blocking shall be tested separately with a single in-gap interferer at a time.

For a ProSe UE that supports both ProSe Direct Discovery and ProSe Direct Communication, the receiver characteristics specified in clause 7 for ProSe Direct Communication shall apply.

For ProSe Direct Discovery and ProSe Direct Communication on E-UTRA ProSe operating bands that correspond to TDD E-UTRA operating bands as specified in subclause 5.5D, the only additional requirement for ProSe specified in subclause 7.4.1D is applicable.

7.2 Diversity characteristics

The requirements in Section 7 assume that the receiver is equipped with two Rx port as a baseline. These requirements apply to all UE categories unless stated otherwise. Additional requirements apply for UE(s) equipped with four Rx ports. With the exception of subclause 7.9 all requirements shall be verified by using both (all) antenna ports simultaneously.

NOTE: for an operating band in which the UE can operate using up to four Rx ports, it suffices to verify for conformance the additional requirements applicable for four Rx ports [except for REFSENS].

NOTE: Implementation of 4 antenna ports for all operating bands supported by the UE is not mandated. For a category 0 UE the requirements in Section 7 assume that the receiver is equipped with single Rx port.

7.3 Reference sensitivity power level

The reference sensitivity power level REFSENS is the minimum mean power applied to each one of the UE antenna ports for all UE categories except category 0, or to the single antenna port for UE category 0, at which the throughput shall meet or exceed the requirements for the specified reference measurement channel.

7.3.1 Minimum requirements (QPSK)

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.1-1 and Table 7.3.1-2

Table 7.3.1-1: Reference sensitivity QPSK PREFSENS

	Channel bandwidth						
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
1	, ,	, ,	-100	-97	-95.2	-94	FDD
2	-102.7	-99.7	-98	-95	-93.2	-92	FDD
3	-101.7	-98.7	-97	-94	-92.2	-91	FDD
4	-104.7	-101.7	-100	-97	-95.2	-94	FDD
5	-103.2	-100.2	-98	-95			FDD
6			-100	-97			FDD
7			-98	-95	-93.2	-92	FDD
8	-102.2	-99.2	-97	-94			FDD
9			-99	-96	-94.2	-93	FDD
10			-100	-97	-95.2	-94	FDD
11			-100	-97			FDD
12	-101.7	-98.7	-97	-94			FDD
13			-97	-94			FDD
14			-97	-94			FDD
17			-97	-94			FDD
18			-100 ⁷	-97 ⁷	-95.2 ⁷		FDD
19			-100	-97	-95.2		FDD
20			-97	-94	-91.2	-90	FDD
21			-100	-97	-95.2		FDD
22			-97	-94	-92.2	-91	FDD
23	-104.7	-101.7	-100	-97	-95.2	-94	FDD
24			-100	-97			FDD
25	-101.2	-98.2	-96.5	-93.5	-91.7	-90.5	FDD
26	-102.7	-99.7	-97.5 ⁶	-94.5 ⁶	-92.7 ⁶		FDD
27	-103.2	-100.2	-98	-95			FDD
28		-100.2	-98.5	-95.5	-93.7	-91	FDD
30			-99	-96			FDD
31	-99.0	-95.7	-93.5				FDD
33			-100	-97	-95.2	-94	TDD
34			-100	-97	-95.2		TDD
35	-106.2	-102.2	-100	-97	-95.2	-94	TDD
36	-106.2	-102.2	-100	-97	-95.2	-94	TDD
37			-100	-97	-95.2	-94	TDD
38			-100	-97	-95.2	-94	TDD
39			-100	-97	-95.2	-94	TDD
40			-100	-97	-95.2	-94	TDD
41			-98	-95	-93.2	-92	TDD
42			-99	-96	-94.2	-93	TDD
43			-99	-96	-94.2	-93	TDD
44		[-100.2]	[-98]	[-95]	[-93.2]	[-92]	TDD
45		1	-100	-97	-95.2	-94	TDD
65			-99.5	-96.5	-94.7	-93.5	FDD
66		İ	-99.5	-96.5	-94.7	-93.5	FDD

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5 NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

NOTE 3: The signal power is specified per port

NOTE 4:	For the UE which supports both Band 3 and Band 9 the reference sensitivity
	lavel is FES

NOTE 5: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.

NOTE 6: 6 indicates that the requirement is modified by -0.5 dB when the carrier

NOTE 6: oindicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.

NOTE 7: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.

For UE(s) equipped with 4 antenna ports the following additional requirements apply. The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.1-1a and Table 7.3.1-2.

Table 7.3.1-1a: Reference sensitivity QPSK PREFSENS

	Channel bandwidth							
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode	
2	[-105.4]	[-102.4]	[-100.7]	[-97.7]	[-95.9]	[-94.7]	FDD	
3	[-104.4]	[-101.4]	[-99.7]	[-96.7]	[-94.9]	[-93.7]		
7			[-100.7]	[-97.7]	[-95.9]	[-94.7]	FDD	
20			[-99.7]	[-96.7]	[-93.9]	[-92.7]	FDD	
39			[-102.7]	[-99.7]	[-97.9]	[-96.7]	TDD	
42			[-101.2]	[-98.2]	[-96.4]	[-95.2]	TDD	

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5

NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

NOTE 3: The signal power is specified per port.

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3.1-1 (two antenna ports) and Table 7.3.1-1a (four antenna ports) shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.1-2.

NOTE: Table 7.3.1-2 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors. Typical receiver sensitivity performance with HARQ retransmission enabled and using a residual BLER metric relevant for e.g. Speech Services is given in the Annex G (informative). For the UE which supports inter-band carrier aggregation configuration with the uplink in one or two E-UTRA bands, the minimum requirement for reference sensitivity in Table 7.3.1-1 and Table 7.3.1-1a shall be increased by the amount given in $\Delta R_{IB,c}$ in Table 7.3.1-1A, Table 7.3.1-1B and Table 7.3.1-1C for the applicable E-UTRA bands.

Table 7.3.1-1A: ΔR_{IB,c} (two bands)

Inter-band CA Configuration	E-UTRA Band	ΔR _{IB,c} [dB]
CA_1A-3A	<u>1</u> 3	0 0
CA_1A-3C	1	0
CA_1A-5A	3 1	0 0
	5 1	0 0
CA_1A-7A	7	0
CA_1A-8A	1 8	0 0
CA_1A-11A	<u> </u>	0 0
CA_1A-18A	1 18	0
CA_1A-19A	1	0
	19 1	0 0
CA_1A-20A	20 1	0
CA_1A-21A	21	0 0
CA_1A-26A	<u>1</u> 26	0 0
CA_1A-28A	1 28	0 0.2
CA_1A-40A	1	0
CA_1A-41A ⁸	40 1	0 0
	41 1	0 0
CA_1A-41C ⁸	41	0
CA_1A-42A	1 42	0 0.5
CA_1A-42C	1 42	0 0.5
CA_2A-4A	2	0.3
CA_2A-2A-4A	<u>4</u> 2	0.3 0.3
	<u>4</u> 2	0.3 0.3
CA_2A-4A-4A	4	0.3
CA_2A-2A-4A- 4A	<u>2</u> 4	0.3 0.3
CA_2A-5A	<u>2</u> 5	0 0
CA_2A-2A-5A	2	0
CA_2C-5A	5 2	0 0
	<u>5</u> 2	0 0
CA_2A-12A	12 2	0
CA_2A-2A-12A	12	0
CA_2A-2A-12B	2 12	0 0
CA_2A-12B	2 12	0 0
CA_2C-12A	2	0
	12 2	0 0
CA_2A-13A CA_2A-2A-13A	13 2	0 0
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	13	0
		0
CA_2A-17A	2	0
	17	0.5
	2	0
CA_2A_28A		
	28	0
CA_2A-30A CA_2C-30A	2	0.4
	30	0.5
	2	0.4
	30	0.5
CA_3A-5A	3	0
	5	0
CA_3C-5A	3	0
	5	0
CA_3A-7A	3	0
	7	0
CA_3A-7B	3	0
	1	
	7	0
CA_3A-7C	3	0
	7	0
CA_3C-7A	3	0
	7	0
CA_3A-8A	3	0
	8	0
	3	0
CA_3A-3A-8A		
	8	0
CA 2A 40A	3	0
CA_3A-19A	19	0
CA_3A-20A		
	3	0
	20	0
CA_3A-26A	3	0
	26	0
CA_3A-27A	3	0
6/1_6/1 2 ///	27	0
CA_3A-28A	3	0
	28	0
CA_3A-31A		
	3	0
	31	0.2
	3	0
CA_3A-38A	38	0
CA_3A-40A	3	0
	40	0
CA_3A-40C	3	0
	40	0
CA_3A-41A	3	0
	41	O ¹⁰
	41	0.5 ¹¹
	3	0
CA_3A-41C	<u> </u>	0 ¹⁰
	41	U
		0.5 ¹¹
CA_3A-42A CA_3A-42C	3	0.2
	42	0.5
	3	0.2
	42	0.5
CA_4A-5A	4	0
	5	0
CA_4A-4A-5A		
	4	0
	5	0
CA_4A-7A	4	0.5
	7	0.5
CA_4A-4A-7A	4	0.5
	7	0.5
04 14 15	4	0
CA_4A-12A		
CA_4A-12B	12	0.5
	4	0
	12	0.5
T.	1	

	4	0
CA_4A-4A-12A		
	12	0.5
CA_4A-13A	4	0
O/1_4/1 10/1	13	0
00 40 40 400	4	0
CA_4A-4A-13A	13	0
	4	0
CA_4A-17A		
	17	0.5
CA_4A-27A	4	0
	27	0
CA_4A-28A	4	0
CA_4A-20A	28	0.2
	4	0.4
CA_4A-30A	}	
	30	0.5
CA_5A-7A	5	0
_	7	0
CA_5A-12A	5	0.5
CA_5A-12A	12	0.3
	5	0.5
CA_5A-12B	12	0.3
		_
CA_5A-13A	5	0
	13	0
CA_5A-17A	5	0.5
UA_3A-17A	17	0.3
04 54 55	5	0
CA_5A-25A	25	0
	5	0
CA_5A-30A		
_	30	0
CA_5A-38A	5	0
OA_3A-30A	38	0
04 54 404	5	0
CA_5A-40A	40	0
	5	0
CA_5A-40C		
	40	0
CA_7A-8A	7	0
<u> </u>	8	0.2
CA_7A-12A	7	0
CA_1A-12A	12	0
	7	0
CA_7A-20A	20	0
	7	0
CA_7A-22A		
	22	0.5
CA_7A-28A	7	0
5	28	0
CA 7D 20A	7	0
CA_7B-28A	28	0
04 -0	7	0
CA_7C-28A	28	0
		0
CA_7A-40A	7	
_	40	0.5
CA_7A-40C	7	0
UN_17\-400	40	0.5
04 74 404	7	0
CA_7A-42A	42	0.5
CA_7A-42A-	7	0
42A	42	0.5
CA_8A-11A	8	0
55,,,,,,,	11	0
CA 9A 99A	8	0
CA_8A-20A	20	0
24	8	0
CA_8A-40A	40	0
CA_8A-41A	8	0
	41	0
CA_8A-41C	8	0

	1 44	0
	41	0
CA_11A-18A	11	0
	18	0
CA_12A-25A	12	0
	25	0
CA_12A-30A	12	0
_	30	0
CA_18A-28A ⁹	18	0
	28	0
CA_19A-21A	19	0
	21	0
CA_19A-28A ⁹	19	0
0/10/120/1	28	0
CA_19A-42A	19	0
	42	0.5
CA_19A-42C	19	0
0/1_10/1120	42	0.5
CA_20A-31A	20	0
UA_2UA-31A	31	0
CA_20A-38A	20	0
UA_2UA-30A	38	0
CA_20A-40A	20	0
CA_20A-40A	40	0
CA 20A 40A	20	0
CA_20A-42A	42	0.5
CA_20A-42A-	20	0
42A	42	0.5
	21	0.2
CA_21A-42A	42	0.5
	21	0.2
CA_21A-42C	42	0.5
	25	0
CA_25A-26A	26	0
	25	0
CA_25A-41A ⁸	41	0
2	25	0
CA_25A-41C ⁸	41	0
	25	0
CA_25A-41D ⁸	41	0
	26	0
CA_26A-41A		0
	41 26	0
CA_26A-41C		
	41	0
CA_28A-40A	28	0
•	40	0
CA_28A-40C	28	0
	40	0
CA_28A-40D	28	0
	40	0
CA_28A-41A	28	0
57257. 117.	41	0
CA_28A-41C	28	0
5/ \Z5/ \\ _T10	41	0
CA_28A-42A	28	0.2
O/_ZU/\34Z/\	42	0.5
CA_28A-42C	28	0.2
UA_20A-42U	42	0.5
CA 20A 40A	38	0.54
CA_38A-40A	40	0.54
CA_38A-40A-	38	0.54
40A	40	0.54
	38	0.54
CA_38A-40C	40	0.54
	39	0.24
CA_39A-41A	41	0.2
	41	٧.٧

CA_39A-41A	39	0.2
CA_39A-41A	41	0.27
CA 20A 44C	39	0.24
CA_39A-41C	41	0.24
CA 20A 41C	39	0.2
CA_39A-41C	41	0.2
CA_39A-41D	39	0.24
CA_39A-41D	41	0.24
CA 20C 44A	39	0.24
CA_39C-41A	41	0.24
CA_39C-41A	39	0.2
CA_39C-41A	41	0.2
CA_39C-41C	39	0.24
CA_39C-41C	41	0.24
CA_41A-42A	41	0.44
UA_41A-42A	42	0.54
CA_41A-42C	41	0.44
UA_41A-42U	42	0.5
CA_41C-42A	41	0.44
CA_41C-42A	42	0.5
CA 41C 42C	41	0.44
CA_41C-42C	42	0.54

- NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations
- NOTE 2: The above additional tolerances also apply in intra-band and non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations
- NOTE 3: In case the UE supports more than one of the above 2DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 2DL inter-band carrier aggregation configurations then:
 - When the E-UTRA operating band frequency range is ≤ 1GHz, the applicable additional tolerance shall be the average of the 2DL tolerances in Table 7.3.1-1A, truncated to one decimal place that would apply for that operating band among the supported 2DL CA configurations. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 2DL carrier aggregation configurations involving such band shall be applied
 - When the E-UTRA operating band frequency range is >1GHz, the applicable additional tolerance shall be the maximum 2DL tolerance in Table 7.3.1-1A that would apply for that operating band among the supported 2DL CA configurations
- NOTE 4: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx.
- NOTE 5: Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:
 - When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied
 - When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.
- NOTE 6: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.
- NOTE 7: Applicable for UE supporting inter-band carrier aggregation without simultaneous Rx/Tx.
- NOTE 8: Only applicable for UE supporting inter-band carrier aggregation with the uplink active in the FDD band.

- NOTE 9: For Band 28, the requirements only apply for the restricted frequency range specified for this CA configuration (Table 5.5A-2).
- NOTE 10: The requirement is applied for UE transmitting on the frequency range of 2545-
- 2690MHz.

 NOTE 11: The requirement is applied for UE transmitting on the frequency range of 2496-2545MHz.

Table 7.3.1-1B: $\Delta R_{IB,c}$ (three bands)

Inter-band CA Configuration	E-UTRA Band	$\Delta R_{IB,c}$ [dB]
	1	0
CA_1A-3A-5A	3	0
	5	0
	1	0
CA_1A-3A-7A	3	0
	7	0
_	1	0
CA_1A-3A-8A	3	0
	8	0
	1	0
CA_1A-3A-19A	3	0
	19	0
	1	0
CA_1A-3A-20A	3	0
	20	0
	1	0
CA_1A-3A-26A	3	0
	26	0
	1	0
CA_1A-3A-28A	3	0
	28	0.2
a aa.	1	0
CA_1A-3A-40A	3	0
	40	0
	1	0.2
CA_1A-3A-42A	3	0.2
	42	0.5
	1	0.2
CA_1A-3A-42C	3	0.2
	42	0.5
	1	0
CA_1A-5A-7A	5	0
	7	0
CA 4A 5A 4OA	1	0
CA_1A-5A-40A	5	0
	40	0
CA 4A 7A 9A	1	0
CA_1A-7A-8A	7	0
	8	0.2
CA 4A 7A 20A	1 7	0
CA_1A-7A-20A	7	0
	20	0
CA_1A-7A-28A	7	0
UA_1A-1A-20A	28	0.2
CA_1A-8A-11A	1 8	0
CA_IA-6A-TIA	11	0
	1	0
CA 1A 8A 40A		
CA_1A-8A-40A	8	0
	40 1	
CA_1A-11A-18A	11	0
0A_IA-IIA-I0A	18	0
	10	0
CA_1A-18A-28A	18	0
UA_1A-1UA-2UA	28	0
	1	0
CA_1A-19A-21A	19	0
UN_IN-19N-21A	21	0
CA_1A-19A-28A	1	0
ON_1A-19A-20A	I	U

	40	
	19	0
	28	0
	1	0
CA_1A-19A-42A	19	0
	42	0.5
	1	0
CA_1A-19A-42C	19	0
	42	0.5
	1	0
CA_1A-21A-42A	21	0.2
0A_1A-21A-42A	42	0.5
0.0 4.0 0.4.0 400	1	0
CA_1A-21A-42C	21	0.2
	42	0.5
	2	0.3
CA_2A-2A-4A-12A	4	0.3
	12	0.5
	2	0.3
CA_2A-4A-5A		0.3
O/(_Z/(4/(0/(5	0
		_
04 04 64 44 54	2	0.3
CA_2A-2A-4A-5A	4	0.3
	5	0
	2	0.3
CA_2A-4A-4A-5A	4	0.3
	5	0
	2	0.3
CA_2A-4A-12A	4	0.3
O/(_Z/(4/(12/(12	0.5
	2	0.3
CA_2A-4A-4A-12A	4	0.3
	12	0.5
	2	0.3
CA_2A-4A-13A	4	0.3
	13	0
	2	0.4
CA_2A-4A-30A	4	0.4
0/(_2/(//(00/(30	0.5
	2	0.3
04 04 54 404		· · · · · · · · · · · · · · · · · · ·
CA_2A-5A-12A	5	0.5
	12	0.3
	2	0.3
CA_2A-2A-5A-12A	5	0.5
	12	0.3
	2	0
CA_2A-5A-12B	5	0.5
0,(_2,(0,(128	12	0.3
04 04 54 404	2	0
CA_2A-5A-13A	5	0
	13	0
	2	0.4
CA_2A-5A-30A	5	0
	30	0.5
	2	0.4
CA_2C-5A-30A	5	0
	30	0.5
	2	0.4
CA 2A 42A 20A		
CA_2A-12A-30A	12	0
	30	0.5
	2	0.4
CA_2C-12A-30A	12	0
	30	0.5
	1	0
CA_3A-5A-40A	5	0
	40	0
	T ∪	V

		1
	3	0
CA_3A-7A-8A	7	0
	8	0.2
	3	0
CA_3A-7A-20A	7	0
_	20	0
	3	0
CA_3A-7A-28A	7	0
OA_3A-1A-20A	28	0
	3	0
CA_3A-7C-28A	7	0
	28	0
	3	0
CA_3A-7A-38A	7	0
	38	0.2
	3	0
CA_3A-8A-40A	8	0
_	40	0
	3	0.2
CA_3A-19A-42A		0.2
CA_3A-19A-42A		_
	42	0.5
a. aa.	3	0.2
CA_3A-19A-42C	19	0
	42	0.5
	3	0
CA_3A-28A-40A	28	0
	40	0
	3	0
CA_3A-28A-40C	28	0
0/1_0/120/1400	40	0
	3	0.5
CA_3A-41A-42A	41	05/0.56
	42	0.5
	4	0
CA_4A-5A-12A	5	0.5
	12	0.5
	4	0
CA_4A-4A-5A-12A	5	0.5
	12	0.5
	12 4	0.5 0
CA 4A-5A-13A	4	0
CA_4A-5A-13A	4 5	0
CA_4A-5A-13A	4 5 13	0 0 0
	4 5 13 4	0 0 0 0 0.4
CA_4A-5A-13A CA_4A-5A-30A	4 5 13 4 5	0 0 0 0 0.4
	4 5 13 4 5	0 0 0 0.4 0
CA_4A-5A-30A	4 5 13 4 5 30 4	0 0 0 0.4 0 0.5
	4 5 13 4 5	0 0 0 0.4 0 0.5 0.5
CA_4A-5A-30A	4 5 13 4 5 30 4	0 0 0 0.4 0 0.5
CA_4A-5A-30A	4 5 13 4 5 30 4 7	0 0 0 0.4 0 0.5 0.5
CA_4A-5A-30A	4 5 13 4 5 30 4 7 12	0 0 0 0.4 0 0.5 0.5 0.5 0.5
CA_4A-5A-30A	4 5 13 4 5 30 4 7 12 4	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.5
CA_4A-5A-30A	4 5 13 4 5 30 4 7 12 4 12 30	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.5 0.5
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A	4 5 13 4 5 30 4 7 12 4 12 30 7	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5
CA_4A-5A-30A	4 5 13 4 5 30 4 7 12 4 12 30 7 8	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A	4 5 13 4 5 30 4 7 12 4 12 30 7 8	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A CA_7A-8A-20A	4 5 13 4 5 30 4 7 12 4 12 30 7 8 20 7	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.5 0.5
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A	4 5 13 4 5 30 4 7 12 4 12 30 7 8 20 7	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.2 0.2
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A CA_7A-8A-20A	4 5 13 4 5 30 4 7 12 4 12 30 7 8 20 7 20 38	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.2 0.2
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A CA_7A-8A-20A CA_7A-20A-38A	4 5 13 4 5 30 4 7 12 4 12 30 7 8 20 7 20 38	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.2 0.2 [0.2] 0
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A CA_7A-8A-20A	4 5 13 4 5 30 4 7 12 4 12 30 7 8 20 7 20 38	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.2 0.2
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A CA_7A-8A-20A CA_7A-20A-38A	4 5 13 4 5 30 4 7 12 4 12 30 7 8 20 7 20 38	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.2 0.2 [0.2] 0
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A CA_7A-8A-20A CA_7A-20A-38A	4 5 13 4 5 30 4 7 12 4 12 30 7 8 20 7 20 38 19 21	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.2 0.2 [0.2] 0
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A CA_7A-8A-20A CA_7A-20A-38A CA_19A-21A-42A	4 5 13 4 5 30 4 7 7 12 4 12 30 7 8 20 7 20 38 19 21 42	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.5 0.2 [0.2] 0 0 0.2 0.2
CA_4A-5A-30A CA_4A-7A-12A CA_4A-12A-30A CA_7A-8A-20A CA_7A-20A-38A	4 5 13 4 5 30 4 7 12 4 12 30 7 8 20 7 20 38 19 21 42	0 0 0 0.4 0 0.5 0.5 0.5 0.5 0.4 0.5 0.5 0.5 0.2 [0.2] 0 0 0.2

NOTE 1: The above additional tolerances are only applicable for the E-UTRA operating bands that belong to the supported inter-band carrier aggregation

configurations.

NOTE 2: The above additional tolerances also apply in intra-band and non-aggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

- NOTE 3: Unless otherwise specified, in case the UE supports more than one of the above 3DL inter-band carrier aggregation configurations and a E-UTRA operating band belongs to more than one 3DL inter-band carrier aggregation configurations then:
 - When the E-UTRA operating band frequency range is ≤ 1GHz and the tolerances are the same, the value applies to the band. If the tolerances are different, the applicable additional 3DL tolerance is FFS. In case there is a harmonic relation between low band UL and high band DL, then the maximum tolerance among the different supported 3DL carrier aggregation configurations involving such band shall be applied
 - When the E-UTRA operating band frequency range is >1GHz, the applicable additional 3DL tolerance shall be the maximum tolerance above that applies for that operating band among the supported 3DL CA configurations.
- NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.
- NOTE 5: The requirement is specified for the frequency range of 2545-2690MHz. NOTE 6: The requirement is specified for the frequency range of 2496-2545MHz.

Table 7.3.1-1C: $\Delta R_{IB,c}$ (four bands)

Inter-band CA Configuration	E-UTRA Band	$\Delta R_{IB,c}$ [dB]
	1	0
CA_1A-3A-5A-40A	3	0
CA_1A-3A-3A-40A	5	0
	40	0
	1	0
CA_1A-3A-7A-8A	3	0
CA_1A-3A-7A-0A	7	0
	8	0.2
	1	0
CA_1A-3A-8A-40A	3	0
CA_1A-3A-6A-40A	8	0
	40	0
	1	0.2
CA 1A 2A 10A 42A	3	0.2
CA_1A-3A-19A-42A	19	0
	42	0.5
	1	0.2
CA 1A 2A 10A 42C	3	0.2
CA_1A-3A-19A-42C	19	0
	42	0.5
	1	0
CA 1A 10A 31A 13A	19	0
CA_1A-19A-21A-42A	21	0.2
	42	0.5
	1	0
CA 1A 10A 31A 13C	19	0
CA_1A-19A-21A-42C	21	0.2
	42	0.5
	2	0.3
CA 2A 4A 5A 42A	4	0.3
CA_2A-4A-5A-12A	5	0.5
	12	0.5
	2	0.4
CA 2A 4A 5A 20A	4	0.4
CA_2A-4A-5A-30A —	5	0
	30	0.5
	2	0.4
CA 2A 4A 42A 20A	4	0.4
CA_2A-4A-12A-30A	12	0.5
	30	0.5
NOTE 1: The above addit operating bands	ional tolerances are only appl	

configurations.

The above additional tolerances also apply in intra-band and nonaggregated operation for the supported E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

NOTE 3: Tolerances for a UE supporting multiple 4DL inter-band CA configurations are FFS.

NOTE 4: The above additional tolerances applicable for the E-UTRA operating bands that belong to the supported highest order inter-band carrier aggregation configuration, also applies to the same E-UTRA operating bands that belong to a supported lower order CA configuration.

NOTE: The above additional tolerances do not apply to supported UTRA operating bands with frequency range below 1 GHz that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations when such bands are belonging only to band combination(s) where one band is <1GHz and other bands are >1.7GHz and there is no harmonic relationship between the low band UL and high band DL. Otherwise the above additional tolerances also apply to supported UTRA operating bands that correspond to the E-UTRA operating bands that belong to the supported inter-band carrier aggregation configurations.

Table 7.3.1-2: Uplink configuration for reference sensitivity

E-UTRA Band / Channel bandwidth / N _{RB} / Duplex mode										
E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode			
1			25	50	75	100	FDD			
2	6	15	25	50	50 ¹	50 ¹	FDD			
3	6	15	25	50	50 ¹	50 ¹	FDD			
4	6	15	25	50	75	100	FDD			
5	6	15	25	25 ¹			FDD			
6			25	25 ¹			FDD			
7			25	50	75	75 ¹	FDD			
8	6	15	25	25 ¹			FDD			
9			25	50	50 ¹	50 ¹	FDD			
10			25	50	75	100	FDD			
11			25	25 ¹			FDD			
12	6	15	20 ¹	20 ¹			FDD			
13			20 ¹	20 ¹			FDD			
14			15 ¹	15 ¹			FDD			
17			20 ¹	20 ¹			FDD			
18			25	25 ¹	25 ¹		FDD			
19			25	25 ¹	25 ¹		FDD			
20			25	20 ¹	20 ³	20 ³	FDD			
21			25	25 ¹	25 ¹		FDD			
22			25	50	50 ¹	50 ¹	FDD			
23	6	15	25	50	75	100	FDD			
24			25	50			FDD			
25	6	15	25	50	50 ¹	50 ¹	FDD			
26	6	15	25	25 ¹	25 ¹		FDD			
27	6	15	25	25 ¹			FDD			
28		15	25	25 ¹	25 ¹	25 ¹	FDD			
30			25	25 ¹			FDD			
31	6	5 ⁴	5 ^⁴				FDD			
33			25	50	75	100	TDD			
34			25	50	75		TDD			
35	6	15	25	50	75	100	TDD			
36	6	15	25	50	75	100	TDD			
37			25	50	75	100	TDD			
38			25	50	75	100	TDD			
39			25	50	75	100	TDD			
40			25	50	75	100	TDD			
41			25	50	75	100	TDD			
42			25	50	75	100	TDD			
43			25	50	75	100	TDD			
44		15	25	50	75	100	TDD			
65			25	50	75	100	FDD			
66			25	50	75	100	FDD			
NOTE 1: 1	refers to th	a III rasc	nurce bloc	ke chall ha	located as	close as n	occible to			

NOTE 1: Trefers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

NOTE 2: For the UE which supports both Band 11 and Band 21 the uplink configuration for reference sensitivity is FFS.

NOTE 3: ³ refers to Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 16 NOTE 4: ⁴ refers to Band 31; in the case of 3 MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 9 and in the case of 5 MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 10.

Unless given by Table 7.3.1-3, the minimum requirements specified in Tables 7.3.1-1 and 7.3.1-2 shall be verified with the network signalling value NS_01 (Table 6.2.4-1) configured.

Table 7.3.1-3: Network signalling value for reference sensitivity

E-UTRA Band	Network Signalling
Dana	value
2	NS_03
4	NS_03
10	NS_03
12	NS_06
13	NS_06
14	NS_06
17	NS_06
19	NS_08
21	NS_09
23	NS_03
30	NS_21
66	NS_03

7.3.1A Minimum requirements (QPSK) for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.1-1 and Table 7.3.1-2. The reference sensitivity is defined to be met with all downlink component carriers active and one of the uplink carriers active. The uplink resource blocks shall be located as close as possible to the primary downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1). The primary downlink operating band is the downlink band of the active uplink operating band. The UE shall meet the requirements specified in subclause 7.3.1 with the following exceptions.

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3.1A-0a, exceptions to the aforementioned requirements are allowed when the uplink is active in a lower-frequency band and is within a specified frequency range such that transmitter harmonics fall within the downlink transmission bandwidth assigned in a higher band as noted in Table 7.3.1A-0a. For these exceptions, the UE shall meet the requirements specified in Table 7.3.1A-0a and Table 7.3.1A-0b.

Table 7.3.1A-0a: Reference sensitivity for carrier aggregation QPSK P_{REFSENS, CA} (exceptions)

EUTDA CA	EUTDA I		annel band		40 8411-	45 MI'-	20 8411-	D!
EUTRA CA Configuration	EUTRA band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex mode
Comiguration	1	(ubiii)	(abiii)	-100	-97	-95.2	-94	mode
	3			N/A	N/A	N/A	N/A	
CA_1A-3A-7A-8A ^{4,5,6}	7			IN//A	-87.4	-87	-86.7	FDD
				00.0		-01	-00.7	
	8			-96.8	-93.8	0= 0	0.4	
	1			-100	-97	-95.2	-94	
CA_1A-3A-8A-40A ⁴	3			N/A	N/A	N/A	N/A	FDD
	8		-99.2	-97	-94			
	40			-100	-97	-95.2	-94	TDD
CA_1A-3A-19A-42A ^{9,10}	1			-99.8	-96.8	-95	-93.8	
	3			-96.8	-93.8	-92	-90.8	FDD
_	19			-100 -71.7	-97 -71.7	-95.2	-71.7	TDD
	42 1			-71.7	-71.7 -96.8	-71.7 -95	-71.7	100
CA_1A-3A-19A-42A ¹¹	3			-96.8	-93.8	-92	-90.8	FDD
	19			-100	-97	-95.2	55.5	1 . 55
	42			-97.1	-94.7	-93.2	-92.5	TDD
	1			-99.8	-96.8	-95	-93.8	
CA_1A-3A-19A-42C ^{9,10}	3			-96.8	-93.8	-92	-90.8	FDD
OA_1A-3A-13A-42C	19			-100	-97	-95.2		
	42			-71.7	-71.7	-71.7	-71.7	TDD
CA_1A-3A-19A-42C ¹¹	1			-99.8	-96.8	-95	-93.8	
	3			-96.8	-93.8	-92	-90.8	FDD
	19 42			-100 -97.1	-97 -94.7	-95.2	-92.5	TDD
CA_1A-3A-28A				-89.8	-94.7 -89.4	-93.2 -89	-92.5	וטט
	1							
	3			-97	-94	-92.2	-91	FDD
	28			-98.3	-95.3	-93.5	-90.8	
00 40 00 400 9.10	1			-99.8	-96.8	-95	-93.8	FDD
CA_1A-3A-42A ^{9,10}	3 42			-96.8 -71.7	-93.8	-92	-90.8	TDD
	1			-99.8	-71.7 -96.8	-71.7 -95	-71.7 -93.8	טטו
CA_1A-3A-42A ¹¹	3			-96.8	-93.8	-92	-90.8	FDD
O/_1/\ O/\ 12/\	42			-97.1	-94.7	-93.2	-92.5	TDD
	1			-100	-97	-95.2	-94	
CA_1A-7A-8A ^{5,6}	7				-87.4	-87	-86.7	FDD
• <u>.</u>	8			-96.8	-93.8	0.	3311	
				-89.8	-89.4	-89	-88.7	
CA 4A 7A 00A 5.6	1			-09.0				רכי
CA_1A-7A-28A ^{5,6}	7			22.5	-95	-93.2	-92	FDD
	28			-98.3	-95.3	-93.5		
	1			N/A	N/A	N/A	N/A	
CA_1A-19A-28A ¹⁴	19			N/A	N/A	N/A		FDD
	28			N/A	N/A			
04 44 0045614	1			-89.8	-89.4	-89	-88.7	
CA_1A-28A ^{5,6,14}	28			-98.3	-95.3	-93.5	-90.8	FDD
	2			-97.7	-94.7	-92.9	-91.7	
CA_2A-4A-12A ^{5,6}	4			-90	-89.5	-89	-88.5	FDD
	12			-96.5	-93.5			<u> </u>
	3	_		N/A	N/A	N/A	N/A	
CA_3A-7A-8A ^{4,5,6}	7				-87.4	-87	-86.7	FDD
	8			-96.8	-93.8			
	3			N/A	N/A	N/A	N/A	
CA_3A-8A ⁴			NI/A			IN/A	IN/A	FDD
	8		N/A	N/A	N/A	00	00.0	
CA_3A-19A-42A ^{9,10}	3			-96.8 100	-93.8	-92	-90.8	FDD
	19		<u> </u>	-100	-97	-95.2		L

	42			-71.7	-71.7	-71.7	-71.7	TDD
	3			-96.8	-93.8	-92	-90.8	רחח
CA_3A-19A-42A ¹¹	19			-100	-97	-95.2		FDD
	42			-97.1	-94.7	-93.2	-92.5	TDD
	3			-97	-94	-92.2	-91	FDD
CA_3A-28A-40A ^{15,16}	28			-60.7	-60.7	-60.7	-60.7	רטט
	40			-100	-97	-95.2	-94	TDD
45.40	3			-97	-94	-92.2	-91	FDD
CA_3A-28A-40C ^{15,16}	28			-60.7	-60.7	-60.7	-60.7	טט ו
	40			-100	-97	-95.2	-94	TDD
CA_3A-31A ^{12,13}	3			-86.9	-86.4	-86	-85.6	רחח
CA_3A-31A	31		-95.5	-93.3				FDD
CA_3A-42A ^{9,10}	3			-96.8	-93.8	-92	-90.8	FDD
CA_3A-42A	42			-71.7	-71.7	-71.7	-71.7	TDD
04 04 40411	3			-96.8	-93.8	-92	-90.8	FDD
CA_3A-42A ¹¹	42			-97.1	-94.7	-93.2	-92.5	TDD
	4			-90	-89.5	-89	-88.5	
CA_4A-5A-12A ^{5,6}	5			-97.5	-94.5			FDD
	12			-96.5	-93.5			
	4			-90	-89.5	-89	-88.5	
CA_4A-4A-5A-12A ^{5,6}	5			-97.5	-94.5			FDD
_	12			-96.5	-93.5			
	4			[-90]	[-89.5]	[-89]	[-88.5]	FDD
CA_4A-7A-12A ^{5,6}	7			-97.5	-94.5			
_	12			-96.5	-93.5			
CA_4A-12A ^{5,6}	4	-89.2	-89.2	-90	-89.5	-89	-88.5	FDD
	12		-98.2	-96.5	-93.5			
5.0	4		00.2	-90	-89.5			
CA_4A-17A ^{5,6}	17			-96.5	-93.5			FDD
F.C.	4			-89.8	-89.4	-89	-88.7	
CA_4A-28A ^{5,6}	28			-98.3	-95.3	-93.5	-90.8	FDD
10	5			N/A	N/A	00.0	00.0	FDD
CA_5A-38A ¹⁹	38			N/A	N/A	N/A	N/A	TDD
.	7				-87.4	-87	-86.7	
CA_7A-8A ^{5,6}	8		-99	-96.8	-93.8			FDD
	7				-87.4	-87	-86.7	
CA_7A-8A-20A ^{5,6}	8		-99	-96.8	-93.8			FDD
_	20			[-96.8]	[-93.8]			
0.0.0.0.44.0.8	8	N/A	N/A	N/A	N/A			FDD
CA_8A-41A ⁸	41				N/A	N/A	N/A	TDD
OA 00A 40A 15.16	20			-60.7	-60.7	-60.7	-60.7	FDD
CA_20A-40A ^{15,16}	40			-100	-97	-95.2	-94	TDD
0.4 00.4 44.48	26			N/A	N/A	N/A		FDD
CA_26A-41A ⁸	41			N/A	N/A	N/A	N/A	TDD
CA_28A-40A ^{15,16}	28			-60.7	-60.7	-60.7	-60.7	FDD
CA_26A-40A	40			-100	-97	-95.2	-94	TDD
CA_28A-40C ^{15,16}	28			-60.7	-60.7	-60.7	-60.7	FDD
CA_20A-40C	40			-100	-97	-95.2	-94	TDD
CA_28A-40D ^{15,16}	28			-60.7	-60.7	-60.7	-60.7	FDD
CA_20A-40D	40			-100	-97	-95.2	-94	TDD
CA_28A-42A ^{17,18}	28			-98.3	-95.3	-93.5	-92.3	FDD
UA_2UA*42A	42			-85.7	-85.4	-85.1	-84.9	TDD
	12							
CA_28A-42C ^{17,18}	28			-98.3 -85.7	-95.3 -85.4	-93.5 -85.1	-92.3 -84.9	FDD TDD

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

NOTE 3: The signal power is specified per port

NOTE 4: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.1 apply).

NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission

- bandwidth of a high band.
- NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \left \lfloor f_{DL}^{HB} / 0.3 \right \rfloor 0.1 \text{ in MHz and } F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 < f_{UL}^{LB} < F_{UL_high}^{LB} BW_{Channel}^{LB} / 2 \text{ with } f_{DL}^{HB} \text{ the carrier frequency of a high band in MHz and } BW_{Channel}^{LB} \text{ the channel bandwidth configured in the low band.}$
- NOTE 7: Void.
- NOTE 8: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.1 apply).
- NOTE 9: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range ΔF_{HD} above and below the edge of this downlink transmission bandwidth. The value ΔF_{HD} depends on the E-UTRA configuration: $\Delta F_{HD} = 10$ MHz for CA_3A-42A, CA_3A-42C, CA_1A-3A-42A, CA_1A-3A-42C, CA_3A-19A-42A, CA_3A-19A-42C.
- NOTE 10: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \left \lfloor f_{DL}^{HB} / 0.2 \right \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 < f_{UL}^{LB} < F_{UL_high}^{LB} BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.
- NOTE 11: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm \left(20 + BW_{Channel}^{HB}/2\right) \text{ MHz offset from } 2f_{UL}^{LB} \text{ in the victim (higher band) with} \\ F_{UL_low}^{LB} + BW_{Channel}^{LB}/2 < f_{UL}^{LB} < F_{UL_high}^{LB} BW_{Channel}^{LB}/2 \text{ , where } BW_{Channel}^{LB} \text{ and } BW_{Channel}^{HB} \text{ are the channel} \\ \text{bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.}$
- NOTE 12: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a high band.
- NOTE 13: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{\scriptscriptstyle UL}^{\scriptscriptstyle LB} = \left\lfloor f_{\scriptscriptstyle DL}^{\scriptscriptstyle HB} / 0.4 \right\rfloor 0.1 \, \text{in MHz and} \ F_{\scriptscriptstyle UL_low}^{\scriptscriptstyle LB} + BW_{\scriptscriptstyle Channel}^{\scriptscriptstyle LB} / 2 < f_{\scriptscriptstyle UL}^{\scriptscriptstyle LB} < F_{\scriptscriptstyle UL_high}^{\scriptscriptstyle LB} BW_{\scriptscriptstyle Channel}^{\scriptscriptstyle LB} / 2 \, \text{ with } f_{\scriptscriptstyle DL}^{\scriptscriptstyle HB} \, \text{ the carrier frequency of a high band in MHz and} \ BW_{\scriptscriptstyle Channel}^{\scriptscriptstyle LB} \, \text{ the channel bandwidth configured in the low band.}$
- NOTE 14: For the UE that supports CA_1A-19A-28A, no requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity should only be verified when this is not the case (the requirements specified in clause 7.3.1 apply).
- NOTE 15: These requirements apply when there is at least one individual RE within the downlink transmission bandwidth of the victim (lower) band for which the 3rd harmonic is within the uplink transmission bandwidth or the uplink adjacent channel's transmission bandwidth of an aggressor (higher) band.
- NOTE 16: The requirements should be verified for UL EARFCN of the aggressor (higher) band (superscript HB) such that $f_{DL}^{LB} = \left \lfloor f_{UL}^{HB} / 0.3 \right \rfloor 0.1$ in MHz and $F_{UL_low}^{HB} + BW_{Channel}^{HB} / 2 < f_{UL}^{HB} < F_{UL_high}^{HB} BW_{Channel}^{HB} / 2$ with f_{DL}^{LB} the carrier frequency in the victim (lower) band and $BW_{Channel}^{HB}$ the channel bandwidth configured in the higher band.
- NOTE 17: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 4th transmitter harmonic is within the downlink transmission bandwidth of a high band.
- NOTE 18: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{\scriptscriptstyle UL}^{\scriptscriptstyle LB} = \left\lfloor f_{\scriptscriptstyle DL}^{\scriptscriptstyle HB} / 0.4 \right\rfloor 0.1 \, \text{in MHz and} \ F_{\scriptscriptstyle UL_low}^{\scriptscriptstyle LB} + BW_{\scriptscriptstyle Channel}^{\scriptscriptstyle LB} / 2 < f_{\scriptscriptstyle UL}^{\scriptscriptstyle LB} < F_{\scriptscriptstyle UL_high}^{\scriptscriptstyle LB} BW_{\scriptscriptstyle Channel}^{\scriptscriptstyle LB} / 2 \, \text{ with } f_{\scriptscriptstyle DL}^{\scriptscriptstyle HB} \, \text{ the carrier frequency of a high band in MHz and} \ BW_{\scriptscriptstyle Channel}^{\scriptscriptstyle LB} \, \text{ the channel bandwidth configured in the low band}$
- NOTE 19: No requirements apply for the case that there is at least one individual RE within the uplink transmission bandwidth of the relative higher band and when the frequency range of relative higher band's uplink channel bandwidth or uplink 1st adjacent channel bandwidth is fully or partially overlapped with the 3 times of the frequency range of the relative lower band's downlink channel bandwidth. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.1 apply).

Table 7.3.1A-0b: Uplink configuration for the low band (exceptions)

E-UTRA Band / Channel bandwidth of the high band / N _{RB} / Duplex mode									
EUTRA CA Configuration	UL band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duple x mode	
CA_1A-3A-7A-8A	8				16	25	25	FDD	
CA_1A-3A-19A-42A	3			12	25	36	50	FDD	
CA_1A-3A-19A-42C	3			12	25	36	50	FDD	
CA_1A-3A-28A	28			8	16	25	25	FDD	
CA_1A-3A-42A	3			12	25	36	50	FDD	
CA_1A-7A-8A	8				16	25	25	FDD	
CA_1A-7A-28A	28			8	16	25	25	FDD	
CA_1A-28A	28			8	16	25	25	FDD	
CA_2A-4A-12A	12			8	16	20	20	FDD	
CA_3A-7A-8A	8				16	25	25	FDD	
CA_3A-19A-42A	3			12	25	36	50	FDD	
CA_3A-42A	3			12	25	36	50	FDD	
CA_4A-4A-5A-12A	12			8	16			FDD	
CA_4A-5A-12A	12			8	16	20	20	FDD	
CA_4A-7A-12A	12			8	16	20	20	FDD	
CA_4A-12A	12	2	5	8	16	20	20	FDD	
CA_4A-17A	17			8	16			FDD	
CA_4A-28A	28			[8]	[16]	[25]	[25]	FDD	
CA_7A-8A	8				16	25	25	FDD	
CA_7A-8A-20A	8				16	25	25	FDD	
CA_20A-40A ³	40			25	50	75	100	FDD	
CA_28A-40A	40			25	50	75	100	TDD	
CA_28A-40C	40			25	50	75	100	TDD	

NOTE 1: refers to the UL resource blocks, which shall be centred within the transmission bandwidth configuration for the channel bandwidth.

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3.1A-0bA, exceptions are allowed when the uplink is active within a specified frequency range as noted in Table 7.3.1A-0bA. For these exceptions, the UE shall meet the requirements specified in Table 7.3.1A-0bA and Table 7.3.1A-0bB.

NOTE 2: the UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.1-2 for the uplink bandwidth in which case the allocation according to Table 7.3.1-2 applies.

NOTE 3: ³ refers to the UL resource blocks shall be located between 2373-2400MHz.

Table 7.3.1A-0bA: Reference sensitivity for carrier aggregation QPSK P_{REFSENS, CA} (exceptions for two bands)

			Channel ba	andwidth				
EUTRA CA Configuration	EUTRA band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex mode
CA_1A-3A ⁴	1			-100	-97	-95.2	-94	FDD
CA_TA-3A	3			-94	-91.5	-90	-89	FDD
CA_1A-3A ⁵	1			-100	-97	-95.2	-94	FDD
CA_TA-3A	3			-97	-94	-92.2	-91	FDD
CA_1A-3C ⁴	1			-100	-97	-95.2	-94	FDD
CA_TA-3C	3			-94	-91.5	-90	-89	FDD
CA 1A-3C ⁵	1			-100	-97	-95.2	-94	רככ
CA_1A-3C	3			-97	-94	-92.2	-91	FDD
CA_18A-28A ⁶	18			-100	-97	-95.2		FDD
CA_16A-28A	28			-94	-92.5			רטט
CA 10A 29A ⁷	19			-100	-97	-95.2		רטט
CA_19A-28A ⁷	28			-94	-92			FDD

- NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A.
- NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
- NOTE 3: The signal power is specified per port
- NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.
- NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3, the requirement applies regardless of channel bandwidth in Band 1.
- NOTE 6: These requirements apply when the uplink is active in Band 18 and the downlink channels in Band 28 are confined within the restricted frequency range specified for this CA configuration (Table 5.5A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 18.
- NOTE 7: These requirements apply when the uplink is active in Band 19 and the downlink channels in Band 28 are allocated at the middle of the restricted frequency range specified for this CA configuration (Table 5.5A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 19.

Table 7.3.1A-0bB: Uplink configuration for the uplink band (exceptions for two bands)

	E-UT	RA Band / Ch	annel band	dwidth / N	I _{RB} / Duple	x mode		
EUTRA CA Configuration	UL band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex mode
CA_1A-3A ^{1, 2}	1			25	25	25	25	FDD
CA_1A-3A ^{1, 3}	1			25	45	45	45	FDD
CA_1A-3C ^{1, 2}	1			25	25	25	25	FDD
CA_1A-3C ^{1, 3}	1			25	45	45	45	FDD
CA_18A-28A ⁴	18			18	18	18		FDD
CA_19A-28A ⁴	19			18	18	18		FDD

- NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.
- NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz
- NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.
- NOTE 4: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 28 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3.1A-0bC, exceptions are allowed when the uplink is active within a specified frequency range as noted in Table 7.3.1A-0bC. For these exceptions, the UE shall meet the requirements specified in Table 7.3.1A-0bC and Table 7.3.1A-0bD.

Table 7.3.1A-0bC: Reference sensitivity for carrier aggregation QPSK $P_{\text{REFSENS, CA}}$ (exceptions for three bands)

Channel bandwidth											
EUTRA CA Configuration	EUTRA band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex mode			
	1			-100	-97	-95.2	-94				
CA_1A-3A-5A ⁴	3			-94	-91.5	-90	-89	FDD			
	5			-98	-95						
	1			-100	-97	-95.2	-94				
CA_1A-3A-5A ⁵	3			-97	-94	-92.2	-91	FDD			
_	5			-98	-95						
	1			-100	-97	-95.2	-94				
CA_1A-3A-7A ⁹	3			-94	-91.5	-90	-89	FDD			
	7				-95	-93.2	-92				
	1			-100	-97	-95.2	-94				
CA_1A-3A-7A ¹⁰	3			-97	-94	-92.2	-91	FDD			
o, _ , , , , , , , , , , , , , , , , , ,	7			0.	-95	-93.2	-92	1 . 55			
	1			-100	-97	-95.2	-94				
CA_1A-3A-8A ⁴	3			-94	-91.5	-90	-89	FDD			
OA_1A-3A-0A	8		-99.2	-9 7	-94	-30	-03	100			
	1		-33.2	-100	-97	-95.2	-94				
CA_1A-3A-8A ⁵	3			-97	-94	-93.2	-9 4 -91	FDD			
CA_TA-SA-6A	8		-99.2	-97 -97	-94	-32.2	-31	רטט			
	1		-99.2	-100	-9 4 -97	-95.2	-94				
CA_1A-3A-19A ⁴	_							EDD			
CA_1A-3A-19A	3			-94	-91.5	-90	-89	FDD			
	19			-100	-97	-95.2	0.4				
04 44 04 4045	1			-100	-97	-95.2	-94				
CA_1A-3A-19A ⁵	3			-97	-94	-92.2	-91	FDD			
	19			-100	-97	-95.2	0.4				
4	1			-100	-97	-95.2	-94				
CA_1A-3A-20A ⁴	3			-94	-91.5	-90	-89	FDD			
	20			-97	-94	-91.2	-90				
E	1			-100	-97	-95.2	-94				
CA_1A-3A-20A ⁵	3			-97	-94	-92.2	-91	FDD			
	20			-97	-94	-91.2	-90				
	1			-100	-97	-95.2	-94				
CA_1A-3A-26A ⁴	3			-94	-91.5	-90	-89	FDD			
	26			-97.5 ⁷	-94.5 ⁷						
	1			-100	-97	-95.2	-94				
CA_1A-3A-26A ⁵	3			-97	-94	-92.2	-91	FDD			
	26			-97.5 ⁷	-94.5 ⁷						
	1			-100	-97	-95.2	-94				
CA_1A-3A-28A ⁴	3			-94	-91.5	-90	-89	FDD			
	28			-98.3	-95.3	-93.5	-90.8				
	1			-100	-97	-95.2	-94				
CA_1A-3A-28A ⁵	3			-97	-94	-92.2	-91	FDD			
	28			-98.3	-95.3	-93.5	-90.8	1			
	1			-99.8	-96.8	-95	-93.8	E5.5			
CA_1A-3A-42A ⁴	3			-93.8	-91.3	-89.8	-88.8	FDD			
_	42		1	-98.5	-95.5	-93.7	-92.5	TDD			
	1			-99.8	-96.8	-95	-93.8				
CA_1A-3A-42A ⁵	3			-96.8	-93.8	-92	-90.8	— ⊢I)I)			
	42		†	-98.5	-95.5	-93.7	-92.5	TDD			

	1		-99.8	-96.8	-95	-93.8	FDD
CA_1A-3A-42C ⁴	3		-93.8	-91.3	-89.8	-88.8	רטט
	42		-98.5	-95.5	-93.7	-92.5	TDD
	1		-99.8	-96.8	-95	-93.8	FDD
CA_1A-3A-42C ⁵	3		-96.8	-93.8	-92	-90.8	רטט
	42		-98.5	-95.5	-93.7	-92.5	TDD
	1		-100	-97	-95.2	-94	
CA_1A-18A-28A ⁶	18		-100	-97	-95.2		FDD
	28		-94	-92.5			
	1		-100	-97	-95.2	-94	
CA_1A-19A-28A ⁸	19		-100	-97	-95.2		FDD
	28		-94	-92			

- NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A.
- NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
- NOTE 3: The signal power is specified per port
- NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3 and Band 5 or Band 8 or Band 19 or Band 20 or Band 26 or Band 28 or Band 42, the requirement applies regardless of channel bandwidth in Band 1.
- NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3 and Band 5 or Band 8 or Band 19 or Band 20 or Band 26 or Band 28 or Band 42, the requirement applies regardless of channel bandwidth in Band 1.
- NOTE 6: These requirements apply when the uplink is active in Band 18 and the downlink channels in Band 28 are confined within the restricted frequency range specified for this CA configuration (Table 5.5A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 18.
- NOTE 7: ⁷ indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
- NOTE 8: These requirements apply when the uplink is active in Band 19 and the downlink channels in Band 28 are allocated at the middle of the restricted frequency range specified for this CA configuration (Table 5.5A-2). For each channel bandwidth in Band 28, the requirement applies regardless of channel bandwidth in Band 19.
- NOTE 9: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in Band 3 and Band 7, the requirement applies regardless of channel bandwidth in Band 1.
- NOTE 10: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in Band 3 and Band 7, the requirement applies regardless of channel bandwidth in Band 1.

Table 7.3.1A-0bD: Uplink configuration for the uplink band (exceptions for three bands)

E-UTRA Band / Channel bandwidth / N _{RB} / Duplex mode											
EUTRA CA Configuration	UL band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex mode			
CA_1A-3A-5A ^{1, 2}	1			25	25	25	25	FDD			
CA_1A-3A-5A ^{1, 3}	1			25	45	45	45	FDD			
CA_1A-3A-7A ^{5, 6}	1			25	25	25	25	FDD			
CA_1A-3A-7A ^{5, 7}	1			25	45	45	45	FDD			
CA_1A-3A-8A ^{1, 2}	1			25	25	25	25	FDD			
CA_1A-3A-8A ^{1, 3}	1			25	45	45	45	FDD			
CA_1A-3A-19A ^{1, 2}	1			25	25	25	25	FDD			
CA_1A-3A-19A ^{1, 3}	1			25	45	45	45	FDD			
CA_1A-3A-20A ^{1, 2}	1			25	25	25	25	FDD			
CA_1A-3A-20A ^{1, 3}	1			25	45	45	45	FDD			
CA_1A-3A-26A ^{1, 2}	1			25	25	25	25	FDD			
CA_1A-3A-26A ^{1, 3}	1			25	45	45	45	FDD			
CA_1A-3A-28A ^{1, 2}	1			25	25	25	25	FDD			
CA_1A-3A-28A ^{1, 3}	1			25	45	45	45	FDD			
CA_1A-3A-42A ^{1, 2}	1			25	25	25	25	FDD			
CA_1A-3A-42A ^{1, 3}	1			25	45	45	45	FDD			
CA_1A-3A-42C ^{1, 2}	1			25	25	25	25	FDD			
CA_1A-3A-42C ^{1, 3}	1			25	45	45	45	FDD			
CA_1A-18A-28A ⁴	18			18	18	18		FDD			
CA_1A-19A-28A ⁴	19			18	18	18		FDD			

- NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.
- NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz
- NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.
- NOTE 4: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 28 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).
- NOTE 5: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.
- NOTE 6: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz
- NOTE 7: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3.1A-0bD1, exceptions are allowed when the uplink is active within a specified frequency range as noted in Table 7.3.1A-0bD1. For these exceptions, the UE shall meet the requirements specified in Table 7.3.1A-0bD1 and Table 7.3.1A-0bD2.

Table 7.3.1A-0bD1: Reference sensitivity for carrier aggregation QPSK P_{REFSENS, CA} (exceptions for four bands)

Channel bandwidth											
EUTRA CA Configuration	EUTRA band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex mode			
	1	-		-100	-97	-95.2	-94				
	3 ⁴			-94	-91.5	-90	-89	FDD			
CA_1A-3A-5A-40A	3 ⁵			-97	-94	-92.2	-91	רטט			
	5			-98	-95						
	40				-91.9	-90.4	-89.4	TDD			
	1			-100	-97	-95.2	-94				
	3 ⁴			-94	-91.5	-90	-89				
CA_1A-3A-7A-8A	3^5			-97	-94	-92.2	-91	FDD			
	7				-95	-93.2	-92				
	8			-96.8	-93.8						
	1			-100	-97	-95.2	-94	FDD			
	3 ⁴			-94	-91.5	-90	-89				
CA_1A-3A-8A-40A	3 ⁵			-97	-94	-92.2	-91				
	8		-99.2	-97	-94						
	40			[-93.4]	-91.9	-90.4	-89.4	TDD			
	1			-99.8	-96.8	-95	-93.8				
	3 ⁴			-93.8	-91.3	-89.8	-88.8	FDD			
CA_1A-3A-19A-42A	3 ⁵			-96.8	-93.8	-92	-90.8	רטט			
	19			-100	-97	-95.2					
	42			-98.5	-95.5	-93.7	-92.5	TDD			
	1			-99.8	-96.8	-95	-93.8				
CA_1A-3A-19A-42C	3 ⁴			-93.8	-91.3	-89.8	-88.8	FDD			
	3 ⁵			-96.8	-93.8	-92	-90.8	רטט			
	19			-100	-97	-95.2					
	42			-98.5	-95.5	-93.7	-92.5	TDD			

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

NOTE 3: The signal power is specified per port

NOTE 4: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.

NOTE 5: These requirements apply when the uplink is active in Band 1 and the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz. For each channel bandwidth in the bands other than Band 1, the requirement applies regardless of channel bandwidth in Band 1.

Table 7.3.1A-0bD2: Uplink configuration for the low band (exceptions for four bands)

	E-UTRA Band / Channel bandwidth / N _{RB} / Duplex mode										
EUTRA CA Configuration	UL band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex mode			
CA_1A-3A-5A-40A	1 ^{1,2}			25	25	25	25				
CA_1A-3A-7A-8A CA_1A-3A-8A-40A CA_1A-3A-19A-42A	1 ^{1,3}			25	45	45	45	FDD			
CA 1A 2A 10A 12C	1 ^{1,2}			25	25	25	25	FDD			
CA_1A-3A-19A-42C	1 ^{1,3}			25	45	45	45	רטט			

- NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink channel in Band 3 but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1) in the uplink channel in Band 1.
- NOTE 2: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is < 60 MHz
- NOTE 3: UL allocation when the separation between the lower edge of the uplink channel in Band 1 and the upper edge of the downlink channel in Band 3 is ≥ 60 MHz.

For the UE that supports any of the E-UTRA CA configurations given in Table 7.3.1A-0bE, UE shall meet the reference sensitivities specified in Table 7.3.1A-0bE and Table 7.3.1A-0bF.

Table 7.3.1A-0bE: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA

	EUTR		C	hannel b	andwidth			Duple	Applicabl
EUTRA CA Configuration	A band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	x mode	e active UL band
	1			-100	-97	-95.2	-94	ļ	
CA_1-3A-5A-40A	3			-97	-94	-92.2	-91	FDD	3
5 71 <u>−</u> 1 571 571	5			-98	-95				
	40				-92.9	-91.3	-90.2	TDD	
	1			-91.7	[-89.5]	[-87.9]	[-86.9]	ļ	
CA 1-3A-5A-40A	3			-94.2	-91.2	-89.5	-88.3	FDD	40
0/1_1 0/1 0/1 10/1	5			-98	-95				"
	40				-97	-95.2	-94	TDD	
	1			-100	-97	-95.2	-94		
CA_1-3A-8A-40A	3			-97	-94	-92.2	-91	FDD	3
0/1_1 0/1 0/1 1 0/1	8		-99.2	-97	-94				J
	40			-95.4	-92.9	-91.3	-90.2	TDD	
	1			-91.7	[-89.5]	[-87.9]	[-86.9]		
CA_1-3A-8A-40A	3			-94.2	-91.2	-89.5	-88.3	FDD	40
OA_1-3A-0A-40A	8		-99.2	-97	-94				40
	40			-100	-97	-95.2	-94	TDD	
	1			-100	-97	-95.2	-94	FDD	
CA_1A-3A-40A	3			-97	-94	-92.2	-91	טטיז	3
	40			-100	-92.9	-91.3	-90.2	TDD	
	1			-91.7	[-89.5]	[-87.9]	[-86.9]	FDD	
CA_1A-3A-40A	3			-94.2	-91.2	-89.5	-88.3	טט ד	40
	40			-100	-97	-95.2	-94	TDD	
	1			-100	-97	-95.2	-94		
CA_1A-3A-40A	3			-97	-94	-92.2	-91	FDD	1
_	40			[-93.4]	-91.3	-90	-88.9	TDD	
	1			-100	-97	-95.2	-94		
CA_1A-5A-40A	5			-98	-95		-	FDD	1
	40				-91.9	-90.4	-89.4	TDD	
	1			-91.7	[-89.5]	[-87.9]	[-86.9]		
CA_1A-5A-40A	5			-98	-95	[00]	[00.0]	FDD	40
	40				-97	-95.2	-94	TDD	
	1			-100	-97	-95.2	-94	155	
CA_1A-8A-40A	8		-99.2	-97	-94	00.2	01	FDD	1
Gr_nrorrior	40		00.2	[-93.4]	-91.9	-90.4	-89.4	TDD	'
	1			-91.7	[-89.5]	[-87.9]	[-86.9]	100	
CA_1A-8A-40A	8		-99.2	-97	-94	[07.0]	[00.0]	FDD	40
0A_1A-0A- 1 0A	40		-33.2	-100	-97	-95.2	-94	TDD	70
	1			-100	-97	-95.2	-94	FDD	
CA_1A-40A	40				-91.9	-90.4	-89.4	TDD	1
				[-93.4]					
CA_1A-40A	1			-91.7	[-89.5]	[-87.9] -95.2	[-86.9] -94	FDD	40
	40			-100	-97			TDD	
04 04 54 104	3			-97	-94	-92.2	-91	FDD	
CA_3A-5A-40A	5			-98	-95	04.0	00.0	TDD	3
	40			6.1-	-92.9	-91.3	-90.2	TDD	
	3			-94.2	-91.2	-89.5	-88.3	FDD	
CA_3A-5A-40A	5			-98	-95	c= -			40
	40				-97	-95.2	-94	TDD	
CA_3A-7A-38A	3			-97	-94	-92.2	-91	FDD	3

	7		[-93.8]	[-91.2]	[-89.7]	[-88.6]		
	38		[-93.8]	[-91.2]	[-89.7]	[-88.6]	TDD	
	3		-97	-94	-92.2	-91	100	
CA_3A-8A-40A	8	-99.2	-97	-94	-32.2	-31	FDD	3
OA_5A-6A- 4 6A	40	-55.2	-95.4	-92.9	-91.3	-90.2	TDD	3
	3		-94.2	-92.9	-89.5	-88.3	100	
CA_3A-8A-40A	8	-99.2	-94.2	-91.2 -94	-09.5	-00.3	FDD	40
CA_3A-6A-40A	40	-99.2	-100	-9 4 -97	-95.2	-94	TDD	40
	3		-100	-94	-92.2		טטו	
CA 2A 20A 40A			ļ		-92.2	-91 -91	FDD	2
CA_3A-28A-40A	28		-98.5	-95.5			TDD	3
	40		-95.4	-92.9	-91.3	-90.2	טטו	
04 04 004 404	3		-94.2	-91.2	-89.5	-88.3	FDD	40
CA_3A-28A-40A	28		-96.8	-94.1	-92.5	-89.8		40
	40		-100	-97	-95.2	-94	TDD	
	3		-97	-94	-92.2	-91	FDD	
CA_3A-28A-40A	28		-98.5	-95.5	-93.7	-91		28
	40		-95.1	-92.9	-91.4	-90.5	TDD	
	3		-97	-94	-92.2	-91	FDD	
CA_3A-28A-40C	28		-98.5	-95.5	-93.7	-91		3
	40		-95.4	-92.9	-91.3	-90.2	TDD	
	3		-97	-94	-92.2	-91	FDD	
CA_3A-28A-40C	28		-98.5	-95.5	-93.7	-91		28
	40		-95.1	-92.9	-91.4	-90.5	TDD	
	3		-94.2	-91.2	-89.5	-88.3	FDD	
CA_3A-28A-40C	28		-96.8	-94.1	-92.5	-89.8	100	40
	40		-100	-97	-95.2	-94	TDD	
CA_3A-40A	3		-97	-94	-92.2	-91	FDD	3
OA_3A-40A	40		[-95.4]	[-92.9]	[-91.3]	[-90.2]	TDD	3
CA_3A-40A	3		[-94.2]	[-91.2]	[-89.5]	[-88.3]	FDD	40
CA_3A-40A	40		-100	-97	-95.2	-94	TDD	40
CA_3A-40C	3		-97	-94	-92.2	-91	FDD	3
CA_3A-40C	40		[-95.4]	[-92.9]	[-91.3]	[-90.2]	TDD	3
CA 2A 40C	3		[-94.2]	[-91.2]	[-89.5]	[-88.3]	FDD	40
CA_3A-40C	40		-100	-97	-95.2	-94	TDD	40
	3		[-94]	[-91]	[-89.2]	[-87.9]	FDD	44
CA 2A 44 A 5	41		-97.5	-94.5	-92.7	-91.5	TDD	41
CA_3A-41A ⁵	3		-97	-94	-92.2	-91	FDD	0
	41		[-93.3]	[-90.7]	[-89.2]	[-88.1]	TDD	3
	3		[-94]	[-91]	[-89.2]	[-87.9]	FDD	4.4
04 04 44 05	41		-97.5	-94.5	-92.7	-91.5	TDD	41
CA_3A-41C ⁵	3		-97	-94	-92.2	-91	FDD	0
	41		[-93.3]	[-90.7]	[-89.2]	[-88.1]	TDD	3
	3		-96.5	-93.5	-91.7	-90.5	FDD	
CA_3A-41A-42A ^{5,6,7,8}	41		[-93.3]	[-90.7]	[-89.2]	[-88.1]		3
	42		-71.7	-71.7	-71.7	-71.7	TDD	
	3		-96.5	-93.5	-91.7	-90.5	FDD	
CA_3A-41A-42A ^{5,6,9}	41		[-93.3]	[-90.7]	[-89.2]	[-88.1]		3
	42		-97.1	-94.7	-93.2	-92.5	TDD	-
	3		-96.5	-93.5	-91.7	-90.5	FDD	
CA_3A-41A-42A ^{5,6,10}	41		-97.5	-94.5	-92.7	-91.5		42
<u> </u>	42		-98.5	-95.5	-93.7	-92.5	TDD	
5040	3		[-93.5]	[-90.5]	[-88.7]	[-87.4]	FDD	
CA_3A-41A-42A ^{5,6,10}	41		-97.5	-94.5	-92.7	-91.5	TDD	41
			07.0	5 1.0	52.1	51.0	ני.	

		I I	1	1	1		1	
	42		-98.5	-95.5	-93.7	-92.5		
	7		-98	-95	-93.2	-92	FDD	7
CA_7A-40A	40		-96.3	-93.6	-92	-90.9	TDD	,
O/_//\ 40/\	7		-97.1	-94.3	-92.7	-91.5	FDD	40
	40		-99.5	-96.5	-94.7	-93.5	TDD	40
	7		-98	-95	-93.2	-92	FDD	7
CA_7A-40C	40		-96.3	-93.6	-92	-90.9	TDD	,
UA_7A-40C	7		-97.1	-94.3	-92.7	-91.5	FDD	40
	40		-99.5	-96.5	-94.7	-93.5	TDD	40
	7		-98	-95	-93.2	-92	FDD	7
CA 7A 40A	42		-95.6	-93	-91.5	-90.4	TDD	,
CA_7A-42A	7		-96.2	-93.2	-91.5	-90.3	FDD	40
	42		-98.5	-95.5	-93.7	-92.5	TDD	42
	7		-98	-95	-93.2	-92	FDD	7
04 74 404 404	42		-95.6	-93	-91.5	-90.4	TDD	7
CA_7A-42A-42A	7		-96.2	-93.2	-91.5	-90.3	FDD	40
	42		-98.5	-95.5	-93.7	-92.5	TDD	42
04 004 404	28		-98.5	-95.5	-93.7	-91	FDD	00
CA_28A-40A	40		-95.1	-92.9	-91.4	-90.5	TDD	28
04 004 404	28		-96.8	-94.1	-92.5	-89.8	FDD	40
CA_28A-40A	40		-100	-97	-95.2	-94	TDD	40
04 004 400	28		-98.5	-95.5	-93.7	-91	FDD	0.0
CA_28A-40C	40		-95.1	-92.9	-91.4	-90.5	TDD	28
04 004 400	28		-96.8	-94.1	-92.5	-89.8	FDD	40
CA_28A-40C	40		-100	-97	-95.2	-94	TDD	40
04 004 405	28		-98.5	-95.5	-93.7	-91		
CA_28A-40D	40		-95.1	-92.9	-91.4	-90.5	FDD	28
	28		-96.8	-94.1	-92.5	-89.8		
CA_28A-40D	40		-100	-97	-95.2	-94	FDD	40
		<u> </u>			l		l	

- NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A
- NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
- NOTE 3: The signal power is specified per port
- NOTE 4: These requirements apply regardless of the channel bandwidth and the location of UL band.
- NOTE 5: The B41 requirements are modified by -0.5dB when carrier frequency of the assigned E-UTRA channel bandwidth is within 2545-2690 MHz.
- NOTE 6: The antenna isolation for MSD calculation is assumed as 10 dB. For conducted mode REFSENS test such antenna isolation is not observed as the antennas are disconnected. Additionally antenna isolation assumption is under discussion depending on the frequency range
- NOTE 7: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range ΔF_{HD} above and below the edge of this downlink transmission bandwidth. The value ΔF_{HD} depends on the E-UTRA configuration: ΔF_{HD} = 10 MHz for CA_3A-42A, CA_3A-42C, CA_1A-3A-42A, CA_1A-3A-42C, CA_3A-19A-42A and CA_1A-3A-19A-42A.
- NOTE 8: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript LB) such that $f_{UL}^{LB} = \left \lfloor f_{DL}^{HB} / 0.2 \right \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 < f_{UL_high}^{LB} BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.
- NOTE 9: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm \left(20 + BW_{Channel}^{HB} / 2\right)$ MHz offset from $2f_{UL}^{LB}$ in the victim (higher band) with $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 < f_{UL}^{LB} < F_{UL_high}^{LB} BW_{Channel}^{LB} / 2$, where $BW_{Channel}^{LB}$ are the channel bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.
- NOTE 10: Only applicable for UE supporting inter-band carrier aggregation with uplink in one E-UTRA band and without simultaneous Rx/Tx.

Table 7.3.1A-0bF: Uplink configuration for reference sensitivity

E-UTRA Band / Channel bandwidth / N _{RB} / Duplex mode											
EUTRA CA Configuration	E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode			
	1			25	50	75	100	FDD			
CA_1A-3A-40A	3			25	50	50 ¹	50 ¹	FDD			
	40			25	50	75	100	TDD			
CA_1A-5A-40A	1			25	50	75	100	FDD			
	1			25	50	75	100	FDD			
CA_1A-8A-40A	8		15	25	25 ¹			FDD			
	40			25	50	75	100	TDD			
CA 4A 40A	1			25	50	75	100	FDD			
CA_1A-40A	40			25	50	75	100	TDD			
CA_3A-7A-38A	3			25	50	50 ¹	50 ¹	FDD			
	3			25	50	50 ¹	50 ¹	FDD			
CA_3A-8A-40A	8		15	25	25 ¹			FDD			
	40			25	50	75	100	TDD			
CA_3A-40A	3			25	50	50 ¹	50 ¹	FDD			
CA_3A-40C CA_3A-5A-40A CA_3A-28A-40A CA_3A-28A- 40C CA_1A-3A-5A- 40A CA_1A-3A-8A- 40A	40			25	50	75	100	TDD			
CA 2A 44A	3			25	50	50 ¹	50 ¹	FDD			
CA_3A-41A	41			25	50	75	100	TDD			
CA 2A 44C	3			25	50	50 ¹	50 ¹	FDD			
CA_3A-41C	41			25	50	75	100	TDD			
	3			25	50	50 ¹	50 ¹	FDD			
CA_3A-41A-42A	41			25	50	75	100	TDD			
	42			25	50	75	100	TDD			
CA_7A-40A,	7			25	50	75	75 ¹	FDD			
CA_7A-40C	40			25	50	75	100	TDD			
CA_7A-42A,	7			25	50	75	75 ¹	FDD			
CA_7A-42A-42A	42			25	50	75	100	TDD			
CA_28A-40A,	28			25	25 ¹	25 ¹	25 ¹	FDD			
CA_28A-40C	40			25	50	75	100	TDD			

NOTE 1: 1 refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

NOTE 2: the UL configuration applies regardless of the channel bandwidth of the low band

NOTE 2: the UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.1-2 for the uplink bandwidth in which case the allocation according to Table 7.3.1-2 applies.

For band combinations including operating bands without uplink band (as noted in Table 5.5-1), the requirements are specified in Table 7.3.1A-0d and Table 7.3.1A-0e.

Table 7.3.1A-0d: Reference sensitivity QPSK PREFSENS

Channel bandwidth											
EUTRA CA Configuration	EUTRA band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex mode			
	2			-97.7	-94.7	-92.9	-91.7				
04 04 44 54 004	4			-99.7	-96.7	-94.9	-93.7				
CA_2A-4A-5A-29A	5			-98	-95			FDD			
	29			-97	-94						
	2			-97.7	-94.7	-92.9	-91.7				
CA_2A-4A-29A	4			-99.7	-96.7	-94.9	-93.7	FDD			
	29			-97	-94						
	2			-97.6	-94.6	-92.8	-91.6				
04 04 44 004 004	4			-99.6	-96.6	-94.8	-93.6				
CA_2A-4A-29A-30A	29			-97	-94			FDD			
	30			-98.5	-95.5						
	2			-98	-95	-93.2	-92				
CA_2A-5A-29A	5			-98	-95			FDD			
_	29			-97	-94			1			
	2			-98	-95	-93.2	-92				
CA_2A-29A	29		-98.7	-97	-94			FDD			
	2			-98	-95	-93.2	-92				
CA_2C-29A	29			-97	-94			FDD			
	2			-97.6	-94.6	-92.8	-91.6				
CA_2A-29A-30A	29			-97	-94			FDD			
0/(_2/(20/(00/(30			-98.5	-95.5						
	2			-97.6	-94.6	-92.8	-91.6				
CA_2C-29A-30A	29			-97	-94			FDD			
0. <u>_</u> 00	30			-98.5	-95.5						
	4			-100	-97	-95.2	-94				
CA_4A-5A-29A	5			-98	-95	00.2	<u> </u>	FDD			
o, ⊆ o, . _o , .	29			-97	-94						
	4			-100	-97	-95.2	-94				
CA_4A-29A	29		-98.7	-97	-94	00.2	0.1	FDD			
	4			-99.6	-96.6	-94.8	-93.6				
CA_4A-29A-30A	29			-97	-94			FDD			
o,	30			-98.5	-95.5						
	5			-98	-95						
CA_5A-29A	29			-97	-94			FDD			
	20			-97	-94						
CA_20A-32A	32			-100	-97	-95.2	-94	FDD			
	20			-97	-94	-91.2	-90				
CA_20A-67A	67			-100	-97	-95.2	-94	FDD			
	23			-100	-97	-95.2	-94 -94				
CA_23A-29A	29		-98.7	-97	-94	33.2	<u> </u>	FDD			
	29		50.7	-97	-94						
CA_29A-30A	30		ļ	-99	-96			FDD			

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

NOTE 3: The signal power is specified per port

Table 7.3.1A-0e: Uplink configuration for reference sensitivity

	E-UTRA	Band / Char		idth / N _{RB}				
EUTRA CA Configuration	EUTRA band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex mode
-	2	•		25	50	50 ¹	50 ¹	
04 04 44 54 004	4			25	50	75	100	
CA_2A-4A-5A-29A	5			25	25 ¹			FDD
	29			N/A	N/A			
	2			25	50	50 ¹	50 ¹	
CA_2A-4A-29A	4			25	50	75	100	FDD
	29			N/A	N/A			
	2			25	50	50 ¹	50 ¹	
04 04 44 004 004	4			25	50	75	100	
CA_2A-4A-29A-30A	29			N/A	N/A			FDD
	30			25	25 ¹			1
	2			25	50	50 ¹	50 ¹	
CA_2A-5A-29A	5			25	25 ¹			FDD
	29			N/A	N/A			1
	2			25	50	50 ¹	50 ¹	
CA_2A-29A	29		N/A	N/A	N/A			FDD
	2		-	25	50	50 ¹	50 ¹	
CA_2C-29A	29			N/A	N/A			FDD
CA_2A-29A-30A	2			25	50	50 ¹	50 ¹	
	29			N/A	N/A			FDD
	30			25	25 ¹			
	2			25	50	50 ¹	50 ¹	
CA_2C-29A-30A	29			N/A	N/A			FDD
	30			25	25 ¹			
	4			25	50	75	100	
CA_4A-5A-29A	5			25	25 ¹		100	FDD
	29			N/A	N/A			1
	4			25	50	75	100	
CA_4A-29A	29		N/A	N/A	N/A		100	FDD
	4		,	25	50	75	100	
CA_4A-29A-30A	29			N/A	N/A			FDD
o, <u>_</u> ≥ o, . o o, .	30			25	25 ¹			
	5			25	25 ¹			
CA_5A-29A	29			N/A	N/A			FDD
	20			25	20 ¹			
CA_20A-32A	32			N/A	N/A	N/A	N/A	FDD
	20			25	20 ¹	20 ²	20 ²	
CA_20A-67A	[67]			N/A	N/A	N/A	N/A	FDD
	23			25	50	75	100	FDD
CA_23A-29A	29		N/A	N/A	N/A	-		
	29			N/A	N/A			FDD
CA_29A-30A	30			25	25			

NOTE 1: ¹ refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

5.6-1).

NOTE 2: ² refers to Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart 16

For band combinations including operating band 46 (Table 5.5-1), the requirements are specified in Table 7.3.1A-0eA and Table 7.3.1A-0eB.

Table 7.3.1A-0eA: Reference sensitivity QPSK PREFSENS

	Channel bandwidth									
EUTRA CA Configuration	EUTRA band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex mode		
CA 1A 16A	1			-100	-97	-95.2	-94	FDD		
CA_1A-46A	46						[-90]	TDD		
CA 2A-46A	2			-98	-95	-93.2	-92	FDD		
CA_2A-46A	46						[-90]	TDD		
CA 3A-46A	3			-97	-94	-92.2	-91	FDD		
CA_3A-46A	46						[-90]	TDD		
CA 4A-46A	4			-100	-97	-95.2	-94	FDD		
CA_4A-46A	46						[-90]	TDD		
CA 7A-46A	7			-98	-95	-93.2	-92	FDD		
CA_/A-46A	46						[-90]	TDD		
CA 41A 46A	41			-98	-95	-93.2	-92	FDD		
CA_41A-46A	46						[-90]	TDD		
CA 42A 46A	42			-99	-96	-94.2	-93	FDD		
CA_42A-46A	46						[-90]	TDD		

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is TBD

NOTE 3: The signal power is specified per port

Table 7.3.1A-0eB: Uplink configuration for reference sensitivity

	E-UTRA Band / Channel bandwidth / N _{RB} / Duplex mode								
EUTRA CA Configuration	EUTRA band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex mode	
CA_1A-46A	1			25	50	75	100	FDD	
CA_2A-46A	2			25	50	50 ¹	50 ¹	FDD	
CA_3A-46A	3			25	50	50 ¹	50 ¹	FDD	
CA_4A-46A	4			25	50	75	100	FDD	
CA_7A-46A	7			25	50	75	75 ¹	FDD	
CA_41A-46A	41			25	50	75	100	TDD	
CA_41A-46A	42			25	50	75	100	TDD	

NOTE 1: refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

In all cases for single uplink inter-band CA, unless given by Table 7.3.1-3 for the band with the active uplink carrier, the applicable reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.4-1) configured.

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to two E-UTRA bands the throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.1-1 and Table 7.3.1-2. The reference sensitivity is defined to be met with all downlink component carriers active and both of the uplink carriers active.

For E-UTRA CA configurations with uplink and downlink assigned to two E-UTRA bands given in Table 7.3.1A-0f the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3.1A-0f. For E-UTRA CA configurations with uplink assigned to two E-UTRA bands and downlink assigned to three E-UTRA bands given in Table 7.3.1A-0g the reference sensitivity is defined only for the specific uplink and downlink test points which are specified in Table 7.3.1A-0g. For these test points the reference sensitivity requirement specified in Table 7.3.1-1 is relaxed by the amount of parameter MSD given in Table 7.3.1A-0f.

The allowed exceptions defined in Table 7.3.1A-0a and Table 7.3.1A-0b for inter-band carrier aggregation with a single active uplink are also applicable for dual uplink operation.

Table 7.3.1A-0f: 2 UL and 2 DL interband Reference sensitivity QPSK P_{REFSENS} and uplink/downlink configurations

E	-UTRA Band	/ Channel I	bandwidth /	N _{RB} / Dupl	ex mode		
EUTRA CA Configuration	EUTRA band	UL F _c (MHz)	UL/DL BW (MHz)	UL C _{LRB}	DL F _c (MHz)	MSD (dB)	Duplex mode
CA 1A 2A	1	1950	5	25	2140	23	FDD
CA_1A_3A	3	1760	5	25	1855	N/A	ן רטט
CA 1A 8A	1	1965	5	25	2155	6	FDD
CA_1A_8A	8	887.5	5	25	932.5	N/A	FDD
CA_2A-4A	2	1860	20	50 ²	1940	5	FDD
CA_2A-4A	4	1752.5	5	25	2152.5	N/A	ן רטט
CA 2A-4A	2	1868.3	5	25	1948.3	N/A	EDD
CA_2A-4A	4	1735	5	25	2135	5	FDD
CA_3A-5A	3	1771	10	50	1866	4	FDD
CA_3A-3A	5	838	5	25	883	N/A	ן רטט
CA_3A-5A	3	1721	10	50	1816	N/A	- FDD
CA_3A-3A	5	838	5	25	883	24	ן רטט
CA 2A 7A	3	1730	5	25	1825	N/A	- FDD
CA_3A-7A	7	2535	10	50	2655	13	ן רטט
CA 3A 9A	3	1755	10	50	1850	N/A	- FDD
CA_3A-8A	8	900	5	25	945	8	ן רטט
CA 3A 10A	3	1771	5	25	1866	4	EDD
CA_3A-19A	19	838	5	25	883	N/A	FDD
CA 2A 10A	3	1721	5	25	1816	N/A	FDD
CA_3A-19A	19	838	5	25	883	27	FDD
CA 2A 20A	3	1775	5	25	1870	4	FDD
CA-3A-20A	20	840	5	25	799	N/A	FDD
CA 2A 20A	3	1735	5	25	1830	N/A	FDD
CA-3A-20A	20	847	5	25	806	9	FDD
04.04.004	3	1771	5	25	1866	4	EDD
CA_3A-26A	26	838	5	25	883	N/A	FDD
CA 2A 2CA	3	1721	5	25	1816	N/A	FDD
CA_3A-26A	26	838	5	25	883	26	FDD
CA 4A 5A	4	1721	5	25	2121	N/A	- FDD
CA_4A-5A	5	838	5	25	883	26	ן רטט
CA 4A 7A	4	1730	5	25	1825	N/A	EDD
CA_4A-7A	7	2535	5	25	2655	15	FDD
CA	5	834	5	25	879	12	EDD
CA_5A-7A	7	2547	10	50	2667	N/A	FDD
CA 7A 20A	7	2512	10	50	2632	N/A	EDD
CA_7A-20A	20	851	5	25	810	12	FDD
		001			010	14	<u> </u>

NOTE 1: Both of the transmitters shall be set min(+20 dBm, P_{CMAX_L,c}) as defined in subclause 6.2.5A

NOTE 2: RB_{START} = 0

Table 7.3.1A-0g: 2 UL and 3 DL interband Reference sensitivity QPSK P_{REFSENS} and uplink/downlink configurations

	E	-UTRA Ba	nd / Chann	el bandwid	th / NRB / D	uplex mode	•		
EUTRA CA	EUTRA CA	EUTRA	UL Fc	UL BW	UL	DL F _c (MHz)	DL BW	MSD	Duploy
DL Configuration	UL Configurati on	band	(MHz)	(MHz)	C _{LRB}	(MHz)	(MHz)	(dB)	- Duplex mode
		1	1968	5	25	2158	5	NA	
CA_1A-5A-7A	CA_1A-7A	7	2512	10	50	2632	10	NA	FDD
		5	835	5	25	880	5	1.0	
	CA_3A-7A	3	1737	5	25	1832	5	NA	FDD
		7	2543	10	50	2663	10	NA	
CA_3A-7A-20A		20	847	10	20	806	10	10.5	
CA_3A-7A-20A	CA_3A-20A	3	1775	10	50	1870	10	NA	FDD
		20	855	5	25	896	5	NA	
		7	2510	10	50	2630	10	26.0	
		3	1747	5	25	1842	5	NA	
	CA_3A-7A	7	2543	5	25	2663	5	NA	FDD
CA 2A 7A 28A		28	741	5	25	796.0	5	20	
CA_3A-7A-28A		7	2543	5	25	2663	5	NA	FDD
	CA_7A-28A	28	710.5	5	25	765.5	5	NA	
		3	1737.5	5	25	1832.5	5	26	

For intra-band contiguous carrier aggregation the throughput of each component carrier shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.1-1, Table 7.3.1A-0h and Table 7.3.1A-1. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the power levels in Table 7.3.1-1 also apply for an SCC assigned in the unpaired part. The requirement is verified using an uplink CA configuration with the largest number of carriers supported by the UE. Table 7.3.1A-1 specifies the maximum number of allocated uplink resource blocks for which the intra-band contiguous carrier aggregation reference sensitivity requirement shall be met. The PCC and SCC allocations as defined in Table 7.3.1A-1 form a contiguous allocation where TX-RX frequency separations of the component carriers are as defined in Table 5.7.4-1. In case downlink CA configuration has additional SCC(s) compared to uplink CA configuration those are configured furthers away from uplink band. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.1-2 and the downlink PCC carrier center frequency shall be configured closer to uplink operating band than any of the downlink SCC center frequency. Unless given by Table 7.3.1-3, the reference sensitivity requirements shall be verified with the network signalling value NS 01 (Table 6.2.4-1) configured.

Table 7.3.1A-0h: Intra-band contiguous CA uplink configuration for reference sensitivity for Bandwith Class B

CA configuration / CC combination / N _{RB_agg} / Duplex mode									
Unlink C	A configuration	50RB-	+25RB	50RB-	+50RB	Duplex			
Opinik C/	A configuration	PCC	SCC	PCC	SCC	Mode			
	CA_8B	25	0	25	0	FDD			
NOTE 1:	The carrier centr	e frequen	icy of SCC	c in the U	L operatir	ng band is			
	configured close								
NOTE 2:	The transmitted	power over	er both PC	CC and So	CC shall b	e set to			
	P _{UMAX} as defined								
NOTE 3:	The UL resource								
	within the transm		ndwidth c	onfigurati	on for the	channel			
	bandwidth (Table	,							
NOTE 4:	The UL resource	blocks in	PCC sha	all be loca	ted as clo	se as			
	possible to the d								
	blocks in SCC sh		ated as fa	ar as poss	sible from	the			
	downlink operati	0							
NOTE 5:	In case a CA cor								
	which are unequ					awiath			
	shall be the large	er one for	reterence	e sensitivit	ty test.				

Table 7.3.1A-1: Intra-band contiguous CA uplink configuration for reference sensitivity for Bandwidth

	CA configuration / CC combination / N _{RB agg} / Duplex mode												
Uplink CA	Uplink CA			75RB-	75RB+75RB		100RB+75RB		100RB+100RB		Duplex		
configuration	PCC	SCC	PCC	SCC	PCC	SCC	PCC	SCC	PCC	SCC	PCC	SCC	Mode
CA_1C	N/A	N/A	N/A	N/A	75	54	N/A	N/A	N/A	N/A	100	30	FDD
CA_3C	50	0	50	0	N/A	N/A	N/A	N/A	50	0	50	0	FDD
CA_7C	N/A	N/A	75	0	75	0	N/A	N/A	75	0	75	0	FDD
CA_38C	N/A	N/A	N/A	N/A	75	75	N/A	N/A	N/A	N/A	100	100	TDD
CA_39C	100	25	100	50	N/A	N/A	N/A	N/A	100	75	N/A	N/A	TDD
CA_40C	N/A	N/A	100	50	75	75	N/A	N/A	100	75	100	100	TDD
CA_41C	N/A	N/A	100	50	75	75	N/A	N/A	100	75	100	100	TDD
CA_42C	100	25	100	50	N/A	N/A	N/A	N/A	100	75	100	100	TDD
CA_66C (NOTE 7)	100	N/A	100	N/A	75	N/A	75	N/A	100	N/A	100	N/A	FDD

NOTE 1: The carrier centre frequency of SCC in the UL operating band is configured closer to the DL operating band.

NOTE 2: The transmitted power over both PCC and SCC shall be set to P_{UMAX} as defined in subclause 6.2.5A.

NOTE 3: The UL resource blocks in both PCC and SCC shall be confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

NOTE 4: The UL resource blocks in PCC shall be located as close as possible to the downlink operating band, while the UL resource blocks in SCC shall be located as far as possible from the downlink operating band.

NOTE 5: In case a CA configuration consists of CC channel bandwidths which are unequal in bandwidth the PCC channel bandwidth shall be the larger one for reference sensitivity test.

NOTE 6: Void.

NOTE 7: the PCC is contained within 1710-1780 MHz.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the throughput of each downlink component carrier shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) and parameters specified in Table 7.3.1-1 and Table 7.3.1A-3 with the power level in Table 7.3.1-1 increased by ΔR_{IBNC} given in Table 7.3.1A-3 for the SCC(s). The requirements apply with all downlink carriers active. Unless given by Table 7.3.1-3, the reference sensitivity requirements shall be verified with the network signalling value NS_01 (Table 6.2.4-1) configured.

Table 7.3.1A-3: Intra-band non-contiguous CA with one uplink configuration for reference sensitivity

CA configuration	Aggregated channel bandwidth (PCC+SCC)	W _{gap} / [MHz]	UL PCC allocation	ΔR _{IBNC} (dB)	Duplex mode
	25RB+25RB	$30.0 < W_{gap} \le 50.0$	12 ¹	5.3	
	23KD+23KD	$0.0 < W_{gap} \le 30.0$	25 ¹	0	
	25RB+50RB	$25.0 < W_{gap} \le 45.0$	121	4.4	
	20.12.100.12	$0.0 < W_{gap} \le 25.0$	25 ¹	0	
	25RB+75RB	$20.0 < W_{gap} \le 40.0$	121	4.2	
		$0.0 < W_{gap} \le 20.0$	25 ¹	0	
	25RB+100RB	$15.0 < W_{gap} \le 35.0$	121	3.8	
		$0.0 < W_{gap} \le 15.0$	25 ¹	0	
	50RB+25RB	$15.0 < W_{gap} \le 45.0$	121	5.9	
	00.12.120.12	$0.0 < W_{gap} \le 15.0$	321	0	
	50RB+50RB	$10.0 < W_{gap} \le 40.0$	12 ¹	4.6	
		$0.0 < W_{gap} \le 10.0$	321	0	
CA_2A-2A	50RB+75RB	$5.0 < W_{gap} \le 35.0$	121	4.1	FDD
		$0.0 < W_{gap} \le 5.0$	321	0	
	50RB+100RB	$0.0 < W_{gap} \le 30.0$	121	4.0	
	75RB+25RB	$10.0 < W_{gap} \le 40.0$	12 ¹²	6.7	
		$0.0 < W_{gap} \le 10.0$	36 ¹	0	
	75RB+50RB	$5.0 < W_{gap} \le 35.0$	12 ¹²	5.4	
		$0.0 < W_{gap} \le 5.0$	36 ¹	0	
	75RB+75RB	$0.0 < W_{gap} \le 30.0$	12 ¹²	4.6	
	75RB+100RB	$0.0 < W_{gap} \le 25.0$	12 ¹²	4.2	
	100RB+25RB	$0.0 < W_{gap} \le 35.0$	16 ¹³	7.2	
	100RB+50RB	$0.0 < W_{gap} \le 30.0$	16 ¹³	5.8	
	100RB+75RB	$0.0 < W_{gap} \le 25.0$	16 ¹³	5.0	
	100RB+100RB	$0.0 < W_{gap} \le 20.0$	16 ¹³	4.6	
	25DB±25DB	$45.0 < W_{gap} \le 65.0$	12 ¹	4.7	
	23ND+23ND	25RB+25RB 0.0 < Wgap ≤ 45.0		0	
	25DD - 50DD	$40.0 < W_{gap} \le 60.0$	12 ¹	3.8	
	25RB+50RB	$0.0 < W_{gap} \le 40.0$	25 ¹	0	
	0500.7500	$35.0 < W_{gap} \le 55.0$	12 ¹	3.6	
	25RB+75RB	$0.0 < W_{gap} \le 35.0$	25 ¹	0	
	0500 40000	$30.0 < W_{gap} \le 50.0$	12 ¹	3.4	
	25RB+100RB	$0.0 < W_{gap} \le 30.0$	25 ¹	0	
		$30.0 < W_{gap} \le 60.0$	12 ⁹	5.1	
	50RB+25RB	$0.0 < W_{gap} \le 30.0$	32 ¹	0	
CA_3A-3A		25.0 < W _{gap} ≤ 55.0	12 ⁹	4.3	FDD
	50RB+50RB	$0.0 < W_{gap} \le 25.0$	32 ¹	0	
		$20.0 < W_{gap} \le 50.0$	12 ⁹	3.8	
	50RB+75RB	$0.0 < W_{gap} \le 20.0$	32 ¹	0	
		$0.0 < W_{\text{gap}} \le 20.0$ $15.0 < W_{\text{gap}} \le 45.0$		3.4	
	50RB+100RB	$0.0 < W_{\text{gap}} \le 15.0$	12 ⁹	0	
		$25.0 < W_{\text{gap}} \le 55.0$	12 ¹⁰	6.0	
	75RB+25RB	$0.0 < W_{gap} \le 25.0$	32 ¹	0.0	-
		$20.0 < W_{\text{gap}} \le 25.0$	12 ¹⁰	4.7	-
	75RB+50RB		32 ¹		-
	7500.7500	$0.0 < W_{gap} \le 20.0$	12 ¹⁰	0	
	75RB+75RB	$15.0 < W_{gap} \le 45.0$	12.3	4.2	

		$0.0 < W_{gap} \le 15.0$	32 ¹	0	
		$10.0 < W_{gap} \le 40.0$	12 ¹⁰	3.8	
	75RB+100RB	0.0 < W _{gap} ≤ 10.0	32 ¹	0	
		$15.0 < W_{gap} \le 50.0$	16 ¹¹	6.5	
	100RB+25RB	•			
		$0.0 < W_{gap} \le 15.0$	32 ¹	0	
	100RB+50RB	$10.0 < W_{gap} \le 45.0$	16 ¹¹	5.1	
		$0.0 < W_{gap} \le 10.0$	32 ¹	0	
	100DD . 75DD	$5.0 < W_{gap} \le 40.0$	16 ¹¹	4.5	
	100RB+75RB	$0.0 < W_{gap} \le 5.0$	32 ¹	0	
	100RB+100RB	$0.0 < W_{gap} \le 35.0$	16 ¹¹	4.1	
CA 4A-4A	NOTE 6	NOTE 7	NOTE 8	0.0	FDD
_	25RB+25RB	NOTE 7	12 ¹	5.3	
CA_5A-5A	25RB+50RB	NOTE 7	12 ¹	4.4	FDD
CA_SA-SA	50RB+25RB	NOTE 7	12 ¹	5.9	FDD
	50RB+50RB	NOTE 7	12 ¹	4.6	
	25RB+25RB	0 < W $_{ m gap} \leqslant 60$	25	0.0	
	25RB+50RB	$0 < W_{gap} \leqslant 55$	25	0.0	
	25RB+75RB	0 < W _{gap} ≤ 50	25	0.0	
	25RB+100RB	0 < W _{gap} ≤ 45	25	0.0	
		30 < W _{gap} ≤ 55	32 ¹	0.0	
	50RB+25RB	$0 < W_{gap} \le 30$	50	0.0	
	50RB+50RB	$25.0 < W_{gap} \le 50.0$	32 ¹	0.0	
	30110+30110	$0.0 < W_{gap} \le 25.0$	50	0.0	
			32 ¹	0.0	
	50RB+75RB	20 < W _{gap} ≤ 45			
		$0 < W_{gap} \le 20$	50	0.0	
	50RB+100RB	$15 < W_{gap} \leqslant 40$	32 ¹	0.0	
	OUNDITIONE	$0 < W_{gap} \leqslant 15$	50	0.0	
	75RB+25RB	$20.0 < W_{gap} \le 50.0$	32 ¹	0.0	
CA_7A-7A		$0.0 < W_{gap} \le 20.0$	50 ¹	0.0	FDD
_	75RB+50RB	$20.0 < W_{gap} \le 45.0$	321	0.0	
		$0.0 < W_{gap} \le 20.0$	50 ¹	0.0	
	75RB+75RB	$15.0 < W_{gap} \le 40.0$	32 ¹	0.0	
		$0.0 < W_{gap} \le 15.0$	50 ¹	0.0	
	75RB+100RB	$10 < W_{gap} \leqslant 35$	32 ¹	0.0	
	TORBITOORB	$0 < W_{gap} \leqslant 10$	50 ¹	0.0	
	100DD : 25DD	$25 < W_{gap} \leqslant 45$	32 ¹	0.0	
	100RB+25RB	0 < W _{gap} ≤ 25	45 ¹	0.0	
		20 < W _{gap} ≤ 40	32 ¹	0.0	
	100RB+50RB	0 < W _{gap} ≤ 20	45 ¹	0.0	
	100RB+75RB	15.0 < W _{qap} ≤ 35.0	36 ¹	0.0	
		$0.0 < W_{gap} \le 15.0$	50 ¹	0.0	
	100RB+100RB	15.0 < W _{gap} ≤ 30.0	32 ¹	0.0	
		$0.0 < W_{gap} \le 15.0$	45 ¹	0.0	
CA_23A-23A	NOTE 6	NOTE 7	NOTE 8	0.0	FDD
		$30.0 < W_{gap} \le 55.0$	10 ¹	5.0	
	25RB+25RB	$0.0 < W_{gap} \le 30.0$	25 ¹	0.0	
	25RB+50RB	$25.0 < W_{gap} \le 50.0$	10 ¹	4.5	
	23KD+30KD	$0.0 < W_{gap} \le 25.0$	25 ¹	0.0	
	25RB+75RB	20 < W _{gap} ≤ 45	10 ¹	4.3	
	ZUNDTIUND	0 < W _{gap} ≤ 20	25 ¹	0	
	25RB+100RB	15 < W _{gap} ≤ 40	10 ¹	4.1	
CA 25A-25A	20110110	$0 < W_{gap} \le 15$	25 ¹	0	FDD
0.1_20.120.1	50RB+25RB	$15.0 < W_{gap} \le 50.0$	10 ⁴	5.5	. 55
	33.15.2010	0.0 < W _{gap} ≤ 15.0	32 ¹	0.0	
	50RB+50RB	$10.0 < W_{gap} \le 45.0$	10 ⁴	5.0	
		$0.0 < W_{gap} \le 10.0$	32 ¹	0.0	
	50RB+75RB	5 < W _{gap} ≤ 40	10 ⁴	4.5	
		0 < W _{gap} ≤ 5	32 ¹	0	
	50RB+100RB	$0 < W_{gap} \le 35$	10 ⁴	4.2	
	75RB+25RB	10 < W _{gap} ≤ 45	10 ¹⁴	7.6	

		0 < W _{gap} ≤ 10	32 ¹	0	
		$5 < W_{\text{gap}} \le 40$	10 ¹⁴	6.7	
	75RB+50RB	0 < W _{gap} ≤ 5	32 ¹	0	
	75RB+75RB	0 < W _{qap} ≤ 35	10 ¹⁴	5.6	
	75RB+100RB	0 < W _{qap} ≤ 30	10 ¹⁴	4.8	
	100RB+25RB	$0 < W_{qap} \le 40$	12 ¹⁵	8	
	100RB+50RB	0 < W _{qap} ≤ 35	12 ¹⁵	6.7	
	100RB+75RB	0 < W _{gap} ≤ 30	12 ¹⁵	6.1	
	100RB+100RB	0 < W _{qap} ≤ 25	12 ¹⁵	5.7	
CA_40A-40A	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_41A-41A	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_41A-41C	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_41A-41D	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_41C-41C	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_42A-42A	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_42A-42C	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_42A-42D	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_42C-42A	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_42C-42C	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_42D-42A	NOTE 6	NOTE 7	NOTE 8	0.0	TDD
CA_66A-66A	NOTE 6	NOTE 7	NOTE 8, NOTE 16	0.0	FDD

- 1 refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission.
- NOTE 2: W_{gap} is the sub-block gap between the two sub-blocks.
- NOTE 3: The carrier center frequency of PCC in the UL operating band is configured closer to the DL operating band.
- NOTE 4: refers to the UL resource blocks shall be located at RB_{start}=33.
- NOTE 5: For the TDD intra-band non-contiguous CA configurations, the minimum requirements apply only in synchronized operation between all component carriers.
- NOTE 6: All combinations of channel bandwidths defined in Table 5.6A.1-3.
- NOTE 7: All applicable sub-block gap sizes.
- NOTE 8: The PCC allocation is same as Transmission bandwidth configuration N_{RB} as defined in Table 5.6-1. In case of uplink sub-block is TDD intra-band contiguous CA then the uplink PCC and SCC allocations are the same as N_{RB_agg} defined in Table 7.3.1A-1.
- ⁹ refers to the UL resource blocks shall be located at RB_{start}=25.
- NOTE 10: 10 refers to the UL resource blocks shall be located at RB_{start}=35.
- NOTE 11: 11 refers to the UL resource blocks shall be located at RB_{start}=50.
- NOTE 12: ¹² refers to the UL resource blocks shall be located at RB_{start}=39.
- NOTE 13: ¹³ refers to the UL resource blocks shall be located at RB_{start}=57.
- NOTE 13. Telefs to the UL resource blocks shall be located at RB_{start}=47.
- NOTE 15: ¹⁵ refers to the UL resource blocks shall be located at RB_{start}=62.
- NOTE 16: The carrier center frequency of PCC in the DL operating band is configured closer to the UL operating band.

For intra-band non-contiguous carrier aggregation with two uplink and downlink carriers the reference sensitivity is defined to be met with both downlink and uplink carriers activated. The downlink PCC and SCC minimum requirements for reference sensitivity as specified in Table 7.3.1-1 are increased by amount of ΔR_{2UL_PCC} and ΔR_{2UL_SCC} which are defined in Table 7.3.1A-4 when uplink PCC and SCC allocations are according to the Table 7.3.1A-4.

Table 7.3.1A-4: Intra-band non-contiguous CA with two uplinks configuration for reference sensitivity

CA configuration	Aggregated channel bandwidth (PCC+SCC)	W _{gap} / [MHz]	UL PCC allocation	UL SCC allocation	ΔR _{2UL_PCC} (dB)	ΔR _{2UL_SCC} (dB)	Duplex mode
CA_4A-4A	NOTE 2	NOTE 3	NOTE 4	NOTE 5	0.0	0.0	FDD

- NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A.
- NOTE 2: All combinations of channel bandwidths defined in Table 5.6A.1-3.
- NOTE 3: All applicable sub-block gap sizes.
- NOTE 4: The PCC allocation is same as Transmission bandwidth configuration N_{RB} as defined in Table 5.6-1.
- NOTE 5: The SCC allocation is same as Transmission bandwidth configuration N_{RB} as defined in Table 5.6-1.

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two noncontiguously aggregated carriers per band and up to four contiguously aggregated carriers per band) and up to three uplink carriers (up to two contiguously aggregated carriers per band), the requirement is defined with an uplink configuration in accordance with Table 7.3.1A-3 when the uplink is active in a band supporting two non-contigous component carriers, Table 7.3.1A-1 when the uplink (up to two contiguously aggregated uplink carriers) is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.1-2 when an uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to three component carriers. The carrier center frequency of PCC in the UL operating band is configured closer to the DL operating band when the uplink is active in band(s) supporting non-contiguous aggregation of up to two component carriers. For these uplink configurations, the UE shall meet the reference sensitivity requirements for intra-band non-contiguous carrier aggregation of two downlink carriers, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.3.1. For the two component carriers within the same band, $\Delta R_{IRNC} = 0$ dB for all sub-block gaps (Table 7.3.1A-3) when the uplink is active in another band. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with all uplink carriers active in each band capable of UL operation. For contiguously aggregated component carriers configured in Band 46, the said requirements for intra-band contiguous carrier aggregation of downlink carriers are replaced by the requirements in Table 7.3.1A-0eA and Table 7.3.1A-0eB. Unless given by Table 7.3.1-3, the reference sensitivity requirements shall be verified with the network signalling value NS 01 (Table 6.2.4-1) configured.

For the UE that supports any of combinations of intra-band non-contiguous and inter-band carrier aggregation given in Table 7.3.1A-5, exceptions to the aforementioned requirements are allowed when the uplink is active in a lower-frequency band and is within a specified frequency range such that transmitter harmonics fall within the downlink transmission bandwidth assigned in a higher band as noted in Table 7.3.1A-5. For these exceptions, the UE shall meet the requirements specified in Table 7.3.1A-5 and Table 7.3.1A-6.

Table 7.3.1A-5: Reference sensitivity for carrier aggregation QPSK PREFSENS, CA (exceptions)

	Channel bandwidth											
EUTRA CA	EUTRA	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex				
Configuration	band	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	mode				
	1			-99.8	-96.8	-95	-93.8	FDD				
CA_1A-3A-42C ^{8,9}	3			-96.8	-93.8	-92	-90.8	רטט				
	42			-71.7	-71.7	-71.7	-71.7	TDD				
	1			-99.8	-96.8	-95	-93.8	FDD				
CA_1A-3A-42C ¹⁰	3			-96.8	-93.8	-92	-90.8	FDD				
	42			-97.1	-94.7	-93.2	-92.5	TDD				
	2			-97.7	-94.7	-92.9	-91.7					
CA_2A-2A-4A-12A ^{5,6}	4			-90	-89.5	-89	-88.5	FDD				
	12			-96.5	-93.5							
	2			-97.7	-94.7	-92.9	-91.7					
CA_2A-4A-4A-12A ^{5,6}	4			-90	-89.5	-89	-88.5	FDD				
	12			-96.5	-93.5							
	3			N/A	N/A	N/A	N/A					
CA_3A-3A-8A ⁴	3			N/A	N/A	N/A	N/A	FDD				
	8			N/A	N/A							
	3			-96.8	-93.8	-92	-90.8	FDD				
CA_3A-19A-42C ^{8,9}	19			-100	-97	-95.2		רטט				
	42			-71.7	-71.7	-71.7	-71.7	TDD				
CA_3A-19A-42C ¹⁰	3			-96.8	-93.8	-92	-90.8	FDD				
CA_3A-19A-42C	19			-100	-97	-95.2		FDD				
CA_3A-42C ^{8,9}	3			-96.8	-93.8	-92	-90.8	FDD				
CA_3A-42C	42			-71.7	-71.7	-71.7	-71.7	TDD				
CA_3A-42C ¹⁰	3			-96.8	-93.8	-92	-90.8	FDD				
CA_3A-42C	42			-97.1	-94.7	-93.2	-92.5	TDD				
CA_4A-4A-12A ^{5,6}	4			-90	-89.5	-89	-88.5	FDD				
CA_4A-4A-12A	12			-96.5	-93.5			רטט				
CA_4A-12B ^{5,6}	4			-90	-89.5	-89	-88.5	רטט				
UA_4A-12D	12			-96.5	-93.5			FDD				
	8	N/A	N/A	N/A	N/A			FDD				
CA_8A-41C ⁷	41				N/A	N/A	N/A	TDD				
5/(_5/(115	41				N/A	N/A	N/A	טטו				
CA 26A-41C ⁷	26			N/A	N/A	N/A		FDD				
CA_20A-41C	41	<u></u>		N/A	N/A	N/A	N/A	TDD				

- NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A.
- NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1
- NOTE 3: The signal power is specified per port
- NOTE 4: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.1 apply).
- NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of a low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of a high band.
- NOTE 6: The requirements should be verified for UL EARFCN of a low band (superscript LB) such that $f_{UL}^{LB} = \left \lfloor f_{DL}^{HB} / 0.3 \right \rfloor 0.1 \text{ in MHz and } F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 < f_{UL}^{LB} < F_{UL_high}^{LB} BW_{Channel}^{LB} / 2 \text{ with } f_{DL}^{HB} \text{ the carrier frequency of a high band in MHz and } BW_{Channel}^{LB} \text{ the channel bandwidth configured in the low band.}$
- NOTE 7: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.1 apply).
- NOTE 8: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the aggressor (lower) band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of a victim (higher) band and a range ΔF_{HD} above and below the edge of this downlink transmission bandwidth. The value ΔF_{HD} depends on the E-UTRA configuration: $\Delta F_{HD} = 10$ MHz for CA_3A-42C, CA_1A-3A-42C and CA_3A-19A-42C.
- NOTE 9: The requirements should be verified for UL EARFCN of the aggressor (lower) band (superscript

LB) such that $f_{UL}^{LB} = \left \lfloor f_{DL}^{HB} / 0.2 \right \rfloor 0.1$ in MHz and $F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2$ with f_{DL}^{HB} carrier frequency in the victim (higher) band in MHz and $BW_{Channel}^{LB}$ the channel bandwidth configured in the lower band.

NOTE 10: The requirements are only applicable to channel bandwidths with a carrier frequency at $\pm \left(20 + BW_{Channel}^{HB} / 2\right) \text{ MHz offset from } 2 f_{UL}^{LB} \text{ in the victim (higher band) with} \\ F_{UL_low}^{LB} + BW_{Channel}^{LB} / 2 < f_{UL}^{LB} < F_{UL_high}^{LB} - BW_{Channel}^{LB} / 2 \text{, where } BW_{Channel}^{LB} \text{ and } BW_{Channel}^{HB} \text{ are the channel} \\ \text{bandwidths configured in the aggressor (lower) and victim (higher) bands in MHz, respectively.}$

Table 7.3.1A-6: Uplink configuration for the low band (exceptions)

E-UTRA B	E-UTRA Band / Channel bandwidth of the high band / N_{RB} / Duplex mode												
EUTRA CA Configuration	UL band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duple x mode					
CA_1A-3A-42C	3			12	25	36	50	FDD					
CA_2A-2A-4A-12A	12			8	16	20	20	FDD					
CA_2A-4A-4A-12A	12			8	16	20	20	FDD					
CA_3A-19A-42C	3			12	25	36	50	FDD					
CA_3A-42C	3			12	25	36	50	FDD					
CA_4A-4A-12A	12			8	16	20	20	FDD					
CA_4A-12B	12			8	16	20	20	FDD					

NOTE 1: refers to the UL resource blocks, which shall be centred within the transmission bandwidth configuration for the channel bandwidth.

NOTE 2: the UL configuration applies regardless of the channel bandwidth of the low band unless the UL resource blocks exceed that specified in Table 7.3.1-2 for the uplink bandwidth in which case the allocation according to Table 7.3.1-2 applies.

7.3.1B Minimum requirements (QPSK) for UL-MIMO

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in Clause 7.3.1 shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2. For UL-MIMO, the parameter P_{UMAX} is the total transmitter power over the two transmits power over the two transmit antenna connectors.

7.3.1D Minimum requirements (QPSK) for ProSe

When UE is configured for E-UTRA ProSe reception non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in Table 5.5D-1, the throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.6.2 with parameters specified in Table 7.3.1D-1 and Table 7.3.1D-2.

Table 7.3.1D-1: Reference sensitivity for ProSe Direct Discovery QPSK PREFSENS

	Channel bandwidth											
E-UTRA ProSe Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode					
2			-104.1	-104.1	-104.1	-104.1	HD					
3			-103.1	-103.1	-103.1	-103.1	HD					
4			-106.1	-106.1	-106.1	-106.1	HD					
7			-103.8	-103.8	-103.8	-103.8	HD					
14			-103.1	-103.1			HD					
20			-103.2	-103.2	-102.2	-102.2	HD					
26			-103.5 ⁵	-103.5 ⁵	-103.5 ⁵		HD					
28			-104.4	-104.4	-104.4	-102.9	HD					
31			-99.5				HD					

- NOTE 1: Reference measurement channel is A.6.2
- NOTE 2: The signal power is specified per port
- NOTE 3: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
- NOTE 4: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
- NOTE 5: ⁵ indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
- NOTE 6: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.

Table 7.3.1D-2: Reference sensitivity for ProSe Direct Communication QPSK PREFSENS

	Channel bandwidth											
E-UTRA ProSe Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode					
3				-97.6			HD					
7				-98.3			HD					
14				-97.6			HD					
20				-97.7			HD					
26				-98.0 ⁵			HD					
28				-98.9			HD					
31			-96.7				HD					

- NOTE 1: Reference measurement channel is A.6.2
- NOTE 2: The signal power is specified per port
- NOTE 3: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.
- NOTE 4: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.
- NOTE 5: ⁵ indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz.
- NOTE 6: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths.

NOTE: Table 7.3.1D-1/ Table 7.3.1D-2 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of allocated resource blocks will be practically constrained by other factors.

For the UE which supports ProSe in an operating band as specified in Section 5.5D, and the UE also supports a E-UTRA downlink inter-band carrier aggregation configuration in Table 7.3.1-1A or Table 7.3.1-1B, the minimum requirement for reference sensitivity in Table 7.3.1D-1 and Table 7.3.1D-2 shall be increased by the amount given in $\Delta R_{\rm IB,c}$ in Table 7.3.1-1A and Table 7.3.1-1B for the corresponding E-UTRA ProSe band.

When UE is configured for E-UTRA ProSe reception on PCC for the inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, there are no further requirements for reference sensitivity beyond those specified above when only PCC is configured in Table 7.3.1D-1 and Table 7.3.1D-2.

When UE is configured for E-UTRA ProSe reception on SCC or a non-serving carrier concurrent with E-UTRA uplink for inter-band E-UTRA ProSe / E-UTRA bands specified in Table 5.5D-2, E-UTRA ProSe throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.6.2 with parameters specified in Table 7.3.1D-1 and Table 7.3.1D-2. The reference sensitivity is defined to be met with E-UTRA uplink assigned to one band (that differs from the ProSe operating band) and all E-UTRA downlink carriers active. The E-UTRA uplink resource blocks shall be located as close as possible to E-UTRA ProSe operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1). The uplink configuration for the E-UTRA operating band is specified in Table 7.3.1D-3.

NOTE: The E-UTRA uplink channel bandwidth and transmission bandwidth specified in this Table 7.3.1D-3 are intended for conformance tests and does not restrict the operating conditions of the network.

Table 7.3.1D-3: Uplink configuration for E-UTRA band / E-UTRA CA band

	RA ProSe/E-UTRA uration	E-UTRA UL band / Channel BW / N _{RB} / Duplex mode					
E-UTRA ProSe band	E-UTRA band / E- UTRA CA band	E-UTRA UL band	Channel Bandwidth (MHz)	N _{RB}	Duplex Mode		
2	4	4	5	25	FDD		
2	CA_2-4	4	5	25	FDD		
28	1	1	5	25	FDD		
28	CA_1-28	1	5	25	FDD		

NOTE 1: For E-UTRA ProSe reception on SCC, the channel bandwith of the E-UTRA downlink SCC is set same as the ProSe channel bandwidth for which reference sensitivity is being measured.

7.3.1E Minimum requirements (QPSK) for UE category 0

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.3.1E-1A/Table 7.3.1E-1B and Table 7.3.1E-2.

Table 7.3.1E-1A: Reference sensitivity for FDD and TDD UE category 0 QPSK PREFSENS

	Channel bandwidth											
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode					
2	-100.2	-97.2	-95.5	-92.5	-90.7	-89.5	FDD					
3	-99.2	-96.2	-94.5	-91.5	-89.7	-88.5	FDD					
4	-102.2	-99.2	-97.5	-94.5	-92.7	-91.5	FDD					
5	-100.7	-97.7	-95.5	-92.5			FDD					
8	-99.7	-96.7	-94.5	-91.5			FDD					
13			-94	-91			FDD					
20			-94.5	-91.5	-88.2	-87	FDD					
39			-97.5	-94.5	-92.7	-91.5	TDD					
41			-95.5	-92.5	-90.7	-89.5	TDD					

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5 NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

Table 7.3.1E-1B: Reference sensitivity for HD-FDD UE category 0 QPSK PREFSENS

	Channel bandwidth										
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode				
2	-101	-98	-96.3	-93.3	-91.5	-90.3	HD-FDD				
3	-100	-97	-95.3	-92.3	-90.5	-89.3	HD-FDD				
4	-103	-100	-98.3	-95.3	-93.5	-92.3	HD-FDD				
5	-101.5	-98.5	-96.3	-93.3			HD-FDD				
8	-100.5	-97.5	-95.3	-92.3			HD-FDD				
13			-95.3	-92.3			HD-FDD				
20			-95.3	-92.3	-89.5	-88.3	HD-FDD				

NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5

NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3.1E-1A/Table 7.3.1E-1B shall be met for an uplink transmission bandwidth less than or equal to that specified in Table 7.3.1E-2.

NOTE: Table 7.3.1E-2 is intended for conformance tests and does not necessarily reflect the operational conditions of the network, where the number of uplink and downlink allocated resource blocks will be practically constrained by other factors. Typical receiver sensitivity performance with HARQ retransmission enabled and using a residual BLER metric relevant for e.g. Speech Services is given in the Annex X (informative).

Table 7.3.1E-2: FDD and TDD UE category 0 Uplink configuration for reference sensitivity

	E-U1	RA Band	/ Channe	el bandwid	th / N _{RB} /	Duplex mo	ode
E-UTRA	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
Band							
2	6	15	25	[36 ¹]	[36 ¹]	[36 ¹]	FDD and HD-FDD
3	6	15	25	[36 ¹]	[36 ¹]	[36 ¹]	FDD and HD-FDD
4	6	15	25	[36 ¹]	[36 ¹]	[36 ¹]	FDD and HD-FDD
5	6	15	25	[25 ¹]			FDD and HD-FDD
8	6	15	25	25 ¹			FDD and HD-FDD
13			20 ¹	[20 ¹]			FDD and HD-FDD
20			25	20 ¹	20 ²	20 ²	FDD and HD-FDD
39			25	[36 ¹]	[36 ¹]	[36 ¹]	TDD
41			25	[36 ¹]	[36 ¹]	[36 ¹]	TDD

NOTE 1: ¹ refers to the UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

NOTE 2: ² refers to Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RB_{start} 16.

7.3.2 Void

7.4 Maximum input level

This is defined as the maximum mean power received at the UE antenna port, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel.

7.4.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4.1-1. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements only apply for carriers assigned in the paired part.

Table 7.4.1-1: Maximum input level

Rx Parameter	Units		(Channel b	andwidth	ı			
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
Power in Transmission	dBm			-2					
Bandwidth Configuration	ubili	-27 ³							
	E 1: The transmitter shall be set to 4dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax_L as defined in subclause 6.2.5.								
NOTE 2: Reference measure	ment chan	nel is Anr	nex A.3.2:	64QAM, R	R=3/4 varia	ant with or	ne sided		
	amic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.								
	3: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one								
sided dynamic OCN	G Pattern	OP.1 FDI	D/TDD as	described	in Annex	A.5.1.1/A.	5.2.1.		

7.4.1A Minimum requirements for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the maximum input level is defined with the uplink active on the band(s) other than the band whose downlink is being tested. For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part, the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The UE shall meet the requirements specified in subclause 7.4.1 for each component carrier while all downlink carriers are active.

For intra-band contiguous carrier aggregation maximum input level is defined as the powers received at the UE antenna port over the Transmission bandwidth configuration of each CC, at which the specified relative throughput shall meet or exceed the minimum requirements for the specified reference measurement channel over each component carrier.

The downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.4.1A-1 with the uplink configuration set according to Table 7.3.1A-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.1-2.

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels over each component carrier as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.4.1A-1. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Table 7.4.1A-1.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, each larger than or equal to 5 MHz, the maximum input level requirements are defined with the uplink configuration in accordance with Table 7.3.1A-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in Table 7.4.1-1 and Table 7.4.1A-1 for one component carrier and two component carriers per sub-block, respectively. The throughput of each downlink component carrier shall be \geq 95% of the maximum throughput of the specified reference measurement channel as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1). The requirements apply with all downlink carriers active.

Table 7.4.1A-1: Maximum input level for intra-band contiguous CA

Rx Parameter	Units			CA Bandw	idth Class		
		Α	В	С	D	E	F
Power in largest			-28 ²	-25 ²	-25 ²	-26 ²	
Transmission Bandwidth Configuration CC	dBm		[-30] ³	[-27] ³	[-27] ³	[-28] ³	
Power in each other CC			-28+	-25 +	-25 +	-26 +	
			10log(N _{RB,c}	10log(N _{RB,c}	10log(N _{RB,c}	10log(N _{RB,c}	
			/N _{RB,largest}	/N _{RB,largest}	/N _{RB,largest}	/N _{RB,largest}	
	dBm		BW) [∠]	BW) ²	BW) ²	BW) [∠]	
	abiii		[-30]+	[-27] +	[-27] +	[-28] +	
			10log(N _{RB,c}	10log(N _{RB,c}	10log(N _{RB,c}	10log(N _{RB,c}	
			/N _{RB,largest}	/N _{RB,largest}	/N _{RB,largest}	/N _{RB,largest}	
			BW) 3	BW) 3	BW) 3	BW) 3	

NOTE 1: The transmitter shall be set to 4dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

NOTE 3: Reference measurement channel is Annex A.3.2: 256QAM, R=4/5 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

For combinations of intra-band and inter-band carrier aggregation with up to four downlink carriers (up to two non-contiguously aggregated carriers per band) and one uplink assigned to one E-UTRA band, the requirement is defined with the uplink active in a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3.1A-3 when the uplink is active in the band supporting two non-contiguous component carriers Table 7.3.1A-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.1-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to three component carriers. For these uplink configurations, the UE shall meet the maximum input-level requirements for intra-band non-contiguous carrier aggregation of two downlink carriers, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the the requirements specified in subclause 7.4.1. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

7.4.1B Minimum requirements for UL-MIMO

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing, the minimum requirements in Clause 7.4.1 shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2. For UL-MIMO, the parameter $P_{\text{CMAX_L}}$ is defined as the total transmitter power over the two transmit antenna connectors.

7.4.1D Minimum requirements for ProSe

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.6.2.

Table 7.4.1D-1: Maximum input level for ProSe

Rx Parameter	Units	Channel bandwidth						
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
Power in Transmission Bandwidth Configuration	dBm	-22						
NOTE 1: Reference measure	ment chan	nel is Anı	nex A.6.2					

7.4A Void

7.4A.1 Void

7.5 Adjacent Channel Selectivity (ACS)

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel. ACS is the ratio of the receive filter attenuation on the assigned channel frequency to the receive filter attenuation on the adjacent channel(s).

7.5.1 Minimum requirements

The UE shall fulfil the minimum requirement specified in Table 7.5.1-1 for all values of an adjacent channel interferer up to -25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5.1-2 and Table 7.5.1-3 where the throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1). For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements only apply for carriers assigned in the paired part.

Table 7.5.1-1: Adjacent channel selectivity

			Channel bandwidth								
Rx Parameter	Units	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz				
ACS	dB	33.0	33.0	33.0	33.0	30	27				

Table 7.5.1-2: Test parameters for Adjacent channel selectivity, Case 1

Rx Parameter	Units			Channel b	andwidth		
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in	dBm						
Transmission Bandwidth Configuration				REFSENS	S + 14 dB		
	dBm	REFSENS	REFSENS	REFSENS	REFSENS	REFSENS	REFSENS
P _{Interferer}		+45.5dB	+45.5dB	+45.5dB	+45.5dB	+42.5dB	+39.5dB
BW _{Interferer}	MHz	1.4	3	5	5	5	5
F _{Interferer} (offset)	MHz	1.4+0.0025 /	3+0.0075 /	5+0.0025 /	7.5+0.0075 /	10+0.0125 /	12.5+0.0025 /
		-1.4-0.0025	-3-0.0075	-5-0.0025	-7.5-0.0075	-10-0.0125	-12.5- 0.0025

NOTE 1: The transmitter shall be set to 4dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax_L as defined in subclause 6.2.5.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.

NOTE 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively.

Table 7.5.1-3: Test parameters for Adjacent channel selectivity, Case 2

Rx Parameter	Units	its Channel bandwidth								
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz			
Power in Transmission Bandwidth Configuration	dBm	-56.5	-56.5	-56.5	-56.5	-53.5	-50.5			
P _{Interferer}	dBm			-2	5					
BW _{Interferer}	MHz	1.4	3	5	5	5	5			
F _{Interferer} (offset)	MHz	1.4+0.0025 / -1.4-0.0025	3+0.0075 / -3-0.0075	5+0.0025 / -5-0.0025	7.5+0.0075 / -7.5-0.0075	10+0.0125 / -10-0.0125	12.5+0.0025 / -12.5- 0.0025			

NOTE 1: The transmitter shall be set to 24dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax_L as defined in subclause 6.2.5.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.

7.5.1A Minimum requirements for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band, the adjacent channel requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.5.1 for each component carrier while all downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink operation or an operating band with an unpaired DL part (as noted in Table 5.5-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For a component carrier configured in Band 46, the requirements specified in subclause 7.5.1 are replaced by the requirements in Table 7.5.1A-0a with test parameters in Table 7.5.1A-0b and Table 7.5.1A-0c.

Table 7.5.1A-0a: Adjacent channel selectivity

E-UTRA band	Rx Parameter	Units		(Channel b	andwidth	1	
			1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
			IVITIZ	IVITIZ	IVITIZ	IVITIZ	IVITZ	IVITIZ
46	ACS	dB						27

Table 7.5.1A-0b: Test parameters for Adjacent channel selectivity, Case 1

E-UTRA Band	Rx	Units			Channel	bandwidth		
	Parameter		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
	Power in Transmission Bandwidth Configuration	dBm			REFSEN	IS + 14 dB		
46	P _{Interferer}	dBm						REFSENS +39.5dB
	BW _{Interferer}	MHz						20
	F _{Interferer} (offset)	MHz						20+0.0025 / -20-0.0025

NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax_L as defined in subclause 6.2.5.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 (TBD)

Table 7.5.1A-0c: Test parameters for Adjacent channel selectivity, Case 2

E-UTRA band	Rx	Units	Channel bandwidth							
	Parameter		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
	Power in Transmission Bandwidth Configuration	dBm						-50.5		
46	P _{Interferer}	dBm			-:	25				
	BW _{Interferer}	MHz						20		
	F _{Interferer} (offset)	MHz						20+0.0025 / -20-0.0025		

NOTE 1: In a band capable of unplink operation, the transmitter shall be set to 24dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax_L as defined in subclause 6.2.5.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 (TBD)

For E-UTRA CA configurations listed in Table 7.3.1A-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the adjacent channel requirements of subclause 7.5.1A do not apply.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.5.1A-2 and Table 7.5.1A-3 with the uplink configuration set according to Table 7.3.1A-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.1-2. The UE shall fulfil the minimum requirement specified in Table 7.5.1A-1 for an adjacent channel interferer on either side of the aggregated downlink signal at a specified frequency offset and for an interferer power up to -25 dBm. The throughput of each carrier shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.5.1A-2 and 7.5.1A-3. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.5.1A-2 and 7.5.1A-3.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, each larger than or equal to 5 MHz, the adjacent channel selectivity requirements are defined with the uplink configuration in accordance with Table 7.3.1A-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.5.1 and 7.5.1A for one component carrier and two component carriers per sub-block, respectively. The UE shall fulfil the minimum requirements all values of a single adjacent channel interferer in-gap and out-of-gap up to a –25 dBm interferer power while all downlink carriers are active. For the lower range of test parameters (Case 1), the interferer power P_{interferer} shall be set to the maximum of the levels given by the carriers of the respective sub-blocks as specified in Table 7.5.1-2 and Table 7.5.1A-2 for one component carrier and two component carriers per sub-block, respectively. The wanted signal power levels for the carriers of each sub-block shall then be adjusted relative to P_{interferer} in accordance with the ACS requirement for each sub-block (Table 7.5.1-1 and Table 7.5.1A-1). For the upper range of test parameters (Case 2) for which the interferer power P_{interferer} is -25 dBm (Table 7.5.1-3 and Table 7.5.1A-3) the wanted signal power levels for the carriers of each sub-block shall be adjusted relative to P_{interferer} like for Case 1.

Table 7.5.1A-1: Adjacent channel selectivity

		CA Bandwidth Class								
Rx Parameter	Units	В	С	D	E	F				
ACS	dB	27	24	22.2	21					

Table 7.5.1A-2: Test parameters for Adjacent channel selectivity, Case 1

Rx Parameter	Units		CA	Bandwidth C	lass	
		В	С	D	E	F
Pw in Transmission Bandwidth		REFSENS	REFSENS	REFSEN	REFSENS	
Configuration, per CC		+ 14 dB	+ 14 dB	S + 14 dB	+ 14 dB	
	dBm	Aggregated	Aggregated	Aggregat	Aggregate	
		power +	power +	ed power	d power +	
P _{Interferer}		25.5 dB	22.5 dB	+ 20.7 dB	19.5 dB	
BW _{Interferer}	MHz	5	5	5	5	
F _{Interferer} (offset)	MHz		2.5 + F _{offset}	2.5 +	2.5 + F _{offset}	
		2.5 + F _{offset}	/	Foffset	/	
		/	-2.5 - F _{offset}	/	-2.5 - F _{offset}	
		-2.5 - F _{offset}		-2.5 -		
				F _{offset}		

- NOTE 1: The transmitter shall be set to 4dB below P_{CMAX_L,c} or P_{CMAX_L} as defined in subclause 6.2.5A.
- NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1
- NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the adjacent channel interferer and shall be further adjusted to $\left[F_{interferer}/0.015+0.5\right]0.015+0.0075$ MHz to be offset from the sub-carrier raster.

Table 7.5.1A-3: Test parameters for Adjacent channel selectivity, Case 2

Rx Parameter	Units		CA	Bandwidth C	lass	
		В	С	D	E	F
Pw in Transmission Bandwidth Configuration, per CC	dBm	-50.5 +10log ₁₀ (N _{RB,c} / N _{RB}	-47.5 +10log ₁₀ (N _{RB} , _c /N _{RB agg})	-43.9 +10log10(N _{RB,c} /N _{RB}	-44.5 +10log ₁₀ (N _{RB,c} /N _{RB agg})	
P _{Interferer}	dBm			-25		
BW _{Interferer}	MHz	5	5	5	5	
F _{Interferer} (offset)	MHz	2.5+ F _{offset} / -2.5- F _{offset}	2.5+ F _{offset} / -2.5- F _{offset}	2.5+ F _{offset} / -2.5- F _{offset}	2.5+ F _{offset} / -2.5- F _{offset}	

- NOTE 1: The transmitter shall be set to 24dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A.
- NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1
- NOTE 3: The $F_{\text{interferer}}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the adjacent channel interferer and shall be further adjusted to $|F_{\text{interferer}}/0.015 + 0.5|0.015 + 0.0075 \,\text{MHz}$ to be offset from the sub-carrier raster.

For combinations of intra-band and inter-band carrier aggregation with up to five downlink carriers (up to two noncontiguously aggregated carriers per band and up to four contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in each band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3.1A-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3.1A-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.1-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to three component carriers. For these uplink configurations, the UE shall meet the adjacent channel selectivity requirements for intra-band non-contiguous carrier aggregation of two downlink carriers with $\Delta R_{IBNC} = 0$ dB for all sub-block gaps (Table 7.3.1A-3) for the two non-contiguous downlink carriers, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.5.1. For contiguously aggregated component carriers configured in Band 46, the said requirements for intra-band contiguous carrier aggregation of downlink carriers are replaced by requirements in Table 7.5.1A-4 with test parameters in Table 7.5.1A-5 and Table 7.5.1A-6. All downlink carriers shall be active throughout the tests and the requirements for downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

Table 7.5.1A-4: Adjacent channel selectivity

E-UTRA band	Rx Parameter	Units	CA Bandwidth Class							
			B C D E F							
46	ACS	dB		24	22.2	[21]				

Table 7.5.1A-5: Test parameters for Adjacent channel selectivity, Case 1

E-UTRA Band	Rx Parameter	Units		CA Bandwidth Class					
			В	С	D	E	F		
	Pw in Transmission Bandwidth Configuration, per CC			REFSENS + 14 dB	REFSENS + 14 dB	REFSENS + 14 dB			
46	PInterferer	dBm		Aggregate d power + 22.5 dB	Aggregate d power + 20.7 dB	[Aggregate d power + 19.5 dB]			
	BW _{Interferer}	MHz		20	20	20			
	FInterferer (offset)	MHz		10 + F _{offset} / -10 - F _{offset}	10 + F _{offset} / -10 - F _{offset}	10 + F _{offset} / -10 - F _{offset}			

NOTE 1*: In a band capable of uplink operation, the transmitter shall be set to 4dB below P_{CMAX_L,c} or P_{CMAX_L} as defined in subclause 6.2.5A.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 (TBD)

NOTE 3: The F_{interferer} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the adjacent channel interferer and shall be further adjusted to

 $|F_{\text{interferer}}/0.015+0.5|0.015+0.0075 \, \text{MHz}$ to be offset from the sub-carrier raster.

Table 7.5.1A-6: Test parameters for Adjacent channel selectivity, Case 2

E-UTRA band	Rx Parameter	Units		CAI	Bandwidth Cl	ass	
			В	С	D	E	F
	Pw in Transmission Bandwidth Configuration, per CC	dBm		-47.5 +10log10(_{NRB} , _c /N _{RB agg})	-45.7 +10log10(_N _{RB,c} /N _{RB agg})	[-43.5 +10log10(_N _{RB,c} /N _{RB} _{agg})]	
46	P _{Interferer}	dBm			-25		
	BW _{Interferer}	MHz		20	20	20	
	F _{Interferer} (offset)	MHz		10 + F _{offset}	10 + F _{offset}	10 + F _{offset}	
				/	/	/	
				-10 - F _{offset}	-10 - F _{offset}	-10 - F _{offset}	

NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 24dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 (TBD)

NOTE 3: The $F_{interferer}$ (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the adjacent channel interferer and shall be further adjusted to $\left[F_{interferer}/0.015+0.5\right]0.015+0.0075$ MHz to be offset from the sub-carrier raster.

7.5.1B Minimum requirements for UL-MIMO

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in Clause 7.5.1 shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2. For UL-MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

7.5.1D Minimum requirements for ProSe

The UE shall fulfil the minimum requirement specified in Table 7.5.1D-1 for all values of an adjacent channel interferer up to -25 dBm. However it is not possible to directly measure the ACS, instead the lower and upper range of test parameters are chosen in Table 7.5.1D-2 and Table 7.5.1D-3 where the throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2.

Table 7.5.1D-1: Adjacent channel selectivity for ProSe

		Channel bandwidth						
Rx Parameter	Units	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
ACS	dB			33.0	33.0	30	27	

Table 7.5.1D-2: Test parameters for Adjacent channel selectivity for ProSe, Case 1

Rx Parameter	Units		Channel bandwidth							
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz			
Power in Transmission Bandwidth Configuration	dBm		P _{REFSENS_ProSe} + 14 dB							
<u> </u>	dBm			REFSENS	REFSENS	REFSENS	REFSENS			
P _{Interferer}				+45.5dB	+45.5dB	+42.5dB	+39.5dB			
BW _{Interferer}	MHz			5	5	5	5			
F _{Interferer} (offset)	MHz			5+0.0025 /	7.5+0.0075 /	10+0.0125 /	12.5+0.0025 /			
				-5-0.0025	-7.5-0.0075	-10-0.0125	-12.5-			
							0.0025			

NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211.

Table 7.5.1D-3: Test parameters for Adjacent channel selectivity for ProSe, Case 2

Rx Parameter	Units	Channel bandwidth							
	•	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
Power in									
Transmission	dBm			-56.5	-56.5	-53.5	-50.5		
Bandwidth	UDIII			-30.3	-30.5	-55.5	-50.5		
Configuration									
P _{Interferer}	dBm			-2	5				
BW _{Interferer}	MHz			5	5	5	5		
F _{Interferer} (offset)	MHz			5+0.0025	7.5+0.0075	10+0.0125	12.5+0.0025		
, ,				/	/	/	/		
				-5-0.0025	-7.5-0.0075	-10-0.0125	-12.5-		
							0.0025		

NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211.

7.6 Blocking characteristics

The blocking characteristic is a measure of the receiver's ability to receive a wanted signal at its assigned channel frequency in the presence of an unwanted interferer on frequencies other than those of the spurious response or the adjacent channels, without this unwanted input signal causing a degradation of the performance of the receiver beyond a specified limit. The blocking performance shall apply at all frequencies except those at which a spurious response occur.

7.6.1 In-band blocking

In-band blocking is defined for an unwanted interfering signal falling into the UE receive band or into the first 15 MHz below or above the UE receive band at which the relative throughput shall meet or exceed the minimum requirement for the specified measurement channels.

For CA configurations including Band 46, in-band blocking in Band 46 is defined for a 20 MHz unwanted interfering signal falling into the UE receive band or into the first 60 MHz below or above the UE receive band (Table 7.6.1.1A-0a and Table 7.6.1.1A-0b).

7.6.1.1 Minimum requirements

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.1.1-1 and 7.6.1.1-2. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements only apply for carriers assigned in the paired part.

Table 7.6.1.1-1: In band blocking parameters

Rx parameter	Units	Channel bandwidth						
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
Power in		REFSENS + channel bandwidth specific value below						
Transmission Bandwidth Configuration	dBm	6	6	6	6	7	9	
BW _{Interferer}	MHz	1.4	3	5	5	5	5	
Floffset, case 1	MHz	2.1+0.0125	4.5+0.0075	7.5+0.0125	7.5+0.0025	7.5+0.0075	7.5+0.0125	
F _{loffset, case 2}	MHz	3.5+0.0075	7.5+0.0075	12.5+0.0075	12.5+0.012	12.5+0.002	12.5+0.007	
					5	5	5	

- NOTE 1: The transmitter shall be set to 4dB below Pcmax L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax L as defined in subclause 6.2.5.
- NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1.
- NOTE 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively.

Table 7.6.1.1-2: In-band blocking

E-UT	RA	Parameter	Unit	Case 1	Case 2	Case 3	Case 4	Case 5
ban	nd	P _{Interferer}	dB m	-56	-44			-38
		F _{Interferer} (offset)	MH z	=-BW/2 - F _{loffset,case 1} & =+BW/2 + F _{loffset,case 1}	≤-BW/2 − F _{loffset,case 2} & ≥+BW/2 + F _{loffset,case 2}			-BW/2 - 11
1, 2, 3, 6, 7, 8 10, 11, 13, 14 18, 19 21, 22 25, 26 28, 31, 34, 35, 37, 38 40, 41, 43, 44, 65, 6	3, 9, , 12, , 17, , 20, , 23, , 27, , 33, , 36, , 39, , 42,	F _{Interferer}	MHz	(NOTE 2)	F _{DL_low} – 15 to F _{DL_high} + 15	Void	Void	
30)	F _{Interferer}	MHz	(NOTE 2)	F _{DL_low} – 15 to F _{DL_high} + 15			F _{DL_low} – 11

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:

- a. the carrier frequency -BW/2 Floffset, case 1 and
- b. the carrier frequency +BW/2 + Floffset, case 1
- NOTE 3: F_{Interferer} range values for unwanted modulated interfering signal are interferer center frequencies

For the UE which supports inter band CA configuration in Table 7.3.1-1A, $P_{Interferer}$ power defined in Table 7.6.1.1-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A.

7.6.1.1A Minimum requirements for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the in-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.1.1 for each component carrier while all downlink carriers are active. For the UE which supports inter band CA configuration in Table 7.3.1-1A, $P_{\text{Interferer}}$ power defined in Table 7.6.1.1-2 is increased by the amount given by $\Delta R_{\text{IB,c}}$ in Table 7.3.1-1A. For E-UTRA CA configurations including an operating band without uplink operation or an operating band with an unpaired DL part (as noted in Table 5.5-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. The requirements for the component carrier configured in the operating band without uplink operation are specified in Table 7.6.1.1A-0, Table 7.6.1.1A-0a and Table 7.6.1.1A-0b.

Table 7.6.1.1A-0: In-band blocking for additional operating bands for carrier aggregation

E-UTRA band	E-UTRA band Parameter		Case 1	Case 2
	P _{Interferer}	dBm	-56	-44
	F _{Interferer} (offset)	MHz	=-BW/2 - F _{loffset,case 1} & =+BW/2 + F _{loffset,case 1}	≤-BW/2 − F _{loffset,case 2} & ≥+BW/2 + F _{loffset,case 2}
29, 32, 67	F _{Interferer}	MHz	(NOTE 2)	F _{DL_low} – 15 to F _{DL_high} + 15

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:

a. the carrier frequency -BW/2 - $F_{\text{loffset, case 1}}$ and

b. the carrier frequency +BW/2 + F_{loffset, case 1}

NOTE 3: F_{Interferer} range values for unwanted modulated interfering signal are interferer center frequencies

Table 7.6.1.1A-0a: In band blocking parameters for additional operating bands for carrier aggregation

E-UTRA band	Rx parameter	Units	Channel bandwidth					
			1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
	Power in			REFSENS	+ channel band	width specific	value below	
46 (NOTE 2)	Transmission Bandwidth Configuration	dBm						9
(NOTE 3)	BW _{Interferer}	MHz						20
	F _{loffset, case 1}	MHz						30+0.0125
	F _{loffset, case 2}	MHz						50+0.0075

NOTE 1: The transmitter shall be set to 4dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax_L as defined in subclause 6.2.5.

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

NOTE 3: The interferer consists of the Reference measurement channel specified in Annex A.3.2 (TBD)

Table 7.6.1.1A-0b: In-band blocking for additional operating bands for carrier aggregation

E-UTRA band	E-UTRA band Parameter		Case 1	Case 2	
	P _{Interferer}	dBm	-50	-44	
	F _{Interferer} (offset)	MHz	=-BW/2 - F _{loffset,case 1} & =+BW/2 + F _{loffset,case 1}	≤-BW/2 − F _{loffset,case 2} & ≥+BW/2 + F _{loffset,case 2}	
46	F _{Interferer}	MHz	(Note 2)	$F_{DL_low} - 60$ to $F_{DL_high} + 60$	

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz or 60 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency -BW/2 - $F_{loffset, case 1}$ and

b. the carrier frequency +BW/2 + F_{loffset, case 1}

NOTE 3: F_{Interferer} range values for unwanted modulated interfering signal are interferer center frequencies

For E-UTRA CA configurations listed in Table 7.3.1A-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the in-band blocking requirements of subclause 7.6.1.1A do not apply.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.6.1.1A-1 with the uplink configuration set according to Table 7.3.1A-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.1-2. The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Tables 7.6.1.1A-1 and Tables 7.6.1.1A-2 being on either side of the aggregated signal. The throughput of each carrier shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.1.1A-1 and 7.6.1.1A-2. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.6.2.1A-1 and 7.6.2.1A-2.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, each larger than or equal to 5 MHz, the in-band blocking requirements are defined with the uplink configuration in accordance with Table 7.3.1A-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclause 7.6.1.1 and in this subclause for one component carrier and two component carriers per sub-block, respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

Table 7.6.1.1A-1: In band blocking parameters

Rx Parameter	Units	CA Bandwidth Class						
		В	С	D	E	F		
Pw in Transmission		REFSENS + CA Bandwidth Class specific value below						
Bandwidth Configuration, per CC	dBm	9	12	13.8	15			
BW _{Interferer}	MHz	5	5	5	5			
Floffset, case 1	MHz	7.5	7.5	7.5	7.5			
Floffset case 2	MHz	12.5	12.5	12.5	12.5			

NOTE 1: The transmitter shall be set to 4dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

Table 7.6.1.1A-2: In-band blocking

CA configuration	Parameter	Unit	Case 1	Case 2
	P _{Interferer}	dBm	-56	-44
	F _{Interferer}	MHz	=-F _{offset} F _{loffset,case 1} &	≤-F _{offset} F _{loffset,case 2} &
	(offset)		=+F _{offset} + F _{loffset,case 1}	≥+F _{offset} + F _{loffset,case 2}
CA_1C, CA_2C, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_38C, CA_39C, CA_40C, CA_41C, CA_40D, CA_41D, CA_42C, CA_42D, CA_42E, CA_66B, CA_66C	F _{Interferer} (Range)	MHz	(NOTE 2)	F _{DL_low} – 15 to F _{DL_high} + 15

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:

a. the carrier frequency -Foffset - Floffset, case 1 and

b. the carrier frequency +F_{offset} + F_{loffset}, case 1

NOTE 3: F_{offset} is the frequency offset from the center frequency of the CC being tested to the edge of

aggregated channel bandwidth.

The F_{interferer} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the interferer and shall be further adjusted to

 $|F_{\text{interferer}}|/0.015+0.5|$ |0.015+0.0075| MHz to be offset from the sub-carrier raster.

For combinations of intra-band and inter-band carrier aggregation with up to four downlink carriers (up to two noncontiguously aggregated carriers per band and up to three contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in the band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3.1A-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3.1A-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.1-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to three component carriers. For these uplink configurations, the UE shall meet the in-band blocking requirements for intra-band non-contiguous carrier aggregation of two downlink carriers with $\Delta R_{IBNC} = 0$ dB for all sub-block gaps (Table 7.3.1A-3) for the two non-contiguous downlink carriers, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.6.1. For contiguously aggregated component carriers configured in Band 46, the said requirements for intraband contiguous carrier aggregation of downlink carriers are replaced by requirements in Table 7.6.1.1A-3 and 7.6.1.1A-4. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of uplink operation.

Table 7.6.1.1A-3: In band blocking parameters

E-UTRA Band	Rx Parameter Units		CA Bandwidth Class					
			В	С	D	E	F	
	Pw in Transmission		REF	SENS + CA B	andwidth Class	specific value b	oelow	
46	Bandwidth Configuration, per CC	dBm		12	13.8	[15]		
46	BW _{Interferer}	MHz		20	20	20		
	F _{loffset, case 1}	MHz		30	30	30		
	F _{loffset, case 2}	MHz		50	50	50		

NOTE 1: In a band capable of uplink operation, the transmitter shall be set to 4dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A

NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1

Table 7.6.1.1A-4: In-band blocking

E-UTRA Band	Parameter	Unit	Case 1	Case 2
	P _{Interferer}	dBm	[-56]	-44
	F _{Interferer} (offset)	MHz	=-F _{offset} F _{loffset,case 1} & =+F _{offset} + F _{loffset,case 1}	≤-F _{offset} - F _{loffset,case 2} & ≥+F _{offset} + F _{loffset,case 2}
46	F _{Interferer} (Range)	MHz	(Note 2)	$F_{DL_low} - 60$ to $F_{DL_bigh} + 60$

- NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band
- NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
 - a. the carrier frequency -Foffset Floffset, case 1 and
 - b. the carrier frequency +F_{offset} + F_{loffset, case 1}
- NOTE 3: F_{offset} is the frequency offset from the center frequency of the CC being tested to the edge of aggregated channel bandwidth.
- NOTE 4: The F_{interferer} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the interferer and shall be further adjusted to $\left|F_{\text{interferer}}/0.015+0.5\right|0.015+0.0075\,\text{MHz}$ to be offset from the sub-carrier raster.

7.6.1.1D Minimum requirements for ProSe

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2.

Table 7.6.1.1D-1: In band blocking parameters for ProSe Direct Discovery

Rx parameter	Units	Channel bandwidth							
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
Power in		PR	REFSENS_ProSe +	channel bandwidth specific value below + Poffset					
Transmission	dBm								
Bandwidth	ubili			6	6	7	9		
Configuration									
BW _{Interferer}	MHz			5	5	5	5		
F _{loffset, case 1}	MHz			7.5+0.0125	7.5+0.0025	7.5+0.0075	7.5+0.0125		
Floffset, case 2	MHz			12.5+0.0075	12.5+0.012	12.5+0.002	12.5+0.007		
					5	5	5		
Poffset	dB			10.9	13.9	15.7	16.9		

NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211

Table 7.6.1.1D-2: In band blocking parameters for ProSe Direct Communication

Rx parameter	Units	Channel bandwidth							
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
Power in			P _{REFSENS ProSe} + channel bandwidth specific value below						
Transmission	dBm								
Bandwidth	ubili			6	6	7	9		
Configuration									
BW _{Interferer}	MHz			5	5	5	5		
F _{loffset, case 1}	MHz			7.5+0.0125	7.5+0.0025	7.5+0.0075	7.5+0.0125		
F _{loffset, case 2}	MHz			12.5+0.0075	12.5+0.012	12.5+0.002	12.5+0.007		
					5	5	5		

NOTE 1: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211

E-UTRA	Parameter	Unit	Case 1	Case 2
ProSe	P _{Interferer}	dBm	-56	-44
band	E		=-BW/2 - F _{loffset,case 1}	≤-BW/2 − F _{loffset,case 2}
	F _{Interferer} (offset)	MHz	&	&
	(Oliset)		=+BW/2 + F _{loffset,case 1}	≥+BW/2 + F _{loffset,case 2}
2,3,4,7,14, 20,26,28,31	F _{Interferer}	MHz	(NOTE 2)	F _{DL_low} – 15 to F _{DL_bigh} + 15

Table 7.6.1.1D-3: In-band blocking for ProSe

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:

a. the carrier frequency -BW/2 - $F_{\text{loffset, case 1}}$ and

b. the carrier frequency +BW/2 + F_{loffset, case 1}

NOTE 3: F_{Interferer} range values for unwanted modulated interfering signal are interferer center frequencies

For the UE which supports inter band CA configuration in Table 7.3.1-1A, $P_{Interferer}$ power defined in Table 7.6.1.1D-3 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A.

7.6.2 Out-of-band blocking

Out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 15 MHz below or above the UE receive band. For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1 and subclause 7.6.1 shall be applied.

For CA configurations including Band 46, out-of-band band blocking is defined for an unwanted CW interfering signal falling more than 60 MHz below or above the UE receive band (see Table 7.6.2.1A-0a). For the first 60 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in subclause 7.5.1A and subclause 7.6.1A shall be applied.

7.6.2.1 Minimum requirements

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.2.1-1 and 7.6.2.1-2. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements only apply for carriers assigned in the paired part.

For Table 7.6.2.1-2 in frequency range 1, 2 and 3, up to $\max(24, 6 \cdot \lceil N_{RB} / 6 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.6-1). For these exceptions the requirements of subclause 7.7 Spurious response are applicable.

For Table 7.6.2.1-2 in frequency range 4, up to $\max(8, \lceil (N_{RB}+2\cdot L_{CRBs})/8 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configurations (see Figure 5.6-1) and L_{CRBs} is the number of resource blocks allocated in the uplink. For these exceptions the requirements of clause 7.7 spurious response are applicable.

Table 7.6.2.1-1: Out-of-band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in		REFSENS + channel bandwidth specific value below					
Transmission Bandwidth Configuration	dBm	6	6	6	6	7	9

- NOTE 1: The transmitter shall be set to 4dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax_L as defined in subclause 6.2.5.
- NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.
- NOTE 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively.

Table 7.6.2.1-2: Out of band blocking

E-UTRA band	Parameter	Units		Fred	quency	
			Range 1	Range 2	Range 3	Range 4
	P _{Interferer}	dBm	-44	-30	-15	-15
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11,			F _{DL_low} -15 to F _{DL_low} -60	F _{DL_low} -60 to F _{DL_low} -85	F _{DL_low} -85 to 1 MHz	-
12, 13, 14, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 (NOTE 2), 43 (NOTE 2), 44, 45, 65, 66	Finterferer (CW)	MHz	F _{DL_high} +15 to F _{DL_high} + 60	F _{DL_high} +60 to F _{DL_high} +85	F _{DL_high} +85 to +12750 MHz	-
2, 5, 12, 17	F _{Interferer}	MHz	-	-	-	FUL_low - FUL_high

- NOTE 1: For the UE which supports both Band 11 and Band 21 the out of blocking is FFS.
- NOTE 2: The power level of the interferer ($P_{Interferer}$) for Range 3 shall be modified to -20 dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz.
- NOTE 3: For the UE that supports both Band 4 and Band 66, the out-of-blocking frequency range for Band 4 is defined relative to F_{DL low} and F_{DL high} of Band 66.

7.6.2.1A Minimum requirements for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band, the out-of-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The throughput in the downlink measured shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.2.1-1 and 7.6.2.1A-0. For E-UTRA CA configurations including an operating band without uplink operation (as noted in Table 5.5-1), the requirements for all downlinks shall be met with the uplink active in the band(s) capable of UL operation. For the E-UTRA CA configurations listed in Table 7.6.2.1A-0a, the parameters specified in Table 7.6.2.1A-0 are replaced by those specified in Table 7.6.2.1A-0a. The UE shall meet these requirements for each component carrier while all downlink carriers are active.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the out-of-band blocking requirements specified above shall be met with the transmitter power for the uplink set to 7 dB below $P_{CMAX_L,c}$ for each serving cell c.

For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part (as noted in Table 5.5-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For E-UTRA CA configurations listed in Table 7.3.1A-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the out-of-band blocking requirements of subclause 7.6.2.1A do not apply.

Table 7.6.2.1A-0: out-of-band blocking for inter-band carrier aggregation

Parameter	Unit	Range 1	Range 2	Range 3				
P_{w}	dBm	Table 7.6	Table 7.6.2.1-1 for all component carriers					
P _{interferer}	dBm	$-44 + \Delta R_{IB,c}$	-30 + ∆R _{IB,c}	-15 + $\Delta R_{IB,c}$				
F _{interferer}	MHz	$-60 < f - F_{DL_Low(j)} < -15$	$-85 < f - F_{DL_Low(j)} \le -60$	$1 \le f \le F_{DL_Low(1)} - 85$				
(CW)		or	or	or				
		$15 < f - F_{DL_High(j)} < 60$	$60 \le f - F_{DL_High(j)} < 85$	F _{DL_High(j)} + 85 ≤ f				
				$\leq F_{DL_Low(j+1)} - 85$ with				
				<i>j</i> < X				
				or				
				$F_{DL_High(X)} + 85 \le f$				
				≤ 12750				

- NOTE 1: $F_{DL_Low(j)}$ and $F_{DL_High(j)}$ denote the respective lower and upper frequency limits of the operating band containing carrier j, j = 1,...,X, with carriers numbered in increasing order of carrier frequency and X the number of component carriers in the band combination (X ≤ 4 for the present version of this specification).
- NOTE 2: For $F_{DL_Low(j+1)} F_{DL_High(j)} < 145$ MHz and $F_{Interferer}$ in $F_{DL_High(j)} < f < F_{DL_Low(j+1)}$ with j < X, $F_{Interferer}$ can be in both Range 1 and Range 2. Then the lower of the $P_{Interferer}$ applies.
- NOTE 3: For F_{DL_Low(j)} − 15 MHz ≤ f ≤ F_{DL_High(j)} + 15 MHz the appropriate adjacent channel selectivity and in-band blocking requirments in the respective subclauses 7.5.1A and 7.6.1.1A shall be applied for carrier *j*.
- NOTE 4: $\Delta R_{IB,c}$ according to Table 7.3.1-1A applies when serving cell c is measured.
- NOTE 5: For inter-band CA combinations containing Bands 42 or 43, the interferer with respect to Band 42 or Band 43 shall have power level ($P_{Interferer}$) for Range 3 modified to -20 + $\Delta R_{IB,c}$ dBm for $F_{Interferer}$ > 2800 MHz and $F_{Interferer}$ < 4400 MHz.
- NOTE 6: For inter-band CA combinations containing Bands 7 and 38 simultaneously, for $F_{Interferer}$ Bands 7 and 38 are considered as one single band as follows: $F_{DL_Low} = 2570$ MHz and $F_{DL_High} = 2690$ MHz. For Range 2, the following applies for F_{DL_Low} : $[-105] < f F_{DL_Low} \le -60$ or $60 \le f F_{DL_High} < 85$. For Range 3 the following applies $1 \le f \le F_{DL_Low}$ [-105] or $F_{DL_High} + 85 \le f \le 12750$.

Table 7.6.2.1A-0a: out-of-band blocking for inter-band carrier aggregation with one active uplink

E-UTRA CA	Parameter	Unit	Range 1	Range 2	Range 3
Configuration				-	
CA 1A 16A	P _{wanted}	dBm	Table 7.6	.2.1-1 for all component of	arriers
CA_1A-46A, CA_2A-46A, CA_3A-46A,	P _{interferer}	dBm	-44 + ΔR _{IB,c}	-30 + ΔR _{IB,c}	-15 + ΔR _{IB,c} (NOTE 5)
CA_3A-46A, CA_4A-46A, CA_7A-46A, CA_41A-46A, CA_42A-46A	Finterferer (CW)	MHz	$-60 < f - F_{DL_Low(j)} < -15$ with $j \le K$ or $15 < f - F_{DL_High(j)} < 60$ with $j \le K$	$-85 < f - F_{DL_Low(j)} \le -60$ or $60 \le f - F_{DL_High(j)} < 85$	$1 \le f \le F_{DL_Low(j)} - 85$ or $F_{DL_High(j)} + 85 \le f$ ≤ 12750

NOTE 1: F_{DL_Low(j)} and F_{DL_High(j)}, j = 1,...,K,...N, denote the respective lower and upper frequency limits of the (non-overlapping) operating bands of the CA configuration numbered in increasing order of frequency, with N the number of bands in the band combination and K the number of bands with F_{DL_High} below 2800 MHz (K = 1 and N = 2 in the present version of this specification).

NOTE 2: For $F_{DL_Low(j)} - 15$ MHz $\leq f \leq F_{DL_High(j)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5.1A and 7.6.1.1A shall be applied for carrier j = 1.

NOTE 3: For $F_{DL_Low(N)} - 60$ MHz \leq f \leq $F_{DL_High(N)} + 60$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective subclauses 7.5.1A and 7.6.1.1A shall be applied for carrier N = 2.

NOTE 4: $\Delta R_{IB,c}$ according to Table 7.3.1-1A applies when serving cell c is measured.

NOTE 5: The power level (P_{Interferer}) for Range 3 is modified to -20 dBm for F_{Interferer} > 4400 MHz.

For Table 7.6.2.1A-0 and Table 7.6.2.1A-0b in frequency ranges 1, 2 and 3, up to $\max(24,6 \cdot \lceil N_{RB} \cdot /6 \rceil)$ exceptions per downlink are allowed for spurious response frequencies for one active uplink when measured using a step size of 1 MHz.

For Table 7.6.2.1A-0 in frequency ranges 1, 2 and 3, up to $2 \cdot \max(24.6 \cdot \lceil N_{RB} \cdot /6 \rceil)$ exceptions per downlink are allowed for spurious response frequencies for two active uplinks when measured using a step size of 1 MHz. For these exceptions the requirements in clause 7.7.1A apply.

For intra-band contiguous carrier aggreagations the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.6.2.1A-1 with the uplink configuration set according to Table 7.3.1A-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.1-2.

The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Tables 7.6.2.1A-1 and Tables 7.6.2.1A-2 being on either side of the aggregated signal. The throughput of each carrier shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.6.2.1A-1 and 7.6.2.1A-2. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.6.2.1A-1 and 7.6.2.1A-2.

For Table 7.6.2.1A-2 in frequency range 1, 2 and 3, up to $\max(24.6 \cdot \lceil N_{RB} \cdot /6 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7 Spurious response are applicable.

Rx Parameter	Units	CA Bandwidth Class					
		В	С	D	E	F	
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + CA Bandwidth Class specific value below				c value	
CC		9	9	9	9		

NOTE 1: The transmitter shall be set to 4dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1

FDD/TDD as described in Annex A.5.1.1/A.5.2.

Table 7.6.2.1A-2: Out of band blocking

CA configuration	Parameter	Units		Frequency	,
			Range 1	Range 2	Range 3
	P _{Interferer}	dBm	-44	-30	-15
CA_1C, CA_2C, CA_3C, CA_5B, CA_7C, CA_8B, CA_12B, CA_23B, CA_27B, CA_38C, CA_40C, CA_41C, CA_40D, CA_42C ¹ , CA_42D ¹ , CA_42E ¹ , CA_66B, CA_66C	F _{Interferer} (CW)	MHz	F _{DL_low} - 15 to F _{DL_low} - 60 F _{DL_high} +15 to	F _{DL_low} - 60 to F _{DL_low} - 85 F _{DL_high} +60 to	F _{DL_low} - 85 to 1 MHz F _{DL_high} +85 to
0.1_000			F _{DL_high} + 60	F _{DL_high} +85	+12750 MHz
NOTE 1. The newer level of the interferor (D	A configuration	n for Do			

NOTE 1: The power level of the interferer (P_{Interferer}) for this CA configuration for Range 3 shall be modified to -20 dBm for F_{Interferer} > 2800 MHz and F_{Interferer} < 4400 MHz.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the out-of-band blocking requirements are defined with the uplink configuration in accordance with table 7.3.1A-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.6.2.1 and 7.6.2.1A for one component carrier and two component carriers per sub-block, respectely. The requirements apply with all downlink carriers active.

For Table 7.6.2.1-2 in frequency range 1, 2 and 3, up to $\max(24.6 \cdot \lceil N_{RB} \cdot /6 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies for one active uplink when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7 spurious response are applicable.

For Table 7.6.2.1-2 in frequency range 4, up to $\max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs})/8 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies for one active uplink when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 spurious response are applicable.

For intra-band non-contiguous carrier aggregation with two uplink carriers and two downlink carriers, the out-of-band blocking requirements are defined with the uplink configuration of the PCC and SCC being in accordance with Table 7.3.1A-4 and powers of both carriers set to $P_{CMAX_L,c} - 7$ dBm. The UE shall meet the requirements specified in subclause 7.6.2.1 for each component carrier while both downlink carriers are active.

For Table 7.6.2.1-2 in frequency range 1, 2 and 3, up to $2 \cdot \max(24,6 \cdot \lceil N_{RB} \cdot /6 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies for two active uplinks in the same operating band when measured using a 1MHz step size. For these exceptions the requirements of subclause 7.7 spurious response are applicable.

For Table 7.6.2.1-2 in frequency range 4, up to $2 \cdot \max\{8, \lceil (N_{RB} + 2 \cdot L_{CRBs})/8 \rceil$) exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies for two active uplinks in the same operating band when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 spurious response are applicable.

For combinations of intra-band and inter-band carrier aggregation with up to four downlink carriers (up to two noncontiguously aggregated carriers per band and up to three contiguously aggregated carriers per band) and the uplink assigned to one E-UTRA band, the requirement is defined with the uplink active a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3.1A-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3.1A-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.1-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to three component carriers. For the two non-contiguous component carriers within the same band, Pwanted in Table 7.6.2.1A-0 is set using $\Delta R_{IBNC} = 0$ dB for all sub-block gaps (Table 7.3.1A-3) while a band supporting contiguously aggregated carriers the out-of-band blocking parameters in Table 7.6.2.1-1 are replaced by those specified in Table 7.6.2.1A-1. For each downlink the UE shall meet the out-of-band blocking requirements applicable for inter-band carrier aggregation with one component carrier per operating band but with up to three component carriers assigned to the same band with the following exception. For each component carrier of the E-UTRA CA Configurations CA 1A-46A, CA 2A-46A. CA 3A-46A, CA 4A-46A, CA 7A-46A, CA 41A-46A, CA 42A-46A the requirements specified in Table 7.6.2.1A-0 are replaced by those in 7.6.2.1A-0a. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

7.6.2.1D Minimum requirements for ProSe

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Tables 7.6.2.1D-1, 7.6.2.1D-2 and 7.6.2.1D-3.

For Table 7.6.2.1D-3 in frequency range 1, 2 and 3, up to $\max(24, 6 \cdot \lceil N_{RB} / 6 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.6-1). For these exceptions the requirements of subclause 7.7 Spurious response are applicable.

For Table 7.6.2.1D-3 in frequency range 4, up to $\max(8, \lceil (N_{RB}+2\cdot L_{CRBs})/8 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configurations (see Figure 5.6-1) and L_{CRBs} is the number of resource blocks allocated in the uplink. For these exceptions the requirements of clause 7.7 spurious response are applicable.

Table 7.6.2.1D-1: Out-of-band blocking parameters for ProSe Direct Discovery

Rx Parameter	Units	Channel bandwidth						
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
Power in Transmission	dBm	P _{REFSENS_ProSe} + channel bandwidth specific value below + P _{offset}						
Bandwidth Configuration	dbiii			6	6	7	9	
Poffset	dB			10.9	13.9	15.7	16.9	
NOTE 2: Reference measurement channel is specified in Annex A.6.2.								

Table 7.6.2.1D-2: Out-of-band blocking parameters for ProSe Direct Communication

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in		Prefsens	S_ProSe + Ch	nannel ba	ndwidth sp	pecific valu	ue below
Transmission Bandwidth	dBm			6	6	7	9
Configuration							
NOTE 1: Reference measurement channel is specified in Annex A.6.2.							

Table 7.6.2.1D-3: Out of band blocking for ProSe

E-UTRA	Parameter	Units	Frequency					
ProSe			Range 1	Range 2	Range 3			
band	P _{Interferer}	dBm	-44	-30	-15			
			F _{DL_low} -15 to	F _{DL_low} -60 to	F _{DL_low} -85 to			
2,3,4,7,14,	F _{Interferer}	MHz	F _{DL_low} -60	F _{DL_low} -85	1 MHz			
20,26,28,31	(CW)	IVITZ	F _{DL_high} +15 to	F _{DL_high} +60 to	F _{DL_high} +85 to			
			F _{DL_high} + 60	F _{DL_high} +85	+12750 MHz			
NOTE 1: For	the UE which su	pports botl	h Band 11 and Band	21 the out of blockir	ng is FFS.			

7.6.3 Narrow band blocking

This requirement is measure of a receiver's ability to receive a E-UTRA signal at its assigned channel frequency in the presence of an unwanted narrow band CW interferer at a frequency, which is less than the nominal channel spacing.

7.6.3.1 Minimum requirements

The relative throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3.1-1. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements only apply for carriers assigned in the paired part.

10.2075

 $\Delta f = 15 \text{ kHz}$ Fuw (offset for

 $\Delta f = 7.5 \text{ kHz}$

5	11.74		(Channel Ba	ndwidth			
Parameter	Unit	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
	dDm	P _{REFSENS} + channel-bandwidth specific value below						
P _w	dBm	22	18	16	13	14	16	
P _{uw} (CW)	dBm	-55	-55	-55	-55	-55	-55	
F _{uw} (offset for	N 41 1-	0.0075	4 7005	0.7075	5.0405	7 7005	40.0075	

2.7075

5.2125

7.7025

1.7025

Table 7.6.3.1-1: Narrow-band blocking

NOTE 1: The transmitter shall be set a 4 dB below PCMAX_L at the minimum uplink configuration specified in Table 7.3.1-2 with PCMAX_L as defined in subclause 6.2.5.

0.9075

Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

NOTE 3: The PREFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively.

For the UE which supports inter-band CA configuration in Table 7.3.1-1A, P_{UW} power defined in Table 7.6.3.1-1 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A.

7.6.3.1A Minimum requirements for CA

MHz

MHz

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the narrow-band blocking requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.6.3.1 for each component carrier while all downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part (as noted in Table 5.5-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For E-UTRA CA configurations listed in Table 7.3.1A-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the narrow-band blocking requirements of subclause 7.6.3.1A do not apply. For E-UTRA CA configurations with a component carrier assigned in Band 46, narrow-band blocking requirements do not apply in the presence of a narrow-band interferer in Band 46.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.6.3.1A-1 with the uplink configuration set according to Table 7.3.1A-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink, the uplink configuration of the PCC shall be in accordance with Table 7.3.1-2. The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Table 7.6.3.1A-1 being on either side of the aggregated signal. The throughput of each carrier shall be > 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.6.3.1A-1. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Table 7.6.3.1A-1.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the narrow band blocking requirements are defined with the uplink configuration in accordance with Table 7.3.1A-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.6.3.1 and 7.6.3.1A for one component carrier and two component carriers per sub-block, respectively. The requirements apply for in-gap and out-of-gap interferers while all downlink carriers are active.

0.2

/

+ Foffset +

0.2

0.2

/

+ Foffset +

0.2

Parameter

Pw in Transmission Bandwidth

Configuration, per CC

P_{uw} (CW)

Fuw (offset for

Fuw (offset for

 $\Delta f = 7.5 \text{ kHz}$

 $\Delta f = 15 \text{ kHz}$

CA Bandwidth Class Unit Ε C D REFSENS + CA Bandwidth Class specific value below dBm 16² 16 16 dBm -55 -55 -55 -55 F_{offset} - Foffset

- F_{offset}

+ F_{offset} + 0.2

Table 7.6.3.1A-1: Narrow-band blocking

- F_{offset} − 0.2

+ F_{offset} + 0.2

NOTE 1: The transmitter shall be set to 4dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A.

MHz

MHz

NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

NOTE 3: The F_{uw} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the interferer and shall be further adjusted to $\left[F_{interferer}/0.015+0.5\right]0.015+0.0075\,\text{MHz}$ to be offset from the sub-carrier raster.

NOTE 4: The requirement is applied for the band combinations whose component carriers' BW≥5 MHz.

For combinations of intra-band and inter-band carrier aggregation with up to four downlink carriers (up to two noncontiguously aggregated carriers per band and up to three contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3.1A-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3.1A-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.1-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to three component carriers. For these uplink configurations, the UE shall meet the narrow-band blocking requirements for intra-band non-contiguous carrier aggregation of two downlink carriers with $\Delta R_{IBNC} = 0$ dB for all sub-block gaps (Table 7.3.1A-3) for the two non-contiguous downlink carriers, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.6.3. For E-UTRA CA configurations with a component carriers assigned in Band 46, narrow-band blocking requirements do not apply in the presence of a narrow-band interferer in Band 46. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

7.6.3.1D Minimum requirements for ProSe

The relative throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Table 7.6.3.1D-1 and Table 7.6.3.1D-2.

Table 7.6.3.1D-1: Narrow-band blocking for ProSe Direct Discovery

Parameter	Unit	Channel Bandwidth							
Parameter	Onit	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
P _w	dBm	P _{REFSENS_ProSe} + channel-bandwidth specific value below + P _{offset}							
FW	UDIII			16	13	14	16		
P _{uw} (CW)	dBm			-55	-55	-55	-55		
Poffset	dB			10.9	13.9	15.7	16.9		
F_{uw} (offset for $\Delta f = 15 \text{ kHz}$)	MHz			2.7075	5.2125	7.7025	10.2075		
F_{uw} (offset for $\Delta f = 7.5 \text{ kHz}$)	MHz								
NOTE 1: Referer	nce measurem	ent channel i	is specified ir	n Annex A.6.	2.				

Channel Bandwidth Parameter Unit 1.4 MHz 3 MHz 5 MHz | 10 MHz | 15 MHz 20 MHz PREFSENS_ProSe + channel-bandwidth specific value below P_w dBm 16 13 14 P_{uw} (CW) dBm -55 -55 -55 -55 Fuw (offset for MHz 2.7075 5.2125 7.7025 10.2075 $\Delta f = 15 \text{ kHz}$ Fuw (offset for MHz $\Delta f = 7.5 \text{ kHz}$ NOTE 1: Reference measurement channel is specified in Annex A.6.2

Table 7.6.3.1D-2: Narrow-band blocking for ProSe Direct Communication

For the UE which supports inter-band CA configuration in Table 7.3.1-1A, P_{UW} power defined in Table 7.6.3.1D-1 and Table 7.6.3.1D-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A.

7.6A Void

<Reserved for future use>

7.6B Blocking characteristics for UL-MIMO

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in subclause 7.6 shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2. For UL-MIMO, the parameter $P_{\text{CMAX_L}}$ is defined as the total transmitter power over the two transmit antenna connectors.

7.7 Spurious response

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out of band blocking limit as specified in subclause 7.6.2 is not met.

7.7.1 Minimum requirements

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7.1-1 and 7.7.1-2. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements only apply for carriers assigned in the paired part.

Table 7.7.1-1: Spurious response parameters

Rx parameter	Units		Channel bandwidth							
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz			
Power in		REF	SENS + ch	nannel band	dwidth speci	fic value bel	ow			
Transmission Bandwidth Configuration	dBm	6	6	6	6	7	9			

NOTE 1: The transmitter shall be set to 4dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2.

N OTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

NOTE 3: The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four antenna ports, respectively.

Table 7.7.1-2: Spurious response

Parameter	Unit	Level
P _{Interferer} (CW)	dBm	-44
F _{Interferer}	MHz	Spurious response frequencies

For the UE which supports inter-band CA configuration in Table 7.3.1-1A, $P_{interferer}$ power defined in Table 7.7.1-2 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A.

7.7.1A Minimum requirements for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the spurious response requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The throughput measured in each downlink with $F_{interferer}$ in Table 7.6.2.1A-0 and Table 7.6.2.1A-0a at spurious response frequencies shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7.1-1 and 7.7.1-2. The UE shall meet these requirements for each component carrier while all downlink carriers are active.

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the spurious response requirements applicable specified above shall be met with the transmitter power for the uplink set to 7 dB below $P_{\text{CMAX_L,c}}$ for each serving cell c.

For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part (as noted in Table 5.5-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For E-UTRA CA configurations listed in Table 7.3.1A-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the spurious response requirements of subclause 7.7.1A do not apply.

For intra-band contiguous carrier aggregation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC. For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.7.1A-1 with the uplink configuration set according to Table 7.3.1A-1 for the applicable carrier aggregation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.1-2. The throughput of each carrier shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Tables 7.7.1A-1 and 7.7.1A-2. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.7.1A-1 and 7.7.1A-2

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the spurious response requirements are defined with the uplink configuration in accordance with Table 7.3.1A-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.7.1 and 7.7.1A for one component carrier and two component carriers per sub-block, respectively. The requirements apply with all downlink carriers active.

For intra-band non-contiguous carrier aggregation with two uplink carriers and two downlink carriers, the spurious response requirements applicable specified above shall be met with the transmitter powers for the uplinks set to $P_{CMAX_L,c} - 7 \text{ dBm}$.

Table 7.7.1A-1: Spurious response parameters

Rx Parameter	Units		CA	Bandwidth C	lass	
		В	С	D	E	F
Pw in Transmission Bandwidth	dDm	REFSE	NS + CA Bar	ndwidth Class	specific value	e below
Configuration, per CC	dBm	9	9	9	9	

NOTE 1: The transmitter shall be set to 4dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A.

NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern

OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.

Table 7.7.1A-2: Spurious response

Parameter	Unit	Level
P _{Interferer} (CW)	dBm	-44
F _{Interferer}	MHz	Spurious response frequencies

FFor combinations of intra-band and inter-band carrier aggregation with up to four downlink carriers (up to two non-contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3.1A-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3.1A-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.1-2 when the uplink is active in a band supporting one carrier per band. The downlink PCC shall be configured closer to the uplink operating band than the downlink SCC(s) when the uplink is active in band(s) supporting contiguous aggregation of up to three component carriers. For the two non-contiguous component carriers within the same band, P_{wanted} in Table 7.6.2.1A-0 is set using $\Delta R_{\text{IBNC}} = 0$ dB for all sub-block gaps (Table 7.3.1A-3) while a band supporting contiguously aggregated carriers the out-of-band blocking parameters in Table 7.7.1-1 are replaced by those specified in Table 7.7.1A-1. For each downlink the UE shall meet the spurious-response requirements applicable for inter-band carrier aggregation with one component carrier per operating band but with up to three component carriers assigned to the same band. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

7.7.1B Minimum requirements for UL-MIMO

For UE with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in Clause 7.7.1 shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2. For UL-MIMO, the parameter $P_{\text{CMAX_L}}$ is defined as the total transmitter power over the two transmit antenna connectors.

7.7.1D Minimum requirements for ProSe

The throughput shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Tables 7.7.1D-1, 7.7.1D-2, and 7.7.1D-3.

Table 7.7.1D-1: Spurious response parameters for ProSe Direct Discovery

Rx parameter	Units		Channel bandwidth								
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz				
Power in		Prefsens	ProSe + chai	nnel bandw	idth specific	value belov	v+ P _{offset}				
Transmission	dBm										
Bandwidth	ubili			6	6	7	9				
Configuration											
Poffset	dB			10.9	13.9	15.7	16.9				
NOTE 1: Referer	nce measu	rement chan	nel is speci	fied in Anne	ex A.6.2.						

Table 7.7.1D-2: Spurious response parameters for ProSe Direct Communication

Rx parameter	Units	Channel bandwidth							
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
Power in		P _{REFS}	ENS_ProSe + (channel bar	ndwidth spe	cific value b	elow		
Transmission	dBm								
Bandwidth	ubili			6	6	7	9		
Configuration									
NOTE 1: Refere	nce measu	rement chan	nel is specit	fied in Anne	ex A 6 2				

Table 7.7.1D-3: Spurious response for ProSe

Parameter	Unit	Level
P _{Interferer} (CW)	dBm	-44
F _{Interferer}	MHz	Spurious response frequencies

For the UE which supports inter-band CA configuration in Table 7.3.1-1A, $P_{interferer}$ power defined in Table 7.7.1D-3 is increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A.

7.8 Intermodulation characteristics

Intermodulation response rejection is a measure of the capability of the receiver to receiver a wanted signal on its assigned channel frequency in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal.

7.8.1 Wide band intermodulation

Units

antenna ports, respectively

The wide band intermodulation requirement is defined following the same principles using modulated E-UTRA carrier and CW signal as interferer.

7.8.1.1 Minimum requirements

Rx Parameter

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.1.1 for the specified wanted signal mean power in the presence of two interfering signals. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements only apply for carriers assigned in the paired part.

Table 7.8.1.1-1: Wide band intermodulation

Channel bandwidth

		1.4 MHz	3 1	ИНz	5 MHz	10 MHz	15 MHz	20 MHz	
Power in		RE	FSEN	S + chan	nel bandwi	dth specific	value below		
Transmission Bandwidth Configuration	dBm	12		8	6	6	7	9	
P _{Interferer 1} (CW)	dBm				-46				
P _{Interferer 2} (Modulated)	dBm		-46						
BW _{Interferer 2}		1.4	1.4 3 5						
F _{Interferer 1}	MHz	-BW/2 -2.1	-BW/	2 –4.5		-BW	/2 – 7.5		
(Offset)		/		/			/		
		+BW/2+ 2.1	+BW/	2 + 4.5		+BW	/2 + 7.5		
F _{Interferer 2} (Offset)	MHz				2*F _{Interfer}	er 1			
		all be set to 4dB Pcmax_L as define				um uplink c	onfiguration	specified in	
		rement channel is specified in Annex A.3.2 with one sided dynamic OCNG/TDD as described in Annex A.5.1.1/A.5.2.1.							
	h one side	erferer consists on ed dynamic OCN on set-up accordin	G Patte	ern OP.1	FDD/TDD	as describe	d in Annex		

For the UE which supports inter band CA configuration in Table 7.3.1-1A, $P_{interferer1}$ and $P_{interferer2}$ powers defined in Table 7.8.1.1-1 are increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A.

The REFSENS power level is specified in Table 7.3.1-1 and Table 7.3.1-1a for two and four

UTRA signal as described in Annex D for channel bandwidth ≥5MHz.

7.8.1A Minimum requirements for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink assigned to one E-UTRA band the wide band intermodulation requirements are defined with the uplink active on the band(s) other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.8.1.1 for each component carrier while all downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band or an operating band with an unpaired DL part (as noted in Table 5.5-1), the requirements for all downlinks shall be met with the single uplink carrier active in each band capable of UL operation. For a component carrier configured in Band 46, the requirements specified in subclause 7.8.1.1 are replaced by the requirements in Table 7.8.1-1A-0.

E-UTRA band Rx Parameter Units Channel bandwidth 1.4 MHz 3 MHz 5 MHz | 10 MHz | 15 MHz 20 MHz Power in REFSENS + channel bandwidth specific value below Transmission dBm Bandwidth 9 Configuration dBm P_{Interferer 1} -46 (CW) P_{Interferer 2} dBm -46 (Modulated) 46 BW_{Interferer 2} 20 MHz -BW/2 -F_{Interferer 1} (Offset) 30 +BW/2 + 30 MHz F_{Interferer 2} 2*FInterferer 1 (Offset)

Table 7.8.1.1A-0: Wide band intermodulation

- NOTE 1: The transmitter shall be set to 4dB below Pcmax_L at the minimum uplink configuration specified in Table 7.3.1-2 with Pcmax L as defined in subclause 6.2.5.
- NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
- NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 (TBD)

For E-UTRA CA configurations listed in Table 7.3.1A-0a under conditions for which reference sensitivity for the operating band being tested is N/A, the wideband intermodulation requirements of subclause 7.8.1A do not apply.

For intra-band contiguous carrier aggegation the downlink SCC(s) shall be configured at nominal channel spacing to the PCC, For FDD, the PCC shall be configured closest to the uplink band. All downlink carriers shall be active throughout the test. The uplink output power shall be set as specified in Table 7.8.1A-1 with the uplink configuration set according to Table 7.3.1A-1 for the applicable carrier aggreagation configuration. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.1-2. The UE shall fulfil the minimum requirement in presence of an interfering signal specified in Table 7.8.1A-1 being on either side of the aggregated signal. The throughput of each carrier shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.1A-1. For operating bands with an unpaired DL part (as noted in Table 5.5-1), the requirements also apply for an SCC assigned in the unpaired part with parameters specified in Tables 7.8.1A-1.

Table 7.8.1A-1: Wide band intermodulation

Rx parameter	Units		CA	Bandwidth Cl	ass			
-		В	С	D	E	F		
P _w in		RE	FSENS + CA B	andwidth Class	specific value be	elow		
Transmission Bandwidth Configuration, per CC	dBm	9	12	13.8	15			
P _{Interferer 1} (CW)	dBm		-46					
P _{Interferer 2} (Modulated)	dBm			-46				
BW _{Interferer 2}	MHz	5	5	5	5			
F _{Interferer 1} (Offset)	MHz	-F _{offset} -7.5 / + F _{offset} +7.5	-F _{offset} -7.5 / + F _{offset} +7.5	-F _{offset} -7.5 / + F _{offset} +7.5	-F _{offset} -7.5 / + F _{offset} +7.5			
F _{Interferer 2} (Offset)	MHz			2*F _{Interferer 1}				

- NOTE 1: The transmitter shall be set to 4dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A.
- NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
- NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.
- NOTE 4: The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz:
- NOTE 5: The F_{interferer 1} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the CW interferer and F_{interferer 2} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the modulated interferer.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink sub-blocks, the wide band intermodulation requirements are defined with the uplink configuration in accordance with Table 7.3.1A-3. For this uplink configuration, the UE shall meet the requirements for each sub-block as specified in subclauses 7.8.1.1 and in this subclause for one component carrier and two component carriers per sub-block, respectively. The requirements apply for out-of-gap interferers while all downlink carriers are active.

For combinations of intra-band and inter-band carrier aggregation with up to four downlink carriers (up to two non-contiguously aggregated carriers per band) and one uplink carrier assigned to one E-UTRA band, the requirement is defined with the uplink active in a band other than that supporting the downlink(s) under test. The uplink configuration shall be in accordance with Table 7.3.1A-3 when the uplink is active in the band supporting two non-contiguous component carriers, Table 7.3.1A-1 when the uplink is active in a band supporting two contiguous component carriers and in accordance with Table 7.3.1-2 when the uplink is active in a band supporting one carrier per band. For these uplink configurations, the UE shall meet the wide-band intermodulation requirements for intra-band non-contiguous carrier aggregation of two downlink carriers with $\Delta R_{IBNC} = 0$ dB for all sub-block gaps (Table 7.3.1A-3) for the two non-contiguous downlink carriers, the requirements for intra-band contiguous carrier aggregation for the contiguously aggregated downlink carriers and for any remaining component carrier(s) the requirements specified in subclause 7.8.1. For contiguously aggregated component carriers configured in Band 46, the said requirements for intra-band contiguous carrier aggregation of two downlink carriers are replaced by requirements in Table 7.8.1A-2. All downlink carriers shall be active throughout the tests and the requirements for the downlinks shall be met with the single uplink carrier active in each band capable of UL operation.

Table 7.8.1A-2: Wide band intermodulation

E-UTRA Band	Rx parameter	Units		CA	Bandwidth C	lass	
			В	С	D	E	F
	Power per CC in		REF	SENS + CA Ba	andwidth Class	specific value I	oelow
	Aggregated Transmission Bandwidth Configuration	dBm		12	13.8	[15]	
	P _{Interferer 1} (CW)	dBm			-46		
46	P _{Interferer 2} (Modulated)	dBm			-46		
	BW _{Interferer 2}	MHz		20	20	20	
	F _{Interferer 1} (Offset)	MHz		-F _{offset} -30 / + F _{offset} +30	-F _{offset} -30 / + F _{offset} +30	-F _{offset} -30 / + F _{offset} +30	
	F _{Interferer 2} (Offset)	MHz		· · · onset · · · ·	2*FInterferer 1	onset 100	

- NOTE 1: The transmitter shall be set to 4dB below Pcmax_L,c or Pcmax_L as defined in subclause 6.2.5A.
- NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1.
- NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 with set-up according to Annex C.3.1.
- NOTE 4: The interfering modulated signal is 20 MHz E-UTRA signal as described in Annex D interference setting 2;
- NOTE 5: The F_{interferer 1} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the CW interferer and F_{interferer 2} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the modulated interferer.

7.8.1B Minimum requirements for UL-MIMO

For UE(s) with two transmitter antenna connectors in closed-loop spatial multiplexing scheme, the minimum requirements in subclause 7.8.1 shall be met with the UL-MIMO configurations specified in Table 6.2.2B-2. For UL-MIMO, the parameter P_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

7.8.1D Minimum requirements for ProSe

The throughput shall be \geq 95% of the maximum throughput of the reference measurement channels as specified in Annex A.6.2 with parameters specified in Table 7.8.1D-1, Table 7.8.1D-2, and Table 7.8.1D-3 for the specified wanted signal mean power in the presence of two interfering signals

Table 7.8.1D-1: Wide band intermodulation parameters for ProSe Direct Discovery

Rx parameter	Units	Channel bandwidth						
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
Poffset	dB			10.9	13.9	15.7	16.9	

Table 7.8.1D-2: Wide band intermodulation for ProSe Direct Communication

Rx parameter	Units	Channel bandwidth						
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
Poffset	dB			0	0	0	0	

+BW/2 + 7.5

Rx Parameter Units Channel bandwidth 15 MHz 1.4 MHz 3 MHz 5 MHz 10 MHz 20 MHz PREFSENS_ProSe + channel bandwidth specific value below+ Poffsei Power in Transmission dBm 7 9 Bandwidth 12 8 6 6 Configuration dBm P_{Interferer 1} -46 (CW) dBm PInterferer 2 -46 (Modulated) BW_{Interferer 2} 1.4 MHz -BW/2 -2.1 -BW/2 -4.5 -BW/2 - 7.5 F_{Interferer 1}

Table 7.8.1D-3: Wide band intermodulation for ProSe

NOTE 1: Reference measurement channel is specified in Annex A.6.2

MHz

+BW/2+ 2.1

NOTE 2: The interferer is QPSK modulated PUSCH containing data and reference symbols. Normal cyclic prefix is used. The data content shall be uncorrelated to the wanted signal and modulated according to clause 5 of TS36.211

+BW/2 + 4.5

2*F_{Interferer 1}

For the UE which supports inter band CA configuration in Table 7.3.1-1A, $P_{interferer1}$ and $P_{interferer2}$ powers defined in Table 7.8.1D-3 are increased by the amount given by $\Delta R_{IB,c}$ in Table 7.3.1-1A.

7.8.2 Void

(Offset)

F_{Interferer 2}

(Offset)

7.9 Spurious emissions

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

7.9.1 Minimum requirements

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.1-1

Table 7.9.1-1: General receiver spurious emission requirements

Frequency band	Measurement bandwidth	Maximum level	NOTE
30MHz ≤ f < 1GHz	100 kHz	-57 dBm	
1GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm	
12.75 GHz ≤ f ≤ 5 th harmonic of the upper frequency edge of the DL operating band in GHz	1 MHz	-47 dBm	1

NOTE 1: Applies only for Band 22, Band 42 and Band 43

NOTE 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1.

7.9.1A Minimum requirements

For E-UTRA CA configurations including an operating band without uplink band (as noted in Table 5.5-1), the power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.1A-1.

Table 7.9.1A-1: General receiver spurious emission requirements

Frequency band	Measurement bandwidth	Maximum level	NOTE			
30MHz ≤ f < 1GHz	100 kHz	-57 dBm				
1GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm				
NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1.						

NOTE 2: The requirements apply when the UE is configured for carrier aggregation but is not transmitting.

7.10 Receiver image

7.10.1 Void

7.10.1A Minimum requirements for CA

Receiver image rejection is a measure of a receiver's ability to receive the E-UTRA signal on one component carrier while it is also configured to receive an adjacent aggregated carrier. Receiver image rejection ratio is the ratio of the wanted received power on a sub-carrier being measured to the unwanted image power received on the same sub-carrier when both sub-carriers are received with equal power at the UE antenna connector.

For intra-band contiguous carrier aggregation the UE shall fulfil the minimum requirement specified in Table 7.10.1A-1 for all values of aggregated input signal up to -22 dBm.

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Table 7.10.1A-1: Receiver image rejection

			CA ba	ndwidth	class		
Rx parameter	Units	Α	В	С	D	E	F
Receiver image rejection	dB		25	25	25	25	

8 Performance requirement

This clause contains performance requirements for the physical channels specified in TS 36.211 [4]. The performance requirements for the UE in this clause are specified for the measurement channels specified in Annex A.3, the propagation conditions in Annex B and the downlink channels in Annex C.3.2.

NOTE: For the requirements in the following sections, similar Release 8 and 9 requirements apply for time domain measurements restriction under colliding CRS.

8.1 General

8.1.1 Receiver antenna capability

The performance requirements are based on UE(s) that utilize one or more antenna receivers.

For all test cases, the SNR is defined as

$$SNR = \frac{\sum_{j=1}^{N_{RX}} \hat{E}_{s}^{(j)}}{\sum_{j=1}^{N_{RX}} N_{oc}^{(j)}}$$

where N_{RX} denotes the number of receiver antenna connectors and the superscript receiver antenna connector j. The above SNR definition assumes that the REs are not precoded. The SNR definition does not account for any gain which can be associated to the precoding operation. The relative power of physical channels transmitted is defined in Table C.3.2-1. The SNR requirement applies for the UE categories and CA capabilities given for each test.

For enhanced performance requirements type A, the SINR is defined as

$$SINR = \frac{\sum_{j=1}^{N_{RX}} \hat{E}_{s}^{(j)}}{\sum_{j=1}^{N_{RX}} N_{oc}^{(j)}}$$

where N_{RX} denotes the number of reciver antenna connectors and the superscript receiver antenna connector j. The above SINR definition assumes that the REs are not precoded. The SINR definition does not account for any gain which can be associated to the precoding operation. The relative power of physical channels transmitted is defined in Table C.3.2-1. The SINR requirement applies for the UE categories given for each test.

For the performance requirements specified in this clause, it is assumed that N_{RX} =2 unless otherwise stated.

Table 8.1.1-1: Void

8.1.1.1 Simultaneous unicast and MBMS operations

8.1.1.2 Dual-antenna receiver capability in idle mode

8.1.2 Applicability of requirements

8.1.2.1 Applicability of requirements for different channel bandwidths

In Clause 8 the test cases may be defined with different channel bandwidth to verify the same target FRC conditions with the same propagation conditions, correlation matrix and antenna configuration.

Test cases defined for 5MHz channel bandwidth that reference this clause are applicable to UEs that support only Band 31.

8.1.2.2 Definition of CA capability

The definition with respect to CA capabilities for 2CCs is given as in Table 8.1.2.2-1. The definition with respect to CA capabilities for 3CCs is given in Table 8.1.2.2-3.

Table 8.1.2.2-1: Definition of CA capability with 2DL CCs

CA Capability Description Capability	
CA2_C	Intra-band contiguous CA
CA2_A2	Inter-band CA (two bands)
CA2_N2	Intra-band non-contiguous CA (with two sub-blocks)
cor CA cor CA	2_C corresponds to E-UTRA CA configurations and bandwidth nbination sets defined in Table 5.6A.1-1 for 2 DL CCs. 2_A2 corresponds to E-UTRA CA configurations and bandwidth nbination sets defined in Table 5.6A.1-2 for 2 DL CCs. 2_N2 corresponds to E-UTRA CA configurations and bandwidth nbination sets defined in Table 5.6A.1-3 for 2 DL CCs.

The supported testable aggregated CA bandwidth combinations for 2CCs for each CA capability are listed in Table 8.1.2.2-2.

Table 8.1.2.2-2: Supported testable aggregated CA bandwidth combinations for different CA capability with 2DL CCs

CA Capability	Bandwidth combination for FDD CA	Bandwidth combination for TDD CA	Bandwidth combination for TDD-FDD CA
CA2_C	5+5MHz, 5+10MHz,	20+20MHz, 15+20MHz	NA
	5+15MHz, 10+10MHz,		
	20+20MHz		
CA2_A2	10+10MHz, 20+5MHz,	20+20MHz	10(FDD)+20(TDD)MHz,
	10+15MHz, 10+20MHz,		15(FDD)+20(TDD)MHz,
	15+20MHz, 20+20MHz		20(FDD)+20(TDD)MHz
CA2_N2	5+10MHz, 10+10MHz,	20+20MHz	NA
	20+20MHz		
NOTE 1: This table is only for information and applicability and test rules of CA performance			

Table 8.1.2.2-3: Definition of CA capability with 3 DL CCs

CA Capability	CA Capability Description	
CA3_C	Intra-band contiguous CA	
CA3_A2	Inter-band CA (two bands)	
CA3_A3	Inter-band CA (three bands)	
CA3_N2	Intra-band non-contiguous CA (with two sub-blocks)	
NOTE 1: CA3_C corresponds to E-UTRA CA configurations and bandwidth		
combination sets defined in Table 5.6A.1-1 for 3 DL CCs.		
CA3_A2 corresponds to E-UTRA CA configurations and bandwidth		
combination sets defined in Table 5.6A.1-2 for 3 DL CCs.		
CA3_A3 corresponds to E-UTRA CA configurations and bandwidth		
combination sets defined in and Table 5.6A.1-2a for 3 DL CCs.		
CA3_N2 corresponds to E-UTRA CA configurations and bandwidth		
cor	nbination sets defined in Table 5.6A.1-3 for 3 DL CCs.	

The supported testable largest aggregated CA bandwidth combinations for 3CCs for each CA capability are listed in Table 8.1.2.2-4.

Table 8.1.2.2-4: Supported largest aggregated CA bandwidth combinations for different CA capability with 3 CCs

CA capability	Bandwidth combination for FDD CA	Bandwidth combination for TDD	Bandwidth combination for TDD-FDD CA
		CA	
CA3_C	NA	20+20+20MHz	NA
CA3_A2	5+10+20MHz,	15+20+20MHz,	15(FDD)+20(TDD)+20(TDD)MHz,
	5+15+20MHz,	20+20+20MHz	20(FDD)+20(TDD)+20(TDD)MHz
	10+10+20MHz,		
	10+20+20MHz,		
	20+20+20MHz		
CA3_A3	10+10+20MHz,	NA	2×20(FDD)+20(TDD)MHz,
	10+15+15MHz,		20(FDD)+15(FDD)+20(TDD)MHz,
	10+15+20MHz,		20(FDD)+10(FDD)+20(TDD)MHz
	10+20+20MHz,		
	15+15+20MHz,		
	15+20+20MHz,		
	20+20+20MHz		
CA3_N2	NA	20+20+20MHz	NA

NOTE 1: This table is only for information and applicability and test rules of CA performance requirements are specified in 8.1.2.3 and 9.1.1.2.

Table 8.1.2.2-5: Definition of CA capability with 4 DL CCs

CA	CA Capability Description		
Capability	. , .		
CA4_C	Intra-band contiguous CA		
CA4_A2	Inter-band CA (two bands)		
CA4_A3	Inter-band CA (three bands)		
CA4_A4	Inter-band CA (four bands)		
CA4_N2	Intra-band non-contiguous CA (with two sub-blocks)		
NOTE 1: CA	4_C corresponds to E-UTRA CA configurations and bandwidth		
con	nbination sets defined in Table 5.6A.1-1 for 3 DL CCs.		
CA4_A2 corresponds to E-UTRA CA configurations and bandwidth			
combination sets defined in Table 5.6A.1-2 for 3 DL CCs.			
CA4_A3 corresponds to E-UTRA CA configurations and bandwidth			
combination sets defined in and Table 5.6A.1-2a for 3 DL CCs.			
CA4_A4 corresponds to E-UTRA CA configurations and bandwidth			
combination sets defined in and Table 5.6A.1-2b for 4 DL CCs			
CA4_N2 corresponds to E-UTRA CA configurations and bandwidth			
con	nbination sets defined in Table 5.6A.1-3 for 3 DL CCs.		

The supported testable largest aggregated CA bandwidth combinations for 4CCs for each CA capability are listed in Table 8.1.2.2-6.

Table 8.1.2.2-6: Supported largest aggregated CA bandwidth combinations for different CA capability with 4 CCs

CA capability	Bandwidth combination for FDD CA	Bandwidth combination for TDD CA	Bandwidth combination for TDD-FDD CA
CA4_C	NA	NA	NA
CA4_A2	20+20+20+20MHz	NA	20(FDD)+20(TDD)+20(TDD)+20(TDD)MHz
CA4_A3	20+20+20+10MHz 20+20+10+10MHz	NA	2×20(FDD)+2×20(TDD)MHz, 20(FDD)+15(FDD)+2×20(TDD)MHz, 2×15(FDD)+2×20(TDD)MHz
CA4_A4	20+20+10+10MHz	NA	2×20(FDD)+15(FDD)+20(TDD)MHz, 2×15(FDD)+20(FDD)+20(TDD)MHz
CA4_N2	NA	NA	NA

NOTE 1: This table is only for information and applicability and test rules of CA performance requirements are specified in 8.1.2.3 and 9.1.1.2.

Table 8.1.2.2-7: Definition of CA capability with 5 DL CCs

CA	CA Capability Description		
Capability			
CA5_C	Intra-band contiguous CA		
CA5_A2	Inter-band CA (two bands)		
CA5_A3	Inter-band CA (three bands)		
CA5_A4	Inter-band CA (four bands)		
CA5_A5	Inter-band CA (five bands)		
CA5_N2	Intra-band non-contiguous CA (with two sub-blocks)		
NOTE 1: CA	5_C corresponds to E-UTRA CA configurations and bandwidth		
	nbination sets defined in Table 5.6A.1-1 for 5 DL CCs.		
CA5_A2 corresponds to E-UTRA CA configurations and bandwidth			
	combination sets defined in Table 5.6A.1-2 for 5 DL CCs.		
CA5_A3 corresponds to E-UTRA CA configurations and bandwidth			
combination sets defined in and Table 5.6A.1-2a for 5 DL CCs.			
CA5_A4 corresponds to E-UTRA CA configurations and bandwidth			
combination sets defined in and Table 5.6A.1-2b for 5 DL CCs			
CA5_A5 corresponds to E-UTRA CA configurations and bandwidth			
	combination sets defined in and Table 5.6A.1-xx for 5 DL CCs		
	5_N2 corresponds to E-UTRA CA configurations and bandwidth		
combination sets defined in Table 5.6A.1-3 for 5 DL CCs.			

The supported testable largest aggregated CA bandwidth combinations for 5CCs for each CA capability are listed in Table 8.1.2.2-8.

Table 8.1.2.2-8: Supported largest aggregated CA bandwidth combinations for different CA capability with 5 CCs

CA capability	Bandwidth combination for FDD CA	Bandwidth combination for TDD CA	Bandwidth combination for TDD-FDD CA
CA5_C	NA	NA	NA
CA5_A2	NA	NA	NA
CA5_A3	5×20MHz	NA	NA
CA5_A4	5×20MHz	NA	15+2×20(FDD)+2×20(TDD)MHz 2×15+20(FDD)+2×20(TDD)MHz
CA5_A5	NA	NA	
CA5_N2	NA	NA	NA

NOTE 1: This table is only for information and applicability and test rules of CA performance requirements are specified in 8.1.2.3 and 9.1.1.2.

For test cases with more than one component carrier, "Fraction of Maximum Throughput" in the performance requirement refers to the ratio of the sum of throughput values of all component carriers to the sum of the nominal maximum throughput values of all component carriers, unless otherwise stated.

8.1.2.2A Definition of dual connectivity capability

The definition with respect to dual connectivity capabilities for configurations with 2CCs is given as in Table 8.1.2.2A-1

Table 8.1.2.2A-1: Definition of dual connectivity capability with 2DL CCs

Dual connectivity Capability	Dual connectivity capability Description
DC_A_2 Inter-band dual connecitivty (two bands)	
NOTE 1: DC_A_2 corresponds to E-UTRA dual connectivity configurations and bandwidth combination sets defined for inter-band dual connectivity (two bands) in Table 5.6C.1-1.	

The supported testable dual connectivity bandwidth combinations for 2CCs for each dual connectivity capability are listed in Table 8.1.2.2A-2.

Table 8.1.2.2A-2: Supported testable dual connectivity bandwidth combinations for different dual connectivitys capability with 2DL CCs

Dual connectivity capability	Bandwidth combination for FDD dual connectivity	Bandwidth combination for TDD dual connectivity	
DC_A_2	10+10MHz, 10+20MHz, 15+15MHz,15+20MHz, 20+20MHz	20+20MHz	
NOTE 1: This table is only for information and applicability and test rules of dual connectivity performance requirements are specified in 8.1.2.3A			

8.1.2.3 Applicability and test rules for different CA configurations and bandwidth combination sets

The performance requirement for CA UE demodulation tests in Clause 8 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.6A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL CCs in Table 8.1.2.3-1 and 3 or more DL CCs in Table 8.2.2.3-2. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

Table 8.1.2.3-1: Applicability and test rules for CA UE demodulation tests with 2 DL CCs

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order
CA tests with 2CCs in Clause 8.2.1.1.1, 8.2.1.4.3	Any one of the supported CA capabilities	Any one of the supported FDD CA configurations	10+10 MHz, 20+20 MHz, 5+5 MHz, 10MHz+5MHz, 15MHz+5MHz
CA tests with 2CCs in Clause 8.2.1.3.1	Each supported CA capability	Any one of the supported FDD CA configurations in each CA capability	10+10 MHz, 20+20 MHz, 5+5 MHz, 10MHz+5MHz, other combinations
CA tests with 2CCs in Clause 8.2.1.3.1A, 8.7.1	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported FDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 2CCs in Clause 8.2.1.7.1	CA_C	Supported FDD intra-band contiguous CA configurations covering the lowest and highest operating bands	Largest aggregated CA bandwidth combinations
CA tests with 2CCs in Clause 8.2.2.1.1, 8.2.2.4.3	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 2CCs in Clause 8.2.2.3.1	Each supported CA capability	Any one of the supported TDD CA configurations in each CA capability with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 2CCs in Clause 8.2.2.3.1A, 8.7.2	Any one of the supported CA capabilities with largest aggregated CA bandwidth	Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 2CCs in 8.2.2.7.1	CA_C	Supported TDD intra-band contiguous CA configurations covering the lowest and highest operating bands	Largest aggregated CA bandwidth combinations
CA tests with 2CCs in Clause 8.2.1.8.1	CA_N	CA_3A-3A defined in Table 5.6A.1-3	10+10 MHz
CA tests with 2CCs in Clause 8.2.2.8.1	CA2_C	CA_41C defined in Table 5.6A.1-1	20+20 MHz

NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.

NOTE 3: A single Uplink CC is configured for all tests

NOTE 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.

Table 8.1.2.3-2: Applicability and test rules for CA UE demodulation tests with 3 or more DL CCs

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order
CA tests with 3 or more CCs in Clause 8.2.1.1.1, 8.2.1.4.3, 8.7.1	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported FDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 3 or more CCs in Clause 8.2.1.3.1	Each supported CA capability	Any one of the supported FDD CA configurations in each CA capability with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 3 or more CCs in Clause 8.2.2.1.1, 8.2.2.4.3, 8.7.2	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 3 or more CCs in Clause 8.2.2.3.1	Each supported CA capability	Any one of the supported TDD CA configurations in each CA capability with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 3CCs in Clause 8.2.2.8.1	CA3_C	CA_41D defined in Table 5.6A.1-1	20+20+20 MHz

NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.

NOTE 2: Number of the supported bandwidth combinations to be tested from each selected

CA configuration is 1.

NOTE 3: A single Uplink CC is configured for all tests

8.1.2.3A Applicability and test rules for different dual connectivity configuration and bandwidth combination set

The performance requirement for dual connectivity UE demodulation tests in Clause 8 are defined independent of dual connectivity configurations and bandwidth combination sets specified in Clause 5.6C.1. For UEs supporting different dual connectivity configurations and bandwidth combination stes, the applicability and test rules are defined for the tests for the configurations with 2CCs in Table 8.1.2.3A-1. For simplicity, dual connectivity configuration below refers to combination of dual connectivity configuration and bandwidth set.

Both CA performance requirements and dual connectivity performance requirements are applied for dual connectivity capable UE.

Table 8.1.2.3A-1: Applicability and test rules for dual connectivity UE demodulation tests with 2DL **CCs**

Tests	Dual connectivity capability where the tests apply	Dual connectivity configuration from the selected CA capbility where the tests apply	Dual connectivity Bandwidth combination to be tested in priority order
Dual connectivity test in Clause 8.2.1.4.3A, 8.7.6	Any one of the supported dual connectivity capabilities with largest aggregated dual connectivity bandwidth combination	Any one of the supported FDD dual connectvity configurations with the largest aggregated dual connectivity bandwidth combimation	Largest dual connectivity aggregated bandwidth combination
Dual connectivity test in Clause 8.2.2.4.3A, 8.7.7	Any one of the supported dual connectivity capabilities with largest aggregated dual connectivity bandwidth combination	Any one of the supported TDD dual connectvity configurations with the largest aggregated dual connectivity bandwidth combination	Largest dual connectivity aggregated bandwidth combination

NOTE 2: Number of the supported bandwidth combinations to be tested from each selected DC or CA configuration is 1.

Applicability and test rules for different TDD-FDD CA configurations and 8.1.2.3B bandwidth combination sets

The performance requirement for TDD-FDD CA UE demodulation tests in Clause 8 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.6A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL TDD-FDD CA in Table 8.1.2.3B-1 and in Table 8.1.2.3B-2 for 3 or more DL TDD-FDD CA. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

Table 8.1.2.3B-1: Applicability and test rules for CA UE demodulation tests for TDD-FDD CA with 2 DL **CCs**

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order
CA tests with 2CCs in Clause 8.2.3.1.1, 8.2.3.2.1A, 8.2.3.3.1, 8.7.5.1	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD-FDD CA configurations with FDD PCell with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 2CCs in Clause 8.2.3.2.1	Each supported CA capability	Any one of the supported TDD-FDD CA configurations with FDD PCell in each CA capability with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 2CCs in Clause 8.2.3.1.2, 8.2.3.2.2A, 8.2.3.3.2, 8.7.5.2	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD-FDD CA configurations with TDD PCell with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 2CCs in Clause 8.2.3.2.2	Each supported CA capability	Any one of the supported TDD-FDD CA configurations with TDD PCell in each CA capability with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination

NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.

NOTE 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is

NOTE 3: A single Uplink CC is configured for all tests.

Table 8.1.2.3B-2: Applicability and test rules for CA UE demodulation tests for TDD-FDD CA with 3 or more DL CCs

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order
CA tests with 3CCs in Clause 8.2.3.1.1, 8.2.3.2.1A, 8.2.3.3.1, 8.7.5.1	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD-FDD CA configurations with FDD PCell with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 3CCs in Clause 8.2.3.2.1	Each supported CA capability	Any one of the supported TDD-FDD CA configurations with FDD PCell in each CA capability with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 3CCs in Clause 8.2.3.1.2, 8.2.3.2.2A, 8.2.3.3.2, 8.7.5.2	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD-FDD CA configurations with TDD PCell with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination
CA tests with 3CCs in Clause 8.2.3.2.2	Each supported CA capability	Any one of the supported TDD-FDD CA configurations with TDD PCell in each CA capability with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination

NOTE 1: The applicability and test rules are specified in this table, unless otherwise stated.

NOTE 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is

1.

NOTE 3: A single Uplink CC is configured for all tests.

8.1.2.4 Test coverage for different number of component carriers

For FDD tests specified in 8.2.1.1.1, 8.2.1.3.1, 8.2.1.4.3, and 8.7.1, if corresponding CA tests are tested, the test coverage can be considered fulfilled without executing single carrier tests.

For TDD tests specified in 8.2.2.1.1, 8.2.2.3.1, 8.2.2.4.3, and 8.7.2, if corresponding CA tests are tested, the test coverage can be considered fulfilled without executing single carrier tests.

For TDD FDD tests specified in 8.2.3.1, 8.2.3.2, 8.2.3.3, and 8.7.5, if corresponding TDD FDD CA tests are tested, the test coverage can be considered fulfilled without executing both FDD and TDD single carrier tests.

For FDD CA tests specified in 8.2.1.1.1, 8.2.1.4.3, and 8.7.1, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For FDD CA tests specified in 8.2.1.3.1, for each supported CA capability, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD CA tests specified in 8.2.2.1.1, 8.2.2.4.3, and 8.7.2, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD CA tests specified in 8.2.2.3.1, for each supported CA capability, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD FDD CA tests specified in 8.2.3.1, 8.2.3.3, and 8.7.5, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the TDD FDD CA tests with less than the largest number of CCs supported by the UE.

For TDD FDD CA tests specified in 8.2.3.2, for each supported CA capability, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the TDD FDD CA tests with less than the largest number of CCs supported by the UE.

For FDD CA power imbalance tests specified in 8.2.1.7.1, if they are are tested with FDD intra-band contiguous CA configurations with 2 DL CCs, the test coverage can be considered fulfilled with FDD intra-band contiguous CA configurations with 3 or more DL CCs supported by the UE.

For TDD CA power imbalance tests specified in 8.2.2.7.1, if they are are tested with TDD intra-band contiguous CA configurations with 2 DL CCs, the test coverage can be considered fulfilled with TDD intra-band contiguous CA configurations with 3 or more DL CCs supported by the UE.

8.1.2.5 Applicability of performance requirements for Type B receiver

For TM10 capable UE, if corresponding tests specified in 8.3.1.1F, 8.3.2.1G, 9.3.8.3 are tested, the test coverage can be considered fulfilled without executing the tests specified in 8.3.1.1C, 8.3.2.1D, 9.3.8.2. For a UE which does not have TM10 capability, the tests specified in sections 8.3.1.1C, 8.3.2.1D, 9.3.8.2 should be used.

8.1.3 UE category and UE DL category

UE category and UE DL category refer to *ue-Category* and *ue-CategoryDL* define in 4.1 and 4.1A from [12]. A UE that belongs to either a UE category or a UE DL category indicated in UE performance requirements in subclause 8, 9, 10 shall fulfil the corresponding requirements.

8.2 Demodulation of PDSCH (Cell-Specific Reference Symbols)

8.2.1 FDD (Fixed Reference Channel)

The parameters specified in Table 8.2.1-1 are valid for all FDD tests unless otherwise stated.

Parameter Unit Value Inter-TTI Distance 1 Number of HARQ processes per **Processes** 8 component carrier Maximum number of HARQ transmission Redundancy version {0,1,2,3} for QPSK and 16QAM coding sequence {0,0,1,2} for 64QAM and 256QAM 4 for 1.4 MHz bandwidth, 3 for 3 MHz and Number of OFDM 5 MHz bandwidths. symbols for PDCCH per OFDM symbols 2 for 10 MHz, 15 MHz and 20 MHz component carrier bandwidths unless otherwise stated Cyclic Prefix Normal 0 Cell ID Not configured Cross carrier scheduling

Table 8.2.1-1: Common Test Parameters (FDD)

8.2.1.1 Single-antenna port performance

The single-antenna performance in a given multi-path fading environments is determined by the SNR for which a certain relative information bit throughput of the reference measurement channels in Annex A.3.3 is achieved. The purpose of these tests is to verify the single-antenna performance with different channel models and MCS. The QPSK and 64QAM cases are also used to verify the performance for all bandwidths specified in Table 5.6.1-1.

8.2.1.1.1 Minimum Requirement

For single carrier, the requirements are specified in Table 8.2.1.1.1-2, with the addition of the parameters in Table 8.2.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 2 DL CCs, the requirements are specified in Table 8.2.1.1.1-4, with the addition of the parameters in Table 8.2.1.1.1-3 and the downlink physical channel setup according to Annex C.3.2.

For CA with 3 DL CCs, the requirements are speicifed in Table 8.2.1.1.1-6, based on single carrier requirement speicified in Table 8.2.1.1.1-5, with the addition of the parameters in Table 8.2.1.1.1-3 and the downlink physical channel setup according to Annex C.3.2.

For CA with 4 DL CCs, the requirements are speicifed in Table 8.2.1.1.1-7, based on single carrier requirement speicified in Table 8.2.1.1.1-5, with the addition of the parameters in Table 8.2.1.1.1-3 and the downlink physical channel setup according to Annex C.3.2.

For CA with 5 DL CCs, the requirements are speicifed in Table 8.2.1.1.1-8, based on single carrier requirement speicified in Table 8.2.1.1.1-5, with the addition of the parameters in Table 8.2.1.1.1-3 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.1.1.1-1: Test Parameters

Paramete	Parameter		Test 1- 5	Test 6-8	Test 9- 15	Test 16- 18	Test 19
David later and	$ ho_{\scriptscriptstyle A}$	dB	0	0	0	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)	0 (NOTE 1)	0 (NOTE 1)	0 (NOTE 1)	0 (NOTE 1)
	σ	dB	0	0	0	0	0
N_{oc} at antenna	N_{oc} at antenna port		-98	-98	-98	-98	-98
Symbols for unused PRBs			OCNG (NOTE 2)	OCNG (NOTE 2)	OCNG (NOTE 2)	OCNG (NOTE 2)	OCNG (NOTE 2)
Modulation			QPSK	16QAM	64QAM	16QAM	QPSK
PDSCH transmiss	ion mode		1	1	1	1	1

NOTE 1: $P_B = 0$.

NOTE 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated

NOTE 3: Void. NOTE 4: Void.

Table 8.2.1.1.1-2: Minimum performance (FRC)

				Propa-	Correlation	Reference	value	
Test num.	Band- width	Reference channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	cate gory
1	10 MHz	R.2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.0	≥1
2	10 MHz	R.2 FDD	OP.1 FDD	ETU70	1x2 Low	70	-0.4	≥1
3	10 MHz	R.2 FDD	OP.1 FDD	ETU300	1x2 Low	70	0.0	≥1
4	10 MHz	R.2 FDD	OP.1 FDD	HST	1x2	70	-2.4	≥1
5	1.4 MHz	R.4 FDD	OP.1 FDD	EVA5	1x2 Low	70	0.0	≥1
	10 MHz	R.3 FDD	OP.1 FDD	EVA5	1x2 Low	70	6.7	≥2
6	5 MHz	R.3-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	6.7	1
0	5 MHz (NOTE 4)	R.3-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	6.7	≥2
	10 MHz	R.3 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.4	≥2
7	5 MHz	R.3-1 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.4	1
'	5 MHz (NOTE 4)	R.3-1 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.4	≥2
	10 MHz	R.3 FDD	OP.1 FDD	ETU300	1x2 High	70	9.4	≥2
8	5 MHz	R.3-1 FDD	OP.1 FDD	ETU300	1x2 High	70	9.4	1
0	5 MHz (NOTE 4)	R.3-1 FDD	OP.1 FDD	ETU300	1x2 High	70	9.4	≥2
9	3 MHz	R.5 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.6	≥1
10	5 MHz	R.6 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.4	≥2
10	5 MHz	R.6-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.5	1
11	10 MHz	R.7 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.7	≥2
11	10 MHz	R.7-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	16.7	1
12	10 MHz	R.7 FDD	OP.1 FDD	ETU70	1x2 Low	70	19.0	≥2
12	10 MHz	R.7-1 FDD	OP.1 FDD	ETU70	1x2 Low	70	18.1	1
13	10 MHz	R.7 FDD	OP.1 FDD	EVA5	1x2 High	70	19.1	≥2
13	10 MHz	R.7-1 FDD	OP.1 FDD	EVA5	1x2 High	70	17.8	1
14	15 MHz	R.8 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.7	≥2
14	15 MHz	R.8-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	16.8	1
	20 MHz	R.9 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.6	≥3
15	20 MHz	R.9-2 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.3	2
	20 MHz	R.9-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	16.7	1
16	3 MHz	R.0 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.9	≥1
17	10 MHz	R.1 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.9	≥1
18	20 MHz	R.1 FDD	OP.1 FDD	ETU70	1x2 Low	30	1.9	≥1
19	10 MHz	R.41 FDD	OP.1 FDD	EVA5	1x2 Low	70	-5.4	≥1

NOTE 1: Void.

NOTE 2: Void.

NOTE 3: Void.

NOTE 4: Test case applicability is defined in 8.1.2.1.

Table 8.2.1.1.1-3: Test Parameters for CA

Parameter		Unit	Value
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0
power	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)
allocation	σ	dB	0
N_{oc} at a	N_{oc} at antenna port		-98
Symbols fo	Symbols for unused PRBs		OCNG (NOTE 2)
Modulation			QPSK
PDSCH trai	nsmission mode		1

NOTE 1: $P_{\scriptscriptstyle B}=0$.

NOTE 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

NOTE 3: PUCCH format 1b with channel selection is used to feedback ACK/NACK for Tests in Table 8.2.1.1.1-4, PUCCH format 3 is used to feedback ACK/NACK for Tests in Table 8.2.1.1.1-6.

NOTE 4: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.1.1.1-4: Minimum performance (FRC) for CA with 2DL CCs

				Propa	Correlatio	Reference	e value	
Test num.	Band- width	Reference channel	OCNG pattern	gation condi- tion	n matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	UE cate- gory
1	2x10 MHz	R.2 FDD	OP.1 FDD (NOTE 1)	EVA5	1x2 Low	70	-1.1	≥3 (NOTE 2)
2	2x20 MHz	R.42 FDD	OP.1 FDD (NOTE 1)	EVA5	1x2 Low	70	-1.3	≥5
	2x5	D 40 0 500	OP.1 FDD	5) (4.5	4.01	70	-1.0	. 0
3	MHz	R.42-2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.0	≥2
	10MHz	R.2 FDD for 10MHz CC	OP.1 FDD			70	-1.7	
4	+5MHz	R.42-2 FDD for 5MHz CC	OP.1 FDD	EVA5	1x2 Low	70	-1.0	≥3
5	15MHz	R.42-3 FDD for 15MHz CC	OP.1 FDD	EVA5	1x2 Low	70	-1.6	≥3
J	+5MHz	R.42-2 FDD for 5MHz CC	OP.1 FDD	EVAS	1XZ LUW	70	-1.0	23

NOTE 1: The OCNG pattern applies for each CC.

NOTE 2: 30usec timing difference between two CCs is applied in inter-band CA case.

NOTE 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Table 8.2.1.1.1-5: Single carrier performance for multiple CA configurations

				Correlation	Reference va	lue
Band- width	Reference channel	OCNG pattern	Propagation condition	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)
1.4MHz	R.4 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.3
3MHz	R.42-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.1
5MHz	R.42-2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.0
10MHz	R.2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.7
15MHz	R.42-3 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.6
20MHz	R.42 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.7

Table 8.2.1.1.1-6: Minimum performance (FRC) based on single carrier performance for CA with 3DL CCs

Test num.	CA Band-width combination	Requirement	UE category
1	3x20MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5
2	20MHz+20MHz+15MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5
3	20MHz+20MHz+10MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5
4	20MHz+15MHz+15MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5
5	20MHz+15MHz+10MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5
6	20MHz+10MHz+10MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5
7	15MHz+15MHz+10MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5
8	20MHz+10MHz+5MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5
9	20MHz+15MHz+5MHz	As specified in Table 8.2.1.1.1-5 per CC	≥5

NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3

NOTE 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC.

Table 8.2.1.1.1-7: Minimum performance (FRC) based on single carrier performance for CA with 4DL CCs

Test num.	CA Band-width combination	Requirement	UE category		
1	4x20MHz	As specified in Table 8.2.1.1.1-5 per CC	≥8		
2	10MHz+20MHz+20MHz+20MHz	As specified in Table 8.2.1.1.1-5 per CC	≥8		
3	10MHz+10MHz+20MHz+20MHz	As specified in Table 8.2.1.1.1-5 per CC	≥8		
NOTE 1: T	NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination				
sets is defined in 8.1.2.3					
NOTE 2: 3	Ousec timing difference between PC	Cell and any SCell is applied in inter-band CA	A case, where		

Table 8.2.1.1.1-8: Minimum performance (FRC) based on single carrier performance for CA with 5DL CCs

PCell can be assigned on any CC

Test num.	CA Band-width combination	Requirement	UE category		
1	5x20MHz	As specified in Table 8.2.1.1.1-5 per CC	8, ≥11		
NOTE 1: 7	NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination				
S	sets is defined in 8.1.2.3				
NOTE 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where					
l F	PCell can be assigned on any CC.				

8.2.1.1.2 Void

8.2.1.1.3 Void

8.2.1.1.4 Minimum Requirement 1 PRB allocation in presence of MBSFN

The requirements are specified in Table 8.2.1.1.4-2, with the addition of the parameters in Table 8.2.1.1.4-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the single-antenna performance with a single PRB allocated at the lower band edge in presence of MBSFN.

Table 8.2.1.1.4-1: Test Parameters for Testing 1 PRB allocation

Parameter		Unit	Test 1
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)
	σ	dB	0
N_{oc} at antenna port		dBm/15kHz	-98
Symbols for MBSFN portion of MBSFN subframes (NOTE 2)			OCNG (NOTE 3)
PDSCH transmission mode			1

NOTE 1: $P_B = 0$

NOTE 2: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the

first slot.

NOTE 3: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN subframes,

QPSK modulated MBSFN data is used instead.

Table 8.2.1.1.4-2: Minimum performance 1PRB (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	value	UE
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.29 FDD	OP.3 FDD	ETU70	1x2 Low	30	2.0	≥1

8.2.1.2 Transmit diversity performance

8.2.1.2.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.2.1.2.1-2, with the addition of the parameters in Table 8.2.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.2.1.2.1-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1-2
	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
PDSCH transmission	on mode		2
NOTE 1: $P_B = 1$.			

Table 8.2.1.2.1-2: Minimum performance Transmit Diversity (FRC)

Test	Band- Reference		OCNG	Propagation	Correlation	Reference	value	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughp ut (%)	SNR (dB)	Category
1	10 MHz	R.11 FDD	OP.1 FDD	EVA5	2x2 Medium	70	6.8	≥2
	5 MHz	R.11-2 FDD	OP.1 FDD	EVA5	2x2 Medium	70	5.9	1
	5 MHz (NOTE 1)	R.11-2 FDD	OP.1 FDD	EVA5	2x2 Medium	70	5.9	≥2
2	10 MHz	R.10 FDD	OP.1 FDD	HST	2x2	70	-2.3	≥1
NOTE 1:	Test case a	pplicability is de	efined in 8.1.2	.1.		•		

8.2.1.2.2 Minimum Requirement 4 Tx Antenna Port

The requirements are specified in Table 8.2.1.2.2-2, with the addition of the parameters in Table 8.2.1.2.2-1 and the downlink physical channel setup according Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC-FSTD) with 4 transmitter antennas.

Table 8.2.1.2.2-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1-2
	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
PDSCH transmission	on mode		2
NOTE 1: $P_B = 1$.			

Table 8.2.1.2.2-2: Minimum performance Transmit Diversity (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	1.4 MHz	R.12 FDD	OP.1 FDD	EPA5	4x2 Medium	70	0.6	≥1
2	10 MHz	R.13 FDD	OP.1 FDD	ETU70	4x2 Low	70	-0.9	≥1

8.2.1.2.3 Minimum Requirement 2 Tx Antenna Ports (demodulation subframe overlaps with aggressor cell ABS)

The requirements are specified in Table 8.2.1.2.3-2, with the addition of parameters in Table 8.2.1.2.3-1 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell. In Table 8.2.1.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Table 8.2.1.2.3-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Cell 1	Cell 2
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)	-3
	σ	dB	0	N/A
	N_{oc1}	dBm/15kHz	-102 (NOTE 2)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (NOTE 3)	N/A
	N_{oc3}	dBm/15kHz	-94.8 (NOTE 4)	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.1.2.3-2	6
BW _{Channel}		MHz	10	10
Subframe Configura	tion		Non-MBSFN	Non-MBSFN
Time Offset between	Cells	μѕ	2.5 (synchror	nous cells)
Cell Id			0	1
ABS pattern (NOTE	E 5)		N/A	11000100 11000000 11000000 11000000 11000000
RLM/RRM Measurement Pattern (NOTE 6			10000000 10000000 10000000 10000000 1000000	N/A
CSI Subframe Sets	C _{CSI,0}		11000100 11000000 11000000 11000000 11000000	N/A
(NOTE7)	C _{CSI,1}		00111011 00111111 00111111 00111111 00111111	N/A
Number of control OFDM			2 2	2
PDSCH transmission	mode		N/A	
Cyclic prefix			Normal	Normal

- NOTE 1: $P_B = 1$.
- NOTE 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- NOTE 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- NOTE 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- NOTE 5: ABS pattern as defined in [9].
- NOTE 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- NOTE 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- NOTE 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- NOTE 9: SIB-1 will not be transmitted in Cell2 in this test.

Table 8.2.1.2.3-2: Minimum Performance Transmit Diversity (FRC)

Test Number	Reference Channel		NG tern	Cond	agation ditions TE 1)	Correlation Matrix and Antenna	Matrix and Cantenna		UE Category
		Cell 1	Cell 2	Cell 1	Cell 2	Configurati on	Fraction of Maximum Throughput (%) NOTE 5	SNR (dB) (Note 2)	
1	R.11-4 FDD (NOTE 4)	OP.1 FDD	OP.1 FDD	EVA5	EVA 5	2x2 Medium	70	3.4	≥2

- NOTE 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.
- NOTE 2: SNR corresponds to \widehat{E}_s/N_{oc2} of cell 1.
- NOTE 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.
- NOTE 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- NOTE 5: The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

8.2.1.2.3A Minimum Requirement 2 Tx Antenna Ports (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

The requirements are specified in Table 8.2.1.2.3A-2, with the addition of parameters in Table 8.2.1.2.3A-1. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cells with CRS assistance information. In Table 8.2.1.2.3A-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.2.1.2.3A-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)	-3 (NOTE 1)	-3 (NOTE 1)
	σ	dB	0	N/A	N/A
	N_{oc1}	dBm/15kHz	-98 (NOTE 2)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (NOTE 3)	N/A	N/A
	N_{oc3}	dBm/15kHz	-93 (NOTE 4)	N/A	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table8.2.1.2.3 A-2	12	10
BW _{Channel}		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift between	en Cells	Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (NO	ΓE 5)		N/A	11000000 11000000 11000000 11000000 11000000	11000000 11000000 11000000 11000000 11000000
RLM/RRM Measur Subframe Pattern (N			1000000 1000000 1000000 1000000 1000000	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		11000000 11000000 11000000 11000000 11000000	N/A	N/A
(NOTE 7)	C _{CSI,1}		00111111 00111111 00111111 00111111 00111111	N/A	N/A
Number of control OFDM symbols			2	NOTE 8	NOTE 8
PDSCH transmission mode			2	NOTE 9	NOTE 9
Cyclic prefix			Normal	Normal	Normal

- NOTE 1: $P_B = 1$.
- NOTE 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
- NOTE 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- NOTE 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- NOTE 5: ABS pattern as defined in [9].
- NOTE 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- NOTE 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- NOTE 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
- NOTE 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
- NOTE 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
- NOTE 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Table 8.2.1.2.3A-2: Minimum Performance Transmit Diversity (FRC)

Test Number	Reference Channel	OC	NG Patte	ern	Propagation Conditions (NOTE 1)			Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configuration (NOTE 2)	Fraction of Maximum Throughput (%) NOTE 5	SNR (dB) (NOTE 3)	gory
1	R.11-4 FDD NOTE 4	OP.1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	EVA5	2x2 Medium	70	3.4	≥2

- NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
- NOTE 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
- NOTE 3: SNR corresponds to E_{s}/N_{oc2} of cell 1.
- NOTE 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- NOTE 5: The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

8.2.1.2.4 Enhanced Performance Requirement Type A - 2 Tx Antenna Ports with TM3 interference model

The requirements are specified in Table 8.2.1.2.4-2, with the addition of parameters in Table 8.2.1.2.4-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 3 interference model defined in clause B.5.2. In Table 8.2.1.2.4-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.1.2.4-1: Test Parameters for Transmit diversity Performance (FRC) with TM3 interference model

Parameter		Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)	-3	-3
	σ	dB	0	0	0
Cell-specific reference	signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna po	ort	dBm/15kHz	-98	N/A	N/A
DIP (NOTE 2)		dB	N/A	-2.23	-8.06
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	2
Number of control OFDM	symbols		2	2	2
PDSCH transmission	mode		2	N/A	N/A
Interference mod	el		N/A	As specified in clause B.5.2	As specified in clause B.5.2
Probability of occurrence of	Rank 1	%	N/A	80	80
transmission rank in interfering cells	Rank 2	%	N/A	20	20
Reporting interva	ıl	ms	5	N/A	N/A
Reporting mode			PUCCH 1-0	N/A	N/A
Physical channel for CQI reporting			PUSCH(Note 5)	N/A	N/A
cqi-pmi-Configuration	Index		2	N/A	N/A

NOTE 1: $P_B = 1$

NOTE 2: The respective received power spectral density of each interfering cell relative to N_{oc} is defined by its associated DIP value as specified in clause B.5.1.

NOTE 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

NOTE 4: Cell 2 transmission is delayed with respect to Cell 1 by 0.33 ms and Cell 3 transmission is delayed with respect to Cell 1 by 0.67 ms.

Note 5: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 and #0.

Table 8.2.1.2.4-2: Enhanced Performance Requirement Type A, Transmit Diversity (FRC) with TM3 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		opagat onditio		Correlation Matrix and	Reference Value		UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (NOTE 3)	Fraction of Maximum Throughput (%)	SINR (dB) (NOTE 2)	gory
1	R.46 FDD	OP. 1 FD D	N/A	N/A	EV A70	EV A70	EV A70	2x2 Low	70	-1.1	≥1

NOTE 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

NOTE 2: SINR corresponds to \hat{E}_s/N_{ac} of Cell 1 as defined in clause 8.1.1.

NOTE 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.2.1.2.5 Enhanced Performance Requirement Type B - 2 Tx Antenna Ports with TM2 interference model

The requirements are specified in Table 8.2.1.2.5-2, with the addition of parameters in Table 8.2.1.2.5-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 2 interference model defined in clause B.6.1. In Table 8.2.1.2.5-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.1.2.5-1: Test Parameters for Transmit Diversity Performance (FRC) with TM2 interference model

Para	ameter		Unit	Cell 1	Cell 2	Cell 3
		$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power alloc	cation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3	-3
		σ	dB	0	0	0
Cell-specific reference	ce signals	3		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port			dBm/15kHz		-98	
\hat{E}_s/N_{oc}			dB	N/A	13.91	3.34
BW _{Channel}			MHz	10	10	10
Cyclic Prefix				Normal	Normal	Normal
Cell Id				0	6	1
Number of control O	FDM sym	bols		3	3	3
CFI indicated in PCF	ICH			3	3	3
PDSCH transmission	n mode			2	2	2
Interference model				N/A	As specified in clause B.6.1	As specified in clause B.6.1
MBSFN				Not configured	Not configured	Not configured
Time offset to cell 1			us	N/A	2	3
Frequency offset to o	cell 1		Hz	N/A	200	300
NeighCellsInfo- r12 (Note 3) p-aList- transmi -r12		12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
		sionModeList		N/A	{2,3,4,8,9}	{2,3,4,8,9}
Note 1: $P_{n} = 1$			l	1		

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

NeighCellsInfo-r12 is described in subclause 6.3.2 of [7]. Note 3:

Table 8.2.1.2.5-2: Minimum Performance for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM2 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		Propagation Conditions		Correlation Reference Value Matrix and		Reference Value	
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.11-10 FDD	OP. 1 FD D	N/A	N/A	EP A5	EP A5	EP A5	2x2 Low	85	15.5	≥1

The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 1:

SNR corresponds to E_s/N_{oc} of Cell 1 as defined in clause 8.1.1. Note 2:

Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. Note 3:

8.2.1.2.6 Enhanced Performance Requirement Type B - 2 Tx Antenna Ports with TM9 interference model

The requirements are specified in Table 8.2.1.2.6-2, with the addition of parameters in Table 8.2.1.2.6-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4. In Table 8.2.1.2.6-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.1.2.6-1: Test Parameters for Transmit Diversity Performance (FRC) with TM9 interference model

Para	ameter		Unit	Cell 1	Cell 2	Cell 3
		$ ho_{\scriptscriptstyle A}$	dB	-3	0	0
Downlink power allo	cation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	0	0
		σ	dB	0	-3	-3
Cell-specific reference signals				Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port			dBm/15kHz		-98	
\hat{E}_s/N_{oc}			dB	N/A	3.28	0.74
BW _{Channel}			MHz	10	10	10
Cyclic Prefix				Normal	Normal	Normal
Cell Id				0	1	6
Number of control O	FDM syı	mbols		3	3	3
CFI indicated in PCFICH				3	Random from set {1,2,3}	Random from set {1,2,3}
PDSCH transmissio	n mode			2	9	9
Interference model				N/A	As specified in clause B.6.4	As specified in clause B.6.4
CSI reference signa	ls			N/A	Antenna ports 15,16	Antenna ports 15,16
CSI-RS periodicity a T _{CSI-RS} / Δ _{CSI-RS}	and subfr	ame offset	Subframes	N/A	10 / 1	10 / 1
CSI reference signa	I configu	ration		N/A	6	7
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap			Subframes / bitmap	N/A	6 / 01000000000 00000	6 / 0010000000 000000
Time offset to cell 1			us	N/A	5	-5
Frequency offset to cell 1			Hz	N/A	600	-600
MBSFN			Not configured	Not configured	Not configured	
NeighCellsInfo- r12	p-aList-r′	12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
,	transmis: r12	sionModeList-		N/A	{2,3,4,8,9}	{2,3,4,8,9}

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: CSI-RS configurations are according to [4] subclause 6.10.5.2.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.2.1.2.6-2: Minimum Performance for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM9 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		opagat onditio		Correlation Matrix and	Reference Value		UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.11-9 FDD	OP. 1 FD D	N/A	N/A	EP A5	EP A5	EP A5	2x2 Low	85	8.4	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.2.1.3 Open-loop spatial multiplexing performance

8.2.1.3.1 Minimum Requirement 2 Tx Antenna Port

For single carrier, the requirements are specified in Table 8.2.1.3.1-2, with the addition of the parameters in Table 8.2.1.3.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 2 DL CC, the requirements are specified in Table 8.2.1.3.1-4, with the addition of the parameters in Table 8.2.1.3.1-3 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

For CA with 3 DL CCs, the requirements are specified in Table 8.2.1.3.1-6, based on single carrier requirement specified in Table 8.2.1.3.1-5, with the addition of the parameters in Table 8.2.1.3.1-3 and the downlink physical channel setup according to Annex C.3.2.

For CA with 4 DL CCs, the requirements are specified in Table 8.2.1.3.1-7, based on single carrier requirement specified in Table 8.2.1.3.1-5, with the addition of the parameters in Table 8.2.1.3.1-3 and the downlink physical channel setup according to Annex C.3.2.

For CA with 5 DL CCs, the requirements are specified in Table 8.2.1.3.1-8, based on single carrier requirement specified in Table 8.2.1.3.1-5, with the addition of the parameters in Table 8.2.1.3.1-3 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.1.3.1-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1-4
Daniel al acces	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
PDSCH transmission	on mode		3
	•	•	·

NOTE 1: $P_B = 1$. NOTE 2: Void. NOTE 3: Void.

Table 8.2.1.3.1-2: Minimum performance Large Delay CDD (FRC)

				Brono	Correlation	Reference	value	
Test num	Bandwidt h	Referenc e channel	OCNG pattern	Propa- gation condi- tion	matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)	UE cate gory
1	10 MHz	R.11 FDD	OP.1 FDD	EVA70	2x2 Low	70	13.0	≥2
2 (NOTE 3)	5 MHz	R.11-2 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.7	≥2
3	10 MHz	R.35 FDD	OP.1 FDD	EVA200	2x2 Low	70	20.2	≥2
4	10 MHz	R.35-4 FDD	OP.1 FDD	ETU600	2x2 Low	70	[20.8]	≥2

NOTE 1: Void.

NOTE 2: Test 1 may not be executed for UE-s for which Test 1 or 2 in Table 8.2.1.3.1-4 is applicable.

NOTE 3: Test case applicability is defined in 8.1.2.1.

Table 8.2.1.3.1-3: Test Parameters for Large Delay CDD (FRC) for CA

Parameter	•	Unit	Value
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)
	σ	dB	0
$N_{\it oc}$ at antenna port		dBm/15kHz	-98
PDSCH transmission	on mode		3

NOTE 1: $P_B = 1$.

NOTE 2: PUCCH format 1b with channel selection is used to feedback ACK/NACK for Tests in Table 8.2.1.3.1-4, PUCCH format 3 is used to feedback ACK/NACK for Tests in Table 8.2.1.3.1-6.

NOTE 3: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.1.3.1-4: Minimum performance Large Delay CDD (FRC) for CA with 2DL CCs

				Propa-	Correlation	Referenc	e value	
Test num	Bandwidth	Referenc e channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)	UE category
1 (NOTE 2)	2x10 MHz	R.11 FDD	OP.1 FDD (NOTE 1)	EVA70	2x2 Low	70	13.7	≥3
2 (NOTE 2)	2x20 MHz	R.30 FDD	OP.1 FDD (NOTE 1)	EVA70	2x2 Low	70	13.2	≥5
3	2x5 MHz	R.11-2 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.7	≥2
4	10MHz+5	R.11 FDD for 10MHz CC,	OP.1 FDD (NOTE 1)	E\/\\ 70	2021 200	70	13.0	,
4	MHz	R.11-2 FDD for 5MHz CC	OP.1 FDD (NOTE 1)	EVA70	2x2 Low	70	12.7	- ≥3
5	15MHz+5	R.11-7 FDD for 15MHz CC	OP.1 FDD (NOTE 1)	EVA70	2x2 Low	70	12.8	≥3
MHz	R.11-2 FDD for 5MHz CC	OP.1 FDD (NOTE 1)			70	12.7		

NOTE 1: The OCNG pattern applies for each CC.

NOTE 2: Void

NOTE 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Table 8.2.1.3.1-5: Single carrier performance for multiple CA configurations

			Propa-	Correlation	Reference value		
Band- width	Reference channel	OCNG pattern	gation condition	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	
1.4MHz	R.11-5 FDD	OP. 1 FDD	EVA70	2x2 Low	70	13.6	
3MHz	R.11-6 FDD	OP. 1 FDD	EVA70	2x2 Low	70	12.3	
5MHz	R.11-2 FDD	OP. 1 FDD	EVA70	2x2 Low	70	12.3	
10 MHz	R.11 FDD	OP. 1 FDD	EVA70	2x2 Low	70	12.9	
15MHz	R.11-7 FDD	OP. 1 FDD	EVA70	2x2 Low	70	12.8	
20MHz	R.30 FDD	OP. 1 FDD	EVA70	2x2 Low	70	12.9	

Table 8.2.1.3.1-6: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs

Test num.	CA Band-width combination	Requirement	UE category
1	3x20MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5
2	20MHz+20MHz+15MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5
3	20MHz+20MHz+10MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5
4	20MHz+15MHz+15MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5
5	20MHz+15MHz+10MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5
6	20MHz+10MHz+10MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5
7	15MHz+15MHz+10MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5
8	20MHz+10MHz+5MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5
9	20MHz+15MHz+5MHz	As specified in Table 8.2.1.3.1-5 per CC	≥5

NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3

Table 8.2.1.3.1-7: Minimum performance (FRC) based on single carrier performance for CA with 4 DL CCs

Test num.	CA Band-width combination	Requirement	UE category		
1	4x20MHz	As specified in Table 8.2.1.3.1-5 per CC	≥8		
2	10MHz+20MHz+20MHz+20MHz	As specified in Table 8.2.1.3.1-5 per CC	≥8		
3	10MHz+10MHz+20MHz+20MHz	As specified in Table 8.2.1.3.1-5 per CC	≥8		
NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination					
S	ets is defined in 8.1.2.3				

Table 8.2.1.3.1-8: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs

Test num.	CA Band-width combination	Requirement	UE category			
1	5x20MHz	As specified in Table 8.2.1.3.1-5 per CC	8, ≥11			
NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination						
s	sets is defined in 8.1.2.3					

8.2.1.3.1A Soft buffer management test

For CA, the requirements are specified in Table 8.2.1.3.1A-2, with the addition of the parameters in Table 8.2.1.3.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the UE performance with proper instantaneous buffer implementation. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.2.1.3.1A-3.

Table 8.2.1.3.1A-1: Test Parameters for soft buffer management test (FRC) for CA

Parameter	•	Unit	Test 1-7
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	-3
	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)
	σ	dB	0
$N_{\it oc}$ at antenna port		dBm/15kHz	-98
PDSCH transmissi	on mode		3

NOTE 1: $P_{R} = 1$.

NOTE 2: For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK.

NOTE 3: For CA test cases, the same PDSCH transmission mode is applied to each component carrier.

Table 8.2.1.3.1A-2: Minimum performance soft buffer management test (FRC) for CA

						Reference	ce value
Test num	Bandwi dth	Reference channel	OCNG pattern	Propa- gation condition	Correlation matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)
1	2x20 MHz	R.30 FDD	OP.1 FDD (NOTE 1)	EVA70	2x2 Low	70	13.2
2	o 15MHz +	R.35-2 FDD for 15MHz CC	OP.1 FDD (NOTE 1)	EVA5	2x2 Low	70	15.1
2	10MHz	R.35-3 FDD for 10MHz CC	OP.1 FDD (NOTE 1)	EVAS		70	15.1
2	3 20MHz + 10MHz	R.30 FDD for 20MHz CC	OP.1 FDD (NOTE 1)	EVA70	2x2 Low	70	13.5
3		R.11 FDD for 10MHz CC	OP.1 FDD (NOTE 1)	EVA/U	ZXZ LOW	70	13.5
4	20MHz +	R.30 FDD for 20MHz CC	OP.1 FDD (NOTE 1)	EVA70	2x2 Low	70	13.5
4	15MHz	R.30-1 FDD for 15MHz CC	OP.1 FDD (NOTE 1)	EVA/U		70	13.5
5	2x20 MHz	R.35-1 FDD	OP.1 FDD (NOTE 1)	EVA5	2x2 Low	70	15.8
6	20MHz +	R.35-1 FDD for 20MHz CC	OP.1 FDD (NOTE 1)	EVA5	2x2 Low	70	15.9
O	10MHz	R.35-3 FDD for 10MHz CC	OP.1 FDD (NOTE 1)	EVAS	ZXZ LUW	70	15.9
7	20MHz +	R.35-1 FDD for 20MHz CC	OP.1 FDD (NOTE 1)	E\/\/E	2v2 Love	70	15.9
/	15MHz	R.35-2 FDD for 15MHz CC	OP.1 FDD (NOTE 1)	EVA5	2x2 Low	70	15.9

NOTE 1: For CA test cases, the OCNG pattern applies for each CC.

NOTE 2: For Test 2, 3, 4, 6, 7 the Fraction of maximum Throughput applies to each CC.

NOTE 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Table 8.2.1.3.1A-3: Test points for soft buffer management tests for CA

IIE ootogony	Bandwidth combination with maximum aggregated bandwidth (NOTE 1)								
UE category	2x20MHz 15MHz+10MHz		20MHz+10MHz	20MHz+15MHz					
3	1	2	3	4					
4 5		N/A	6	7					
NOTE 1: Maximum over all supported CA configurations and bandwidth combination sets according to Table 5.6A.1-1 and Table 5.6A.1-2.									

8.2.1.3.1B Enhanced Performance Requirement Type C –2Tx Antenna Ports

The requirements are specified in Table 8.2.1.3.1B-2, with the addition of the parameters in Table 8.2.1.3.1B-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

Table 8.2.1.3.1B-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1			
Develiels nesses	$ ho_{\scriptscriptstyle A}$	dB	-3			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)			
	σ	dB	0			
N_{oc} at antenna	port	dBm/15kHz	-98			
PDSCH transmission	on mode		3			
NOTE 1: $P_p = 1$.						

Table 8.2.1.3.1B-2: Enhanced Performance Requirement Type C for Large Delay CDD (FRC)

				Propa-	Correlation	Reference		
Test num	Bandwidt h	Referenc e channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)	UE cate gory
1	10 MHz	R.11 FDD	OP.1 FDD	EVA70	2x2 Medium	70	17.8	≥2

8.2.1.3.1C Enhanced Performance Requirement Type C - 2 Tx Antenna Ports with TM1 interference

The requirements are specified in Table 8.2.1.3.1C-2, with the addition of parameters in Table 8.2.1.3.1C-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of open-loop spatial multiplexing performence with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell with transmission mode 1. In Table 8.2.1.3.1C-1, Cell 1 is the serving cell, and Cell 2 is interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2 respectively.

Table 8.2.1.3.1C-1 Test parameters for Larger Delay CDD (FRC) with TM1 interference

Parame	ter	Unit	Cell 1	Cell 2	
Bandwid	dth	MHz	10 M	Hz	
Downlink	$ ho_{\scriptscriptstyle A}$		-3	0	
power	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)	0	
allocation	σ		0	0	
Cell-spec reference s			Antenna ports 0,1	Antenna port 0	
Cyclic Pr			Normal	Normal	
Cell IE			0	1	
Transmis: mode			3	NOTE 2	
$N_{\!oc}$ at anteni	na port	dBm/15kHz	-98	N/A	
\hat{E}_s/N_{oc} (NC	TE 3)	dB	Reference Value in Table 8.2.1.3.1C-2	12.95	
Correlatior antenn configura	а		Medium (2x2)	Medium(1x 2)	
Number of 0 symbols PDCCI	for		2	N/A	
HARC	Max number of HARQ transmissions		4	N/A	
Redundancy version coding sequence			{0,1,2,3}	N/A	

NOTE 1: $P_B = 1$

NOTE 2: Downlink physical channel setup in Cell 2 in

accordance with Annex C.3.2 applying OCNG pattern

OP.5 FDD as defined in Annex A.5.1.5.

NOTE 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

NOTE 4: All cells are time-synchronous.

NOTE 5: SIB-1 will not be transmitted in Cell2 in this test.

Table 8.2.1.3.1C-2 Enhanced Performance Requirement Type C, Larger Delay CDD (FRC) with TM1 interference

Test Number	Reference Channel	OCNG Propagation Reference Value Pattern Conditions (NOTE 1)		Value	UE Categor y			
		Cell 1	Cell 2	Cell 1	Cell 2	Fraction of Maximum Throughpu t (%)	SNR (dB) (NOTE 2)	
1	R.11-8	OP.1	OP.5	EVA7	EVA7	70	19.9	≥2
	FDD	FDD	FDD	0	0			

NOTE 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

NOTE 2: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1.

8.2.1.3.2 Minimum Requirement 4 Tx Antenna Port

The requirements are specified in Table 8.2.1.3.2-2, with the addition of the parameters in Table 8.2.1.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 4 transmitter antennas.

Table 8.2.1.3.2-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1
Develiels news	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (NOTE 1)
	σ	dB	3
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
PDSCH transmission	on mode		3
NOTE 1: $P_B = 1$			

Table 8.2.1.3.2-2: Minimum performance Large Delay CDD (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.14 FDD	OP.1 FDD	EVA70	4x2 Low	70	14.3	≥2

8.2.1.3.3 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS)

The requirements for non-MBSFN ABS are specified in Table 8.2.1.3.3-2, with the addition of parameters in Table 8.2.1.3.3-1 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

The requirements for MBSFN ABS are specified in Table 8.2.1.3.3-4, with the addition of parameters in Table 8.2.1.3.3-3 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

The purpose is to verify the performance of large delay CDD with 2 transmitter antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell. In Tables 8.2.1.3.3-1 and 8.2.1.3.3-3, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Table 8.2.1.3.3-1: Test Parameters for Large Delay CDD (FRC) - Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)	-3	
	σ	dB	0	N/A	
	N_{oc1}	dBm/15kHz	-102 (NOTE 2)	N/A	
$N_{\it oc}$ at antenna port	N_{oc2}	dBm/15kHz	-98 (NOTE 3)	N/A	
	N_{oc3}	dBm/15kHz	-94.8 (NOTE 4)	N/A	
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.1.3.3-2	6	
$BW_Channel$		MHz	10	10	
Subframe Configura	ation		Non-MBSFN	Non-MBSFN	
Cell Id			0	1	
Time Offset between	Cells	μs	2.5 (synchro	nous cells)	
ABS pattern (NOT	E 5)		N/A	11000100, 11000000, 11000000, 11000000, 11000000	
RLM/RRM Measurement Pattern(NOTE 6			1000000 1000000 1000000 1000000 1000000	N/A	
CSI Subframe Sets	C _{CSI,0}		11000100 11000000 11000000 11000000 11000000	N/A	
(NOTE 7)	C _{CSI,1}		00111011 00111111 00111111 00111111 00111111	N/A	
Number of control OFDN			2	2	
PDSCH transmission	mode		3	N/A	
Cyclic prefix			Normal	Normal	

- NOTE 1: $P_B = 1$.
- NOTE 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- NOTE 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- NOTE 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- NOTE 5: ABS pattern as defined in [9].
 NOTE 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].
- NOTE 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- NOTE 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- NOTE 9: SIB-1 will not be transmitted in Cell2 in this test.

Table 8.2.1.3.3-2: Minimum Performance Large Delay CDD (FRC) - Non-MBSFN ABS

Test Number	Reference Channel	OCNG Pattern		Propagation Conditions (Note 1)		Correlation Matrix and Antenna	Reference Value		UE Category	
		Cell 1	Cell 2	Cell 1	Cell 2	Configuration	Fraction of Maximum Throughput (%) Note 5	SNR (dB) (Note 2)		
1	R.11 FDD Note 4	OP.1 FDD	OP.1 FDD	EVA 5	EVA 5	2x2 Low	70	13.3	≥2	
Note 1:	The propagati	The propagation conditions for Cell 1 and Cell2 are statistically independent.								
Note 2:	SNR correspo	IR corresponds to \hat{E}/N , of cell 1.								

SNR corresponds to E_s/IV_{oc2} or cell 1.

The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. Note 3:

Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH Note 4: are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms. Note 5:

Table 8.2.1.3.3-3: Test Parameters for Large Delay CDD (FRC) - MBSFN ABS

Parameter		Unit	Cell 1	Cell 2
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3
	σ	dB	0	N/A
	N_{oc1}	dBm/15kHz	-102 (Note 2)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A
	N_{oc3}	dBm/15kHz	-94.8 (Note 4)	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.1.3.3-4	6
BW _{Channel}		MHz	10	10
Subframe Configur	ation		Non-MBSFN	MBSFN
Cell Id			0	126
Time Offset between	Cells	μs	2.5 (synchro	nous cells)
ABS pattern (Note	÷ 5)		N/A	0001000000 0100000010 0000001000 0000000
RLM/RRM Measurement Pattern (Note 6			0001000000 0100000010 0000001000 0000000	N/A
CSI Subframe Sets (Note	C _{CSI,0}		0001000000 0100000010 0000001000 0000000	N/A
7)	C _{CSI,1}		1110111111 1011111101 1111110111 1111111	N/A
MBSFN Subframe Allocation	,		N/A	001000 100001 000100 000000
Number of control OFDN			2	2
PDSCH transmission	mode		3	N/A
Cyclic prefix			Normal	Normal

- Note 1: $P_{\rm B}=1$.
- Note 2: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbol #0 of a subframe overlapping with the aggressor ABS.
- Note 4:
- This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS. ABS pattern as defined in [9]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are Note 5: MBSFN ABS subframes.
- Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6:
- As configured according to the time-domain measurement resource restriction pattern for CSI Note 7: measurements defined in [7].
- Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 9: SIB-1 will not be transmitted in Cell2 in this test.
- Note 10: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits is chosen for MBSFN subframe allocation.
- The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel Note 11: transmission is in a subframe protected by MBSFN ABS in this test.

Table 8.2.1.3.3-4: Minimum Performance Large Delay CDD (FRC) - MBSFN ABS

Test Number	Reference Channel	OCNG Pattern		Propagation Conditions (Note 2)		Correlation Matrix and Antenna	Reference Value		UE Category
		Cell 1	Cell 2	Cell 1	Cell 2	Configuration	Fraction of Maximum Throughput (%) Note 5	SNR (dB) (Note 2)	
1	R.11 FDD Note 4	OP.1 FDD	OP.1 FDD	EVA 5	EVA 5	2x2 Low	70	12.0	≥2
Note 1:	The properti	on conditi	iona for C	all 1 and 1	20112 050	statiatically indone	ndont		

- Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.
- Note 2: SNR corresponds to E_s/N_{ac2} of cell 1.
- Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.
- Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 5: The maximum Throughput is calculated from the total Payload in 4 subframes, averaged over 40ms.

8.2.1.3.4 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

The requirements for non-MBSFN ABS are specified in Table 8.2.1.3.4-2, with the addition of parameters in Table 8.2.1.3.4-1. The purpose is to verify the performance of large delay CDD with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cells with CRS assistance information. In Table 8.2.1.3.4-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] includes Cell 2 ad Cell3.

Table 8.2.1.3.4-1: Test Parameters for Large Delay CDD (FRC) - Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	Cell 3	
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)	
	σ	dB	0	N/A	N/A	
	N_{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A	
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A	
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A	
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.1.3.4-2	Reference Value in Table 8.2.1.3.4-2	Reference Value in Table 8.2.1.3.4-2	
BW _{Channel}		MHz	10	10	10	
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN	
Time Offset betwee	n Cells	μs	N/A	3	-1	
Frequency shift between	een Cells	Hz	N/A	300	-100	
Cell Id			0	1	126	
ABS pattern (Note 5)			N/A	11000000 11000000 11000000 11000000 11000000	11000000 11000000 11000000 11000000 11000000	
RLM/RRM Measurement Subframe Pattern (Note 6)			10000000 10000000 10000000 10000000 1000000	N/A	N/A	
CSI Subframe Sets	C _{CSI,0}		11000000 11000000 11000000 11000000 11000000	N/A	N/A	
(Note7)	C _{CSI,1}		00111111 00111111 00111111 00111111 00111111	N/A	N/A	
Number of control OFDM symbols			2	Note 8	Note 8	
PDSCH transmissio			3	Note 9	Note 9	
Cyclic prefix			Normal	Normal	Normal	

Note 1: $P_{R} = 1$.

Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.

Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.

Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS

Note 5: ABS pattern as defined in [9].

Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]

Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].

Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.

Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.

Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.

Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Table 8.2.1.3.4-2: Minimum Performance Large Delay CDD (FRC) - Non-MBSFN ABS

Test Refer Number ence Chan nel	Refer ence	\hat{E}_s/N_{oc2}		OCNG Pattern		Propagation Conditions (Note1)			Correlation Matrix and	Reference Value		UE Cate	
		Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughp ut (%) Note 5	SNR (dB) (Note 3)	gory
1	R.11 FDD Note 4	9	7	OP.1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	EVA5	2x2 Low	70	13.9	≥2
2	R.35 FDD Note 4	9	1	OP.1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	EVA5	2x2 Low	70	22.6	≥2

- Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
- Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
- Note 3: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.
- Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 5: The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

8.2.1.4 Closed-loop spatial multiplexing performance

8.2.1.4.1 Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.1.4.1-2, with the addition of the parameters in Table 8.2.1.4.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.1.4.1-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1	Test 1A	Test 2	
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3	
	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)	
	σ	dB	0	0	0	
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98	
Precoding granularity		PRB	6	4	50	
PMI delay (Note 2)		ms	8	8	8	
Reporting interval		ms	1	1	1	
Reporting mode			PUSCH 1-2	PUSCH 1-2	PUSCH 3-1	
CodeBookSubsetRestricti			001111	001111	001111	
on bitmap						
PDSCH transmission			4	4	4	
mode						
1						

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Table 8.2.1.4.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Catego ry
1	10 MHz	R.10 FDD	OP.1 FDD	EVA5	2x2 Low	70	-2.5	≥1
1A (Note 1)	5 MHz	R.10-2 FDD	OP.1 FDD	EVA5	2x2 Low	70	-2.9	≥1
2	10 MHz	R.10 FDD	OP.1 FDD	EPA5	2x2 High	70	-2.3	≥1
Note 1: Tes	st case appli	cability is defin	ed in 8.1.2.1.					

8.2.1.4.1A Minimum Requirement Single-Layer Spatial Multiplexing 4 Tx Antenna Port

The requirements are specified in Table 8.2.1.4.1A-2, with the addition of the parameters in Table 8.2.1.4.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.1.4.1A-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

	Unit	Test 1
$ ho_{\scriptscriptstyle A}$	dB	-6
$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
σ	dB	3
ort	dBm/15kHz	-98
rity	PRB	6
2)	ms	8
al	ms	1
9		PUSCH 1-2
estricti		000000000000000000000000000000000000000
		0000000000000000
		0000000000000000
		11111111111111111
ion		4
	ρ_B σ ort urity 2) al eservicti	$ ho_A$ dB $ ho_B$ dB $ ho$ dB $ ho$ dB ort dBm/15kHz $ ho$ mrity PRB 2) ms al ms estricti

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Table 8.2.1.4.1A-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE	
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Matrix and Antenna Maximum (dB) Configuration Throughput (%)		Category	
1	10 MHz	R.13 FDD	OP.1 FDD	EVA5	4x2 Low	70	-3.2	≥1	

8.2.1.4.1B Enhanced Performance Requirement Type A - Single-Layer Spatial Multiplexing 2 Tx Antenna Port with TM4 interference model

The requirements are specified in Table 8.2.1.4.1B-2, with the addition of the parameters in Table 8.2.1.4.1B-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 4 interference model defined

in clause B.5.3. In Table 8.2.1.4.1B-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.1.4.1B-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model

Parameter		Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3	-3
	σ	dB	0	0	0
Cell-specific reference	signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna po	ort	dBm/15kHz	-98	N/A	N/A
DIP (Note 2)		dB	N/A	-1.73	-8.66
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	2
Number of control OFDM	symbols		2	2	2
PDSCH transmission	mode		6	N/A	N/A
Interference mode	el		N/A	As specified in clause B.5.3	As specified in clause B.5.3
Probability of occurrence of	Rank 1	%	N/A	80	80
transmission rank in interfering cells	Rank 2	%	N/A	20	20
Precoding granular	rity	PRB	50	6	6
PMI delay (Note 4	1)	ms	8	N/A	N/A
Reporting interva	ıl	ms	5	N/A	N/A
Reporting mode			PUCCH 1-1	N/A	N/A
CodeBookSubsetRestricti	on bitmap		001111	N/A	N/A
Physical channel for CQI	reporting		PUSCH(Note 6)	N/A	N/A
cqi-pmi-Configuration	Index		2	N/A	N/A

Note 1: $P_{R} = 1$

Note 2: The respective received power spectral density of each interfering cell relative to N_{oc} is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Note 6: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 and #0.

Table 8.2.1.4.1B-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		pagat onditio		Correlation Matrix and	Reference Value		UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	gory
1	R.47 FDD	OP. 1 FD D	N/A	N/A	EV A5	EV A5	EV A5	2x2 Low	70	0.8	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{ac} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.2.1.4.1C Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Ports (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

The requirements are specified in Table 8.2.1.4.1C-2, with the addition of parameters in Table 8.2.1.4.1C-1. The purpose is to verify the closed loop rank-one performance with wideband precoding if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell with CRS assistance information. In Table 8.2.1.4.1C-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.2.1.4.1C-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) – Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)
anocation	σ	dB	0	N/A	N/A
	N_{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.1.4.1C-2	12	10
BW _{Channel}		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift between	een Cells	Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (Note 5)			N/A	11000000 11000000 11000000 11000000 11000000	11000000 11000000 11000000 11000000 11000000
RLM/RRM Measur Subframe Pattern (I			10000000 10000000 10000000 10000000 1000000	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		11000000 11000000 11000000 11000000 11000000	N/A	N/A
(Note7)	C _{CSI,1}		00111111 00111111 00111111 00111111 00111111	N/A	N/A
Number of control symbols	OFDM		2	Note 8	Note 8
PDSCH transmissio	n mode		6	Note 9	Note 9
Precoding granularity		PRB	50	N/A	N/A
PMI delay (Note 10)		ms	8	N/A	N/A
Reporting interval		ms	1	N/A	N/A
	Peporting mode		PUSCH 3-1	N/A	N/A
CodeBookSubsetRestriction bitmap			1111	N/A	N/A
Cyclic prefix			Normal	Normal	Normal

Reference Value

SNR

Fraction of

UE

Cate

gory

Test

Number

Note 5:

Reference

Channel

OCNG Pattern

Cell 2

Note 1:	$P_{\rm B}=1$.
Note 2:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5:	ABS pattern as defined in [9].
Note 6:	Time-domain measurement resource restriction pattern for PCell measurements as defined in
	[7]
Note 7:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
Note 8:	The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9:	Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
Note 10:	If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 11:	The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 12:	SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Table 8.2.1.4.1C-2: Minimum Performance Single-Layer Spatial Multiplexing (FRC)- Non-MBSFN ABS

Propagation

Conditions (Note1)

Cell 2 | Cell 3

Cell 3 Cell 1

Correlation

Matrix and

Antenna

								on (Note 2)	Maximum Throughput (%) Note 5	(dB) (Note 3)		
1	R.11 FDD	OP.1	OP.1	OP.1	EPA5	EPA5	EPA5	2x2 High	70	6.1	≥2	
	Note 4	FDD	FDD	FDD								
Note 1:	The propagat	he propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.										
Note 2:	The correlation	on matrix	and ante	nna conf	iguration	apply for	Cell 1, C	cell 2 and Cell 3.				
Note 3:	SNR correspo	onds to \hat{I}	\hat{E}_s/N_{oc2}	of cell 1.								
Note 4:	transmitted in	SNR corresponds to \hat{E}_s/N_{oc2} of cell 1. Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are ransmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.										

8.2.1.4.1D Enhanced Performance Requirement Type B - Single-layer Spatial Multiplexing 2 Tx Antenna Port with TM4 interference model

The maximum Throughput is calculated from the total Payload in 9 subframes, averaged over 40ms.

The requirements are specified in Table 8.2.1.4.1D-2, with the addition of the parameters in Table 8.2.1.4.1D-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 4 interference model defined in clause B.6.3. In Table 8.2.1.4.1D-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.1.4.1D-1: Test Parameters for Single-layer Spatial Multiplexing (FRC) with TM4 interference model

Parameter		Unit	Cell 1	Ce	ell 2	Cell 3		
	$ ho_{\scriptscriptstyle A}$	dB	-3		-3	-	-3	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)		3	-3		
anocanon	σ	dB	0	0			0	
Cell-specific referen	ce signals		Antenna ports 0,1	Antenna	ports 0,1	Antenna ports 0,1		
N_{oc} at antenna port		dBm/15 kHz						
Test number (Note	4)			Test 1 Test 2 Test 1 Tes				
\hat{E}_s/N_{oc}		dB	N/A	13.91	3.28	3.34	0.74	
Cell Id				6	1	1	6	
CFI indicated in PCFICH				3	Random from set {1,2,3}	3	Random from set {1,2,3}	
BW _{Channel}		MHz	10	•	0	1	10	
Cyclic Prefix			Normal	Normal		Normal		
Number of control C	FDM symbols		3		3		3	
PDSCH transmissio	n mode		4		4		4	
Interference model			N/A		ed in clause 6.3		ed in clause 6.3	
Precoding			Random wideband precoding per TTI	As specified in clause B.6.3			ed in clause 6.3	
Time offset to cell 1		us	N/A		2		3	
Frequency offset to cell 1		Hz	N/A		00		00	
MBSFN			Not configured		nfigured		nfigured	
NeighCellsInfo-	p-aList-r12		N/A	{dB-6, dB-3, dB0}		{dB-6, d	B-3, dB0}	
r12 (Note 3)	transmissionM odeList-r12		N/A	{2,3,	4,8,9}	{2,3,4,8,9}		

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells. Note 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Note 4: Test 1 and Test 2 are defined in Table 8.2.1.4.1D-2.

Table 8.2.1.4.1D-2: Minimum Performance for Enhanced Performance Requirement Type B, Single-layer Spatial Multiplexing (FRC) with TM4 interference model

Test Num	Referenc e	ОС	NG Patt	ern		ropagation Conditions		Correlation Matrix and	Reference	e Value	UE Categor
	Channel	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughp ut (%)	SNR (dB) (Note 2)	у
1	R.11-10 FDD	OP.1 FDD	N/A	N/A	EVA 5	EVA 5	EVA 5	2x2 Low	85	17.0	≥1
2	R.11-9 FDD	OP.1 FDD	N/A	N/A	EPA 5	EPA 5	EPA 5	2x2 Low	85	10.1	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.2.1.4.1E Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Ports with CRS assistance information

The requirements are specified in Table 8.2.1.4.1E-2, with the addition of parameters in Table 8.2.1.4.1E-1. The purpose is to verify the closed loop rank-one performance with wideband precoding when CRS assistance information [7] is configured. In Table 8.2.1.4.1E-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.2.1.4.1E-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Param	eter	Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	0	0
N_{oc} at antenna po	ort	dBm/15kHz	-98	N/A	N/A
$\hat{\mathbf{E}}_{\mathrm{s}}/N_{oc}$		dB	Reference Value in Table 8.2.1.4.1E-2	[10.45]	[4.6]
BW _{Channel}		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset between	en Cells	μs	N/A	3	-1
Frequency shift be	etween Cells	Hz	N/A	300	-100
Cell Id			0	1	128
Cell-specific refere	ence signals		Ante	nna ports 0,1	
Number of control symbols	OFDM		2	2	2
PDSCH transmiss	ion mode		4	N/A	N/A
Precoding granula		PRB	50	N/A	N/A
PMI delay (Note 2		ms	8	N/A	N/A
Reporting interval	,	ms	1	N/A	N/A
Peporting mode			PUCCH 1-1	N/A	N/A
CodeBookSubsetF bitmap	Restriction		001111	N/A	N/A
Cyclic prefix			Normal	Normal	Normal
Interference mode			N/A	As specified in clause B.5.3	As specified in clause B.5.3
Probability of occurrence of transmission in interference cells		%	N/A	20	20
Probability of occurrence of transmission Rank 1		%	N/A	80	80
rank in interfering cells Note 1: $P_{-} = 1$.	Rank 2	%	N/A	20	20

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Table 8.2.1.4.1E-2: Minimum Performance Single-Layer Spatial Multiplexing (FRC)

Test Number	Reference Channel	OC	NG Patt	ern		ropagati		Correlation Matrix and	Reference Value		UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	gory

1	TBD	OP.1	N/A	N/A	EVA5	EVA5	EVA5	2x2 low	70	TBD	≥2
		FDD									
Note 1:	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.										
Note 2:	The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.										
Note 3:	SNR correspond	onds to 🖺	N _{oo} of	cell 1.	•						

8.2.1.4.2 Minimum Requirement Multi-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.1.4.2-2,with the addition of the parameters in Table 8.2.1.4.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

Table 8.2.1.4.2-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter	•	Unit	Test 1-2	Test 2A	Test 3
Danielink name	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)
	σ		0		
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98	-98	-98
Precoding granu	ularity	PRB	50	25	6
PMI delay (Not	e 2)	ms	8	8	8
Reporting inte	rval	ms	1	1	1
Reporting mo	de		PUSCH 3-1	PUSCH 3-1	PUSCH 1-2
CodeBookSubsetRo bitmap	estriction		110000	110000	110000
PDSCH transmission mode			4	4	4
Number of OFDM symbols for PDCCH per component carrier		OFDM symbol	2	3	1

Note 1: $P_R = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Table 8.2.1.4.2-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference value		UE	UE DL
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category	category
1	10 MHz	R.35 FDD	OP.1 FDD	EPA5	2x2 Low	70	18.9	≥2	≥6
2	10 MHz	R.11 FDD	OP.1 FDD	ETU70	2x2 Low	70	14.3	≥2	≥6
2A (Note 1)	5 MHz	R.11-2 FDD	OP.1 FDD	ETU70	2x2 Low	70	14.0	≥2	≥6
3	10MHz 256QAM	R. 65 FDD	OP.1 FDD	EVA5	2x2 Low	70	25.3	11-12	≥11
Note 1:									

8.2.1.4.2A Enhanced Performance Requirement Type C – Multi-layer Spatial Multiplexing 2Tx Antenna Ports

The requirements are specified in Table 8.2.1.4.2A-2, with the addition of the parameters in Table 8.2.1.4.2A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband precoding.

Table 8.2.1.4.2A-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
Precoding granu	larity	PRB	50
PMI delay (Not	e 2)	ms	8
Reporting inte	rval	ms	1
Reporting mo	de		PUSCH 3-1
CodeBookSubsetRe	estriction		110000
bitmap			
PDSCH transmission	on mode		4

Note 1: $P_R = 1$.

Note 2: If the UE reports in an available uplink reporting instance

at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Table 8.2.1.4.2A-2: Enhanced Performance Requirement Type C for Multi-Layer Spatial Multiplexing with TM4 (FRC)

	Test	Band-	Reference	OCNG	Propagation	Correlation	Reference	/alue	UE
	number	width	Channel	Pattern	Condition	Matrix and	Fraction of	SNR	Category
						Antenna	Maximum	(dB)	
						Configuration	Throughput		
							(%)		
ĺ	1	10 MHz	R.11 FDD	OP.1 FDD	ETU70	2x2 Medium	70	18.3	≥2

8.2.1.4.3 Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port

For single carrier, the requirements are specified in Table 8.2.1.4.3-2, with the addition of the parameters in Table 8.2.1.4.3-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 2 DL CCs, the requirements are specified in Table 8.2.1.4.3-4, with the addition of the parameters in Table 8.2.1.4.3-3 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

For CA with 3 DL CCs, the requirements are specified in Table 8.2.1.4.3-6, based on single carrier requirement specified in Table 8.2.1.4.3-5, with the addition of the parameters in Table 8.2.1.4.3-3 and the downlink physical channel setup according to Annex C.3.2.

For CA with4 DL CCs, the requirements are specified in Table 8.2.1.4.3-7, based on single carrier requirement specified in Table 8.2.1.4.3-5, with the addition of the parameters in Table 8.2.1.4.3-3 and the downlink physical channel setup according to Annex C.3.2.

For CA with 5 DL CCs, the requirements are specified in Table 8.2.1.4.3-8, based on single carrier requirement specified in Table 8.2.1.4.3-5, with the addition of the parameters in Table 8.2.1.4.3-3 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.1.4.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1		
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-6		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)		
	σ	dB	3		
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98		
Precoding granu	larity	PRB	6		
PMI delay (Not	e 2)	ms	8		
Reporting inter	rval	ms	1		
Reporting mo	de		PUSCH 1-2		
CodeBookSubsetRe	estriction		000000000000000000000000000000000000000		
bitmap	bitmap		bitmap		00001111111111111111100000000
	, and the second second second second second second second second second second second second second second se		0000000		
PDSCH transmission mode			4		

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n

based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: Void. Note 4: Void. Note 5: Void.

Table 8.2.1.4.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

				Propa-	Correlation	Reference	value	
Test num.	Band- width	Reference channel	OCNG pattern	Propa- gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	UE cate- gory
1	10 MHz	R.36 FDD	OP.1 FDD	EPA5	4x2 Low	70	14.7	≥2
Note 1	: Void.							

Table 8.2.1.4.3-3: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA

Parameter		Unit	Value
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
Precoding granu	Precoding granularity		4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs
PMI delay (Not	e 2)	ms	8
Reporting inte	rval	ms	1
Reporting mo	de		PUSCH 1-2
CodeBookSubsetRestriction bitmap			00000000000000000000000000000000000000
CSI request field (CSI request field (Note 3)		'10'
PDSCH transmission	on mode		4

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported

PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher

layers.

Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured for Tests in Table 8.2.1.4.3-4, and with PUCCH

format 3 for Tests in Table 8.2.1.4.3-6.

Note 5: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.1.4.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for CA with 2DL CCs

				Dropo	Correlation	Reference	e value		
Test num	Band- width	Reference channel	OCNG pattern	Propa- gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	UE cate- gory	
1	2x10 MHz	R.14 FDD	OP.1 FDD (Note 1)	EVA5	4x2 Low	70	10.8	≥3	
2	2x20 MHz	R.14-3 FDD	OP.1 FDD (Note 1)	EVA5	4x2 Low	70	10.9	≥5	
3	2x5 MHz	R.14-6 FDD	OP.1 FDD (Note 1)	EVA5	4x2 Low	4x2 L ow	70	70 9.5	≥2
3	ZAJ IVII IZ	N.14-01 DD	OP.1 FDD (Note 1)	LVAS		70	9.5	-2	
4	10MHz+5	R.14 FDD for 10MHz CC	OP.1 FDD (Note 1)	EVA5	4x2 Low	70	10.1	≥3	
4	MHz	R.14-6 FDD for 5MHz CC	OP.1 FDD (Note 1)	EVAS	4X2 LOW	70	9.5	23	
5	15MHz+5	R.14-7 FDD for 15MHz CC	OP.1 FDD (Note 1)	EVA5	4x2 Low	70	10.1	≥3	
5	MHz	R.14-6 FDD for 5MHz CC	OP.1 FDD (Note 1)	EVAS	4XZ LUW	70	9.5	_ ≥ວ	

NOTE 1: The OCNG pattern applies for each CC.

NOTE 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Table 8.2.1.4.3-5: Single carrier performance for multiple CA configurations

				Correlation	Reference	e value
Band- width	Reference channel	OCNG pattern	Propa- gation condi-tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)
1.4MHz	R.14-4 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.4
3MHz	R.14-5 FDD	OP.1 FDD	EVA5	4x2 Low	70	9.5
5MHz	R.14-6 FDD	OP.1 FDD	EVA5	4x2 Low	70	9.5
10 MHz	R.14 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.1
15MHz	R.14-7 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.1
20MHz	R.14-3 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.3

Table 8.2.1.4.3-6: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs

Test num.	CA Band-width combination	Requirement	UE category					
1	3x20MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					
2	20MHz+20MHz+15MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					
3	20MHz+20MHz+10MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					
4	20MHz+15MHz+15MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					
5	20MHz+15MHz+10MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					
6	20MHz+10MHz+10MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					
7	15MHz+15MHz+10MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					
8	20MHz+10MHz+5MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					
9	20MHz+15MHz+5MHz	As specified in Table 8.2.1.4.3-5 per CC	≥5					

Table 8.2.1.4.3-7: Minimum performance (FRC) based on single carrier performance for CA with 4 DL CCs

Test num.	CA Band-width combination	Requirement	UE category				
1	4x20MHz	As specified in Table 8.2.1.4.3-5 per CC	≥8				
2	10MHz+20MHz+20MHz+20MHz	As specified in Table 8.2.1. 4.3-5 per CC	≥8				
3	10MHz+10MHz+20MHz+20MHz	As specified in Table 8.2.1. 4.3-5 per CC	≥8				
NOTE 1: T	NOTE 1: The applicability of requirements for different CA configurations and bandwidth combination						
s	ets is defined in 8.1.2.3						

Table 8.2.1.4.3-8: Minimum performance (FRC) based on single carrier performance for CA with 5 DL CCs

Test num.	CA Band-width combination	Requirement	UE category				
1	5x20MHz	As specified in Table 8.2.1.4.3-5 per CC 8, ≥11					
	ne applicability of requirements for difefined in 8.1.2.3	ferent CA configurations and bandwidth comb	ination sets is				

8.2.1.4.3A Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port for dual connectivity

For dual connectivity the requirements are specified in Table 8.2.1.4.3A-3, based on single carrier requirement specified in Table 8.2.1.4.3A-2, with the addition of the parameters in Table 8.2.1.4.3A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding by using dual connectivity transmission.

Table 8.2.1.4.3A-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for dual connectivity

$ ho_{\scriptscriptstyle A}$	in.	
, A	dB	-6
$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
σ	dB	3
port	dBm/15kHz	-98
larity	PRB	6 for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, and 8 for 15MHz CCs and 20MHz CCs
e 2)	ms	8
rval	ms	1
		PUSCH 1-2
estriction		00000000000000000000000000000000000000
on mode		4
nission		Separate ACK/NACK feedbacks with PUCCH format 1b on the MCG and SCG
k		Separate PUSCH feedbacks on the MCG and SCG
Time offset between MCG CC and SCG CC		0 for UE under test supporting synchronous dual connectivity; 334 for UE under test supporting both asynchronous and synchrounous dual connectivity (Note 4)
	port port port llarity e 2) rval de estriction on mode mission k MCG CC	σ dB port dBm/15kHz llarity PRB e 2) ms rval ms de estriction on mode nission k MCG CC μs

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: The same PDSCH transmission mode is applied to each component carrier.

Note 4: As defined in TS36.300 [11].

Note 5: If the UE supports both SCG bearer and Split bearer, the SCG bearer is

configured.

Table 8.2.1.4.3A-2: Single carrier performance for multiple dual connectivity configurations

			Propa-	Correlation	Reference	value
Band- width	Reference channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)
1.4MHz	R.14-4 FDD	OP. 1 FDD	EVA5	4x2 Low	70	10.36
3MHz	R.14-5 FDD	OP. 1 FDD	EVA5	4x2 Low	70	9.5
5MHz	R.14-6 FDD	OP. 1 FDD	EVA5	4x2 Low	70	9.5
10 MHz	R.14 FDD	OP. 1 FDD	EVA5	4x2 Low	70	10.1
15MHz	R.14-7 FDD	OP. 1 FDD	EVA5	4x2 Low	70	10.1
20MHz	R.14-3 FDD	OP. 1 FDD	EVA5	4x2 Low	70	10.3

Table 8.2.1.4.3A-3: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for dual connectivity

Test num.	Band-width combination	Requirement	UE category
1	2x20 MHz	As specified in Table 8.2.1.4.3A-2 per CC	≥5
2	15+20 MHz	As specified in Table 8.2.1.4.3A-2 per CC	≥5
3	10+20MHz	As specified in Table 8.2.1.4.3A-2 per CC	≥5
4	2x15 MHz	As specified in Table 8.2.1.4.3A-2 per CC	≥5
5	2x10 MHz	As specified in Table 8.2.1.4.3A-2 per CC	≥3

Note 1: The OCNG pattern applies for each CC.

Note 2: The applicability of requirements for different dual connectivity configurations and bandwidth combination sets is defined in 8.1.2.3A.

8.2.1.5 MU-MIMO

8.2.1.6 [Control channel performance: D-BCH and PCH]

8.2.1.7 Carrier aggregation with power imbalance

For CA, the requirements in this section verify the ability of an intraband adjacent carrier aggregation UE to demodulate the signal transmitted by the PCell or SCell in the presence of a stronger SCell or PCell signal on an adjacent frequency. Throughput is measured on the PCell or SCell only.

8.2.1.7.1 Minimum Requirement

The requirements are specified in Table 8.2.1.7.1-2, with the addition of the parameters in Table 8.2.1.7.1-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.2.1.7.1-1: Test Parameters for CA

Parameter		Unit	Test 1	Test 2-3
Davinlink navyar	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)
	σ	dB	0	0
$N_{\it oc}$ at antenna poi	t	dBm/15kHz	Off (Note 2)	Off (Note 2)
Symbols for unused	d PRBs		OCNG (Note 3)	OCNG (Note 3)
Modulation			64 QAM	64 QAM
Maximum number of transmission	of HARQ		1	1
Redundancy versio sequence	n coding		{0}	{0}
PDSCH transmission of PCell	on mode		1	3
PDSCH tramsmissi of SCell	on mode		3	1
OCNG Pattern	PCell		OP.1 FDD	OP.5 FDD
OCNG Pattern	SCell		OP.5 FDD	OP.1 FDD
Propagation	Propagation PCell		Clause B.1	Clause B.1
Conditions SCell			Clause B.1	Clause B.1
Correlation Matrix	Correlation Matrix PCell		1x2	2x2
and Antenna	SCell		2x2	1x2

Note 1: $P_B = 0$.

Note 2: No external noise sources are applied

Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated.

pseudo random data, which is QPSK modulated.

Note 4: Void

Table 8.2.1.7.1-2: Minimum performance (FRC) for CA

Test Number	Bandwid	dth (MHz)	Reference channel		Power at port (dBr	antenna n/15KHz)	Referent Fraction of Through		UE Category
	PCell	SCell	PCell	SCell	\hat{E}_{s_PCell} for PCell	\hat{E}_{s_SCell} for Scell	PCell	SCell	
1	20	20	R.49 FDD	NA	-85	-79	85	NA	≥5
2	10	10	NA	R.49-1 FDD	-79	-85.8	NA	85	≥5
3	5	5	NA	R.49-2 FDD	-79	-85.9	NA	85	≥5

Note 1: The OCNG pattern for PCell is used to fill the control channel. The OCNG pattern for SCell is used to fill the control channel and PDSCH.

Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

8.2.1.8 Intra-band non-contiguous carrier aggregation with timing offset

The requirements in this section verify the ability of an intraband non-contiguous carrier aggregation UE to demodulate the signal transmitted by the PCell and SCell in the presence of timing offset between the cells. Throughput is measured on both cells.

8.2.1.8.1 Minimum Requirement

For CA the requirements are specified in Table 8.2.1.8.1-2, with the addition of the parameters in Table 8.2.1.8.1-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.2.1.8.1-1: Test Parameters for CA

Paramete	r	Unit	Test 1
Develiels never	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenn	a port	dBm/15kHz	-98
Modulatio	n		64 QAM
Maximum number	of HARQ		4
transmission	on		
Redundancy versi	on coding		{0,0,1,2}
sequence)		
PDSCH transmiss	ion mode		3
of PCell			
PDSCH tramsmiss of SCell	sion mode		3
Note 1: P - 1			

Note 1:

The OCNG pattern is used to fill unused control Note 2:

channel and PDSCH.

Table 8.2.1.8.1-2: Minimum performance (FRC) for CA

Test	Cell	Band-	Referenc	OCNG	Propagati	Correlati	Refence v	alue	Timing	UE
Numbe r		width	e Channel	Patter n	on Condition s	on Matrix and Antenna	Fraction of Maximum Throughput (%)	SNR (dB)	relative to PCell (µs)	Catego ry
1	PCell	10MH z	R.YY FDD	OP.1	EPA200	2x2 Low	70	21.15	N/A	≥3
I	SCell	10MH z	R.35-3 FDD	FDD	EPA200	2x2 Low	60	15.18	-30.26	23

The EPA200 propagation channels applied to PCell and SCell are statistically independent. Note 1:

The applicability and test rules of requirements for different CA configurations and bandwidth combination sets Note 2: are defined in 8.1.2.3.

TDD (Fixed Reference Channel) 8.2.2

The parameters specified in Table 8.2.2-1 are valid for all TDD tests unless otherwise stated.

Table 8.2.2-1: Common Test Parameters (TDD)

Parameter	Unit	Value				
Uplink downlink configuration (Note 1)		1				
Special subframe configuration (Note 2)		4				
Cyclic prefix		Normal				
Cell ID		0				
Inter-TTI Distance		1				
Number of HARQ processes per component carrier	Processes	7				
Maximum number of HARQ transmission		4				
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM and 256QAM				
Number of OFDM symbols for PDCCH per component carrier	OFDM symbols	4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths unless otherwise stated				
Cross carrier scheduling		Not configured				
Note 1: as specified in Table 4.2-2 in TS 36.211 [4]. Note 2: as specified in Table 4.2-1 in TS 36.211 [4].						

8.2.2.1 Single-antenna port performance

The single-antenna performance in a given multi-path fading environments is determined by the SNR for which a certain relative information bit throughput of the reference measurement channels in Annex A.3.4 is achieved. The purpose of these tests is to verify the single-antenna performance with different channel models and MCS. The QPSK and 64QAM cases are also used to verify the performance for all bandwidths specified in Table 5.6.1-1.

8.2.2.1.1 Minimum Requirement

For single carrier, the requirements are specified in Table 8.2.2.1.1-2, with the addition of the parameters in Table 8.2.2.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 2 DL CCs, the requirements are specified in Table 8.2.2.1.1-4, with the addition of the parameters in Table 8.2.2.1.1-3 and the downlink physical channel setup according to Annex C.3.2.

For CA with 3 DL CCs, the requirements are specified in Table 8.2.2.1.1-7, based on single carrier requirement specified in Table 8.2.2.1.1-5, with the addition of the parameters in Table 8.2.2.1.1-3 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.2.1.1-1: Test Parameters

Parameter		Unit	Test 1- 5	Test 6-8	Test 9- 15	Test 16- 18	Test 19
Downlink $ ho_{\scriptscriptstyle A}$		dB	0	0	0	0	0
power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)				
	σ	dB	0	0	0	0	0
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98	-98	-98
Symbols for un PRBs	used		OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)
Modulation	า		QPSK	16QAM	64QAM	16QAM	QPSK
ACK/NACK feedback			Multiplexing	Multiplexin	Multiplexin	Multiplexin	Multiplexing
mode				g	g	g	
PDSCH transmission mode			1	1	1	1	1

Note 1: $P_B = 0$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 3: Void Note 4: Void

Table 8.2.2.1.1-2: Minimum performance (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	Reference value	
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.2 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.2	≥1
2	10 MHz	R.2 TDD	OP.1 TDD	ETU70	1x2 Low	70	-0.6	≥1
3	10 MHz	R.2 TDD	OP.1 TDD	ETU300	1x2 Low	70	-0.2	≥1
4	10 MHz	R.2 TDD	OP.1 TDD	HST	1x2	70	-2.6	≥1
5	1.4 MHz	R.4 TDD	OP.1 TDD	EVA5	1x2 Low	70	0.0	≥1
6	10 MHz	R.3 TDD	OP.1 TDD	EVA5	1x2 Low	70	6.7	≥2
	5 MHz	R.3-1 TDD	OP.1 TDD	EVA5	1x2 Low	70	6.7	1
7	10 MHz	R.3 TDD	OP.1 TDD	ETU70	1x2 Low	30	1.4	≥2
	5 MHz	R.3-1 TDD	OP.1 TDD	ETU70	1x2 Low	30	1.4	1
8	10 MHz	R.3 TDD	OP.1 TDD	ETU300	1x2 High	70	9.3	≥2
	5 MHz	R.3-1 TDD	OP.1 TDD	ETU300	1x2 High	70	9.3	1
9	3 MHz	R.5 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.6	≥1
10	5 MHz	R.6 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.6	≥2
	5 MHz	R.6-1 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.6	1
11	10 MHz	R.7 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.6	≥2
	10 MHz	R.7-1 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.6	1
12	10 MHz	R.7 TDD	OP.1 TDD	ETU70	1x2 Low	70	19.1	≥2
	10 MHz	R.7-1 TDD	OP.1 TDD	ETU70	1x2 Low	70	19.1	1
13	10 MHz	R.7 TDD	OP.1 TDD	EVA5	1x2 High	70	19.1	≥2
	10 MHz	R.7-1 TDD	OP.1 TDD	EVA5	1x2 High	70	19.1	1
14	15 MHz	R.8 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.8	≥2
	15 MHz	R.8-1 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.8	1
15	20 MHz	R.9 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.7	≥3
	20 MHz	R.9-2 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.7	2
	20 MHz	R.9-1 TDD	OP.1 TDD	EVA5	1x2 Low	70	17.7	1
16	3 MHz	R.0 TDD	OP.1 TDD	ETU70	1x2 Low	30	2.1	≥1
17	10 MHz	R.1 TDD	OP.1 TDD	ETU70	1x2 Low	30	2.0	≥1
18	20 MHz	R.1 TDD	OP.1 TDD	ETU70	1x2 Low	30	2.1	≥1
19	10 MHz	R.41 TDD	OP.1 TDD	EVA5	1x2 Low	70	-5.3	≥1
Note 1:	Void.	•		•	•			

Table 8.2.2.1.1-3: Test Parameters for CA

	Parameter	Unit	Value
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0
power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
	σ	dB	0
Λ	N_{oc} at antenna port		-98
Symb	ools for unused PRBs		OCNG (Note 2)
	Modulation		QPSK
ACK/NACK feedback mode			PUCCH format 1b with channel selection for Tests in Table 8.2.2.1.1-4; PUCCH format 3 for Tests in Table 8.2.2.1.1-7
PDSC	CH transmission mode		1

Note 1: $P_B = \overline{0}$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one

PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated

pseudo random data, which is QPSK modulated.

Note 3: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.2.1.1-4: Minimum performance (FRC) for CA with 2DL CCs

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	Reference value	
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	2x20MHz	R.42 TDD	OP.1 TDD (Note 1)	EVA5	1x2 Low	70	-1.2	≥5
2	20MHz+ 15MHz	R.42 TDD for 20MHz CC	OP.1 TDD (Note 1)	EVA5	1x2 Low	70	-1.4	≥5
		R.42-3 TDD for 15MHz CC	OP.1 TDD (Note 1)			70	-1.4	

Note 1: The OCNG pattern applies for each CC.

Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in

Table 8.2.2.1.1-5: Single carrier performance for multiple CA configurations

				Correlation	Reference value		
Band- width	Reference channel	OCNG pattern	Propa- gation condi-tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	
1.4MHz	R.4 TDD	OP.1 TDD	EVA5	1x2 Low	70	-0.6	
3MHz	R.42-1 TDD	OP.1 TDD	EVA5	1x2 Low	70	-0.8	
5MHz	R.42-2 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.2	
10MHz	R.2 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.6	
15MHz	R.42-3 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.4	
20MHz	R.42 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.4	

Table 8.2.2.1.1-6: Void

Table 8.2.2.1.1-7: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs

Test num.	CA Band-width combination	Requirement	UE category
-----------	---------------------------	-------------	-------------

1	1 3x20MHz		As specified in Table 8.2.2.1.1-5 per CC	≥5
2	2 20MHz+20MHz+15MHz		As specified in Table 8.2.2.1.1-5 per CC	≥5
Note 1:	The 8.1.	• • • • • • • • • • • • • • • • • • • •	nt CA configurations and bandwidth combination s	ets is defined in

8.2.2.1.2 Void

8.2.2.1.3 Void

8.2.2.1.4 Minimum Requirement 1 PRB allocation in presence of MBSFN

The requirements are specified in Table 8.2.2.1.4-2, with the addition of the parameters in Table 8.2.2.1.1.4-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the single-antenna performance with a single PRB allocated at the lower band edge in presence of MBSFN.

Table 8.2.2.1.4-1: Test Parameters for Testing 1 PRB allocation

Parameter		Unit	Test 1
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
Symbols for MBSFN MBSFN subframes			OCNG (Note 3)
ACK/NACK feedba	ck mode		Multiplexing
PDSCH transmission	on mode		1
Note 1: $P_B = 0$			-

Note 1: $P_B = 0$

Note 2: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the

first slot.

Note 3: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are

not inserted in the MBSFN portion of the MBSFN

subframes, QPSK modulated MBSFN data is used instead.

Table 8.2.2.1.4-2: Minimum performance 1PRB (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	value	UE
number		Channel	Pattern	Condition	Matrix and	Fraction of	SNR	Category
					Antenna	Maximum	(dB)	
					Configuration	Throughput		
						(%)		
1	10 MHz	R.29 TDD	OP.3 TDD	ETU70	1x2 Low	30	2.0	≥1

8.2.2.2 Transmit diversity performance

8.2.2.2.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.2.2.2.1-2, with the addition of the parameters in Table 8.2.2.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.2.2.2.1-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter	•	Unit	Test 1-2		
	$ ho_{\scriptscriptstyle A}$	dB	-3		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)		
	σ	dB	0		
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98		
ACK/NACK feedba	ck mode		Multiplexing		
PDSCH transmission	on mode		2		
Note 1: $P_B = 1$					

Table 8.2.2.2.1-2: Minimum performance Transmit Diversity (FRC)

Test	Bandw	Reference	OCNG	Propagation	Correlation	Reference	Reference value	
number	idth	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.11 TDD	OP.1 TDD	EVA5	2x2 Medium	70	6.8	≥2
	5 MHz	R.11-2 TDD	OP.1 TDD	EVA5	2x2 Medium	70	6.8	1
2	10 MHz	R.10 TDD	OP.1 TDD	HST	2x2	70	-2.3	≥1

8.2.2.2.2 Minimum Requirement 4 Tx Antenna Port

The requirements are specified in Table 8.2.2.2.2-2, with the addition of the parameters in Table 8.2.2.2.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC-FSTD) with 4 transmitter antennas.

Table 8.2.2.2.1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1-2
	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
N_{oc} at antenna	port	dBm/15kHz	-98
ACK/NACK feedba	ck mode		Multiplexing
PDSCH transmission	on mode		2
Note 1: $P_B = 1$			

Table 8.2.2.2.2: Minimum performance Transmit Diversity (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference value		UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	1.4 MHz	R.12 TDD	OP.1 TDD	EPA5	4x2 Medium	70	0.2	≥1
2	10 MHz	R.13 TDD	OP.1 TDD	ETU70	4x2 Low	70	-0.5	≥1

8.2.2.2.3 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS)

The requirements are specified in Table 8.2.2.2.3-2, with the addition of parameters in Table 8.2.2.2.3-1 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell. In Table 8.2.2.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Table 8.2.2.2.3-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Cell 1	Cell 2
Uplink downlink conf	iguration		1	1
Special subframe con	figuration		4	4
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	N/A
	N_{oc1}	dBm/15kHz	-102 (Note 2)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A
, in the second	N_{oc3}	dBm/15kHz	-94.8 (Note 4)	N/A
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.2.2.3-2	6
BW _{Channel}		MHz	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN
Time Offset between	n Cells	μs	2.5 (synch	ronous cells)
Cell Id			0	1
ABS pattern (No	te 5)		N/A	0000010001 0000000001
RLM/RRM Measuremer Pattern (Note			0000000001 0000000001	N/A
CSI Subframe Sets	C _{CSI,0}		0000010001 0000000001	N/A
(Note 7)	C _{CSI,1}		1100101000 1100111000	N/A
Number of control OFDM symbols			2	2
ACK/NACK feedbac	k mode		Multiplexing	N/A
PDSCH transmission	n mode		2	N/A
Cyclic prefix			Normal	Normal

- Note 1: $P_B = 1$.
- Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 5: ABS pattern as defined in [9].
- Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].
- Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 9: SIB-1 will not be transmitted in Cell2 in this test.

Table 8.2.2.2.3-2: Minimum Performance Transmit Diversity (FRC)

Test Number	Reference Channel	OCNG	Pattern	Cond	gation itions te 1)	Correlation Matrix and Antenna	Reference	Reference Value	
		Cell 1	Cell 2	Cell 1	Cell 2	Configuration	Fraction of Maximum Throughput (%) Note 5	SNR (dB) (Note 2)	
1	R.11-4 TDD Note 4	OP.1 TDD	OP.1 TDD	EVA5	EVA5	2x2 Medium	70	3.8	≥2

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

8.2.2.2.3A Minimum Requirement 2 Tx Antenna Ports (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

The requirements are specified in Table 8.2.2.2.3A-2, with the addition of parameters in Table 8.2.2.2.3A-1. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell with CRS assistance information. In Table 8.2.2.2.3A-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.2.2.2.3A-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Cell 1	Cell 2	Cell 3	
Uplink downlink confi	guration		1	1	1	
Special subframe con	figuration		4	4	4	
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)	
	σ	dB	0	N/A	N/A	
	N_{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A	
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A	
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A	
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.2.2.3A-2	12	10	
BW _{Channel}		MHz	10	10	10	
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN	
Time Offset betwee	n Cells	μs	N/A	3	-1	
Frequency shift between	en Cells	Hz	N/A	300	-100	
Cell Id			0	126	1	
ABS pattern (Not	e 5)		N/A	0000000001 0000000001	0000000001 0000000001	
RLM/RRM Measur Subframe Pattern (I			0000000001 0000000001	N/A	N/A	
CSI Subframe Sets	C _{CSI,0}		000000001 000000001	N/A	N/A	
(Note7) C _{CSI,1}			1100111000 1100111000	N/A	N/A	
Number of control OFDM symbols			2	Note 8	Note 8	
ACK/NACK feedbac	k mode		Multiplexing	N/A	N/A	
PDSCH transmissio	n mode		2	Note 9	Note 9	
Cyclic prefix			Normal	Normal	Normal	

- Note 1: $P_{p} = 1$.
- Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 5: ABS pattern as defined in [9].
- Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
- Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
- Note 10: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
- Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Table 8.2.2.2.3A-2: Minimum Performance Transmit Diversity (FRC)

Test Number	Reference Channel	OC	NG Patt	ern		15		Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configuration (Note 2)	Fraction of Maximum Throughput (%) Note 5	SNR (dB) (Note 3)	gory
1	R.11-4 TDD Note 4	OP.1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	EVA5	2x2 Medium	70	3.5	≥2
	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3										

- SNR corresponds to \hat{E}_s/N_{oc2} of cell 1. Note 3:
- Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are Note 4: transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

8.2.2.2.4 Enhanced Performance Requirement Type A – 2 Tx Antenna Ports with TM3 interference model

The requirements are specified in Table 8.2.2.2.4-2, with the addition of parameters in Table 8.2.2.2.4-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 3 interference model defined in clause B.5.2. In Table 8.2.2.2.4-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.2.2.4-1: Test Parameters for Transmit diversity Performance (FRC) with TM3 interference model

Parameter		Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3	-3
	σ	dB	0	0	0
Cell-specific reference	signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna po	dBm/15kHz	-98	N/A	N/A	
DIP (Note 2)		dB	N/A	-1.73	-8.66
BW _{Channel}	BW _{Channel}			10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	2
Number of control OFDM	symbols		2	2	2
PDSCH transmission	mode		2	N/A	N/A
Interference mode	el		N/A	As specified in clause B.5.2	As specified in clause B.5.2
Probability of occurrence of	Rank 1	%	N/A	80	80
transmission rank in interfering cells	Rank 2	%	N/A	20	20
Reporting interva	ms	5	N/A	N/A	
Reporting mode		PUCCH 1-0	N/A	N/A	
ACK/NACK feedback	ACK/NACK feedback mode			N/A	N/A
Physical channel for CQI		PUSCH(Note 5)	N/A	N/A	
cqi-pmi-Configuration	Index		4	N/A	N/A

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to N_{oc} is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: All cells are time-synchronous.

Note 5: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Table 8.2.2.2.4-2: Enhanced Performance Requirement Type A, Transmit Diversity (FRC) with TM3 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		opagat onditio		Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	gory
1	R.46 TDD	OP. 1 TD D	N/A	N/A	EV A70	EV A70	EV A70	2x2 Low	70	-1.4	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.2.2.2.5 Minimum Requirement 2 Tx Antenna Port (when *EIMTA-MainConfigServCell-r12* is configured)

The requirements are specified in Table 8.2.2.2.5-2 with the addition of the parameters in Table 8.2.2.2.5-1 and the downlink physical channel setup according to Annex C.3.2. The test purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas in case of using eIMTA TDD UL-DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI on a PCell.

Table 8.2.2.2.5-1: Test Parameters for Transmit diversity Performance (FRC) when EIMTA-MainConfigServCell-r12 is configured

Parameter		Unit	Value
	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna port		dBm/15kHz	-98
Uplink downlink configuration in S	IB1 (Note 2)		0
Downlink HARQ reference config HarqReferenceConfig-r12) (Note			5
Set of dynamic TDD UL-DL confiç 2,3)	gurations (NOTES		{0, 1, 2, 3, 4, 5, 6}
Periodicity of monitoring the L1 re (eimta-CommandPeriodicity-r12)	configuration DCI	ms	10
Set of subframes to monitor the L (eimta-CommandSubframeSet-r1			{0,1,5,6}
Number of DL HARQ processes		Processes	15
PDSCH transmission mode			2
ACK/NACK feedback mode (Note	: 5)		Multiplexing

Note 1: $P_{p} = 1$

Note 2: As specified in Table 4.2-2 in TS 36.211.

Note 3: UL/DL configuration in PDCCH with eIMTA-RNTI is randomly selected from the given set on a per-DCI basis with equal probability.

Note 4: The set of subframes to monitor PDCCH with eIMTA-RNTI for frame n includes subframes {1,5,6} in frame n-1 and subframe 0 in frame n. Subframes for reconfiguration DCI transmission are chosen in a random way on a per-DCI basis with equal probability.

Note 5: PUCCH Format 3 is used for DL HARQ feedback.

Table 8.2.2.2.5-2: Minimum performance Transmit diversity when EIMTA-MainConfigServCell-r12 is configured

Test Reference OCNG channel Pattern		Correlation	Reference v				
Test			Propagation Conditions	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
1	R.67 TDD	OP.1 TDD	EVA5	2x2 Medium	70	5.0	≥1

8.2.2.2.6 Enhanced Performance Requirement Type B - 2 Tx Antenna Ports with TM2 interference model

The requirements are specified in Table 8.2.2.2.6-2, with the addition of parameters in Table 8.2.2.2.6-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 2 interference model defined in clause B.6.1. In Table 8.2.2.2.6-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.2.2.6-1: Test Parameters for Transmit Diversity Performance (FRC) with TM2 interference model

Paran	neter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink Config	guration			1	1	1
Special subframe conf	figuratio	n		4	4	4
		$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power alloca	ation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3	-3
		σ	dB	0	0	0
Cell-specific reference	e signals	;		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port			dBm/15kHz		-98	
\hat{E}_s/N_{oc}			dB	N/A	13.91	3.34
BW _{Channel}			MHz	10	10	10
Cyclic Prefix				Normal	Normal	Normal
Cell Id				0	6	1
Number of control OF normal subframes	DM sym	bols in		3	3	3
CFI indicated in PCFIC subframes	CH in no	ormal		3	3	3
Number of control OF special subframes				2	2	2
CFI indicated in PCFI subframes	CH in sp	ecial		2	2	2
PDSCH transmission	mode			2	2	2
Interference model				N/A	As specified in clause B.6.1	As specified in clause B.6.1
MBSFN				Not configured	Not configured	Not configured
Time offset to cell 1			us	N/A	2	3
Frequency offset to ce	ell 1		Hz	N/A	200	300
	o-aList-r	12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
,	transmis -r12	sionModeList		N/A	{2,3,4,8,9}	{2,3,4,8,9}
Note 1: $P_B = 1$ Note 2: Cell 1 is the	e servino	rcell Cell 2 3	are the interferir	na cells		

NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.2.2.2.6-2: Minimum Performance for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM2 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		opagat onditio		Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.11-12 TDD	OP. 1 TD D	N/A	N/A	EP A5	EP A5	EP A5	2x2 Low	85	15.3	≥1

The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 1:

SNR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1. Note 2:

Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3. Note 3:

8.2.2.2.7 Enhanced Performance Requirement Type B - 2 Tx Antenna Ports with TM9 interference model

The requirements are specified in Table 8.2.2.2.7-2, with the addition of parameters in Table 8.2.2.2.7-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4. In Table 8.2.2.2.7-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.2.2.7-1: Test Parameters for Transmit Diversity Performance (FRC) with TM9 interference model

		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink Configuration			1	1	1
Special subframe configuration	on		4	4	4
	$ ho_{\scriptscriptstyle A}$	dB	-3	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	0	0
	σ	dB	0	-3	-3
Cell-specific reference signal	S		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port		dBm/15kHz		-98	
\hat{E}_s/N_{oc}		dB	N/A	3.28	0.74
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	6
Number of control OFDM syn normal subframes	nbols in		3	3	3
CFI indicated in PCFICH in n	ormal		3	Random from	Random from
subframes				set {1,2,3}	set {1,2,3}
Number of control OFDM syn special subframes	nbols in		2	2	2
CFI indicated in PCFICH in s	pecial		2	Random from	Random from
subframes				set {1,2}	set {1,2}
PDSCH transmission mode			2	9	9
Interference model			N/A	As specified in clause B.6.4	As specified in clause B.6.4
CSI reference signals			N/A	Antenna ports 15,16	Antenna ports 15,16
CSI-RS periodicity and subfra $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	ame offset	Subframes	N/A	10 / 4	10 / 4
CSI reference signal configur	ation		N/A	6	7
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap		Subframes / bitmap	N/A	9 / 010000000000 0000	9 / 001000000000 0000
Time offset to cell 1		us	N/A	5	-5
Frequency offset to cell 1		Hz	N/A	600	-600
MBSFN			Not configured	Not configured	Not configured
NeighCellsInfo- p-aList-	r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
(Note 4) transmis		N/A	{2,3,4,8,9}	{2,3,4,8,9}	

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: CSI-RS configurations are according to [4] subclause 6.10.5.2.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.2.2.2.7-2: Minimum Performance for Enhanced Performance Requirement Type B, Transmit Diversity (FRC) with TM9 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		opagat onditio		Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.11-11 TDD	OP. 1 TD D	N/A	N/A	EP A5	EP A5	EP A5	2x2 Low	85	8.1	≥1
Note 1:	The propagation		litions f		1, Cell	2 and C	Cell 3 ar	e statistically inc	dependent.		

Note 2: SNR corresponds to E_s/N_{ac} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.2.2.3 Open-loop spatial multiplexing performance

8.2.2.3.1 Minimum Requirement 2 Tx Antenna Port

For single carrier, the requirements are specified in Table 8.2.2.3.1-2, with the addition of the parameters in Table 8.2.2.3.1-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 2 DL CCs, the requirements are specified in Table 8.2.2.3.1-4, with the addition of the parameters in Table 8.2.2.3.1-3 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

For CA with 3 DL CCs, the requirements are specified in Table 8.2.2.3.1-7, based on single carrier requirement specified in Table 8.2.2.3.1-5, with the addition of the parameters in Table 8.2.2.3.1-3 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.2.3.1-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1-3
Develiels never	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
ACK/NACK feedba	ck mode		Bundling
PDSCH transmission	on mode		3

Note 1: $P_B = 1$ Note 2: Void.

Note 3: Void.

Table 8.2.2.3.1-2: Minimum performance Large Delay CDD (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	value	UE
num ber		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Cate gory
1	10 MHz	R.11-1 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.1	≥2
2	10 MHz	R.35 TDD	OP.1 TDD	EVA200	2x2 Low	70	20.3	≥2
3	10 MHz	R.35-2 TDD	OP.1 TDD	ETU600	2x2 Low	70	[21.1]	≥2
Note 1	Void.							

Table 8.2.2.3.1-3: Test Parameters for Large Delay CDD (FRC) for CA

i	Unit	Value
$ ho_{\scriptscriptstyle A}$	dB	-3
$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
σ	dB	0
N_{oc} at antenna port		-98
ACK/NACK feedback mode		PUCCH format 1b with channel selection for Tests in Table 8.2.2.3.1-4; PUCCH format 3 for Tests in Table 8.2.2.3.1-7
on mode		3
	ρ_B σ port	$ ho_A$ dB $ ho_B$ dB $ ho$ dB $ ho$ dB $ ho$ dB $ ho$ port dBm/15kHz

Note 1: $P_B = 1$ Note 2: Void

Note 3: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.2.3.1-4: Minimum performance Large Delay CDD (FRC) for CA with 2DL CCs

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	/alue	UE
num ber		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Categ ory
1	2x20 MHz	R.30-1 TDD	OP.1 TDD (Note 1)	EVA70	2x2 Low	70	13.7	≥5
2	20MHz+15M Hz	R.30-1 TDD for 20MHz CC	OP.1 TDD (Note 1)	EVA70	2x2 Low	70	13.0	≥5
		R.11-9 TDD for 15MHz CC	OP.1 TDD (Note 1)	EVA70		70	12.9	

Note 1: The OCNG pattern applies for each CC.

Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Table 8.2.2.3.1-5: Single carrier performance for multiple CA configurations

			Propa-	Correlation	Reference v	alue 💮
Band- width	Reference channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)

1.4MHz	R.11-5 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.2
3MHz	R.11-6 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.8
5MHz	R.11-7 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.6
10 MHz	R.11-8 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.8
15MHz	R.11-9 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.9
20MHz	R.30-1 TDD	OP. 1 TDD	EVA70	2x2 Low	70	13.0

Table 8.2.2.3.1-6: Void

Table 8.2.2.3.1-7: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs

Test num.		CA Band-width combination	Requirement	UE category			
1		3x20MHz	As specified in Table 8.2.2.3.1-5 per CC	≥5			
2		20MHz+20MHz+15MHz	As specified in Table 8.2.2.3.1-5 per CC	≥5			
Note 1:							

8.2.2.3.1A Soft buffer management test

For CA, the requirements are specified in Table 8.2.2.3.1A-2, with the addition of the parameters in Table 8.2.2.3.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify UE performance with proper instantaneous buffer implementation.

Table 8.2.2.3.1A-1: Test Parameters for soft buffer management test (FRC) for CA

Parameter	Parameter		Test 1-2
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{_{oc}}$ at antenna	port	dBm/15kHz	-98
ACK/NACK feedback mode			- (Note 2)
PDSCH transmission	on mode		3

Note 1: $P_{R} = 1$

Note 2: PUCCH format 1b with channel selection is used to feedback ACK/NACK.

Note 3: For CA test cases, the same PDSCH transmission mode is applied to each

component carrier.

Table 8.2.2.3.1A-2: Minimum performance soft buffer management test (FRC) for CA

Test num ber	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference v Fraction of Maximum Throughput (%)	value SNR (dB)	UE Cate gory
1	2x20 MHz	R.30-2 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.2	3
			(Note 1)					
2	2x20 MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA5	2x2 Low	70	15.7	4

Note 1: For CA test cases, the OCNG pattern applies for each CC.

Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

8.2.2.3.1B Enhanced Performance Requirement Type C - 2Tx Antenna Ports

The requirements are specified in Table 8.2.2.3.1B-2, with the addition of the parameters in Table 8.2.2.3.1B-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

Table 8.2.2.3.1B-1: Test Parameters for Large Delay CDD (FRC)

Parameter	•	Unit	Test 1
Daniel I. a. a	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
N_{oc} at antenna	port	dBm/15kHz	-98
ACK/NACK feedba	ck mode		Bundling
PDSCH transmissi	on mode		3
Note 1: $P_B = 1$			

Table 8.2.2.3.1B-2: Enhanced Performance Requirement Type C for Large Delay CDD (FRC)

Test num ber	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference v Fraction of Maximum Throughput (%)	value SNR (dB)	UE Cate gory
1	10 MHz	R.11-1 TDD	OP.1 TDD	EVA70	2x2 Medium	70	17.4	≥2

8.2.2.3.1C Enhanced Performance Requirement Type C - 2 Tx Antenna Ports with TM1 interference

The requirements are specified in Table 8.2.2.3.1C-2, with the addition of parameters in Table 8.2.2.3.1C-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of open-loop spatial multiplexing performence with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell with transmission mode 1. In Table 8.2.2.3.1C-1, Cell 1 is the serving cell, and Cell 2 is interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2 respectively.

Table 8.2.2.3.1C-1 Test parameters for Larger Delay CDD (FRC) with TM1 interference

Paramet	ter	Unit	Cell 1	Cell 2			
Bandwid	lth	MHz	10 M	Hz			
Downlink	$ ho_{\scriptscriptstyle A}$		-3	0			
power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	0			
anooanon	σ		0	0			
Cell-spec reference si			Antenna ports 0,1	Antenna port 0			
Cyclic Pr	efix		Normal	Normal			
Cell ID)		0	1			
Transmission	n mode		3	Note 2			
$N_{\!oc}$ at anten	na port	dBm/15kHz	-98	N/A			
\widehat{E}_s/N_{oc} (No	ote 3)	dB	Reference Value in Table 8.2.2.3.1C-2	12.95			
Correlation antenn configura	а		Medium (2x2)	Medium(1x2)			
Number of 0 symbols for F			2	N/A			
Max numb HARQ transm			4	N/A			
Redundancy version coding sequence			{0,1,2,3}	N/A			
Note 1: $P_{\rm B}=1$ Note 2: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.2 applying OCNG pattern OP.5 TDD as defined in Annex A.5.2.5.							

Table 8.2.2.3.1C-2 Enhanced Performance Requirement Type C, Larger Delay CDD (FRC) with TM1 interference

Cell 1 is the serving cell. Cell 2 is the interfering cell. All cells are time-synchronous. SIB-1 will not be transmitted in Cell2 in this test.

Test Number	Reference Channel	OCNG Pattern		Propagation Conditions (Note 1)		Reference Value		UE Category
		Cell 1	Cell 2	Cell 1	Cell 2	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	
1	R.11-10 TDD	OP.1 TDD	OP.5 TDD	EVA70	EVA70	70	19.6	≥2
Note 1:	te 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.							
Note 2:	SNR correspond	ponds to \hat{E}_s/N_{oc} of Cell 1.						

8.2.2.3.2 Minimum Requirement 4 Tx Antenna Port

Note 3:

Note 4: Note 5:

The requirements are specified in Table 8.2.2.3.2-2, with the addition of the parameters in Table 8.2.2.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 4 transmitter antennas.

Table 8.2.2.3.2-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
$N_{_{oc}}$ at antenna	port	dBm/15kHz	-98
ACK/NACK feedba			Bundling
PDSCH transmission	on mode		3
Note 1: $P_B = 1$.	·		

Table 8.2.2.3.2-2: Minimum performance Large Delay CDD (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference value		UE
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.14 TDD	OP.1 TDD	EVA70	4x2 Low	70	14.2	≥2

8.2.2.3.3 Minimum Requirement 2Tx antenna port (demodulation subframe overlaps with aggressor cell ABS)

The requirements for non-MBSFN ABS are specified in Table 8.2.2.3.3-2, with the addition of parameters in Table 8.2.2.3.3-1 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

The requirements for MBSFN ABS are specified in Table 8.2.2.3.3-4, with the addition of parameters in Table 8.2.2.3.3-3 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

The purpose is to verify the performance of large delay CDD with 2 transmitter antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell. In Tables 8.2.2.3.3-1 and 8.2.2.3.3-3, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Table 8.2.2.3.3-1: Test Parameters for Large Delay CDD (FRC) - Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2
Uplink downlink config			1	1
Special subframe conf	iguration		4	4
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	N/A
	N_{oc1}	dBm/15kHz	-102 (Note 2)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A
	N_{oc3}	dBm/15kHz	-94.8 (Note 4)	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.2.3.3-2	6
$BW_Channel$		MHz	10	10
Subframe Configur	ation		Non-MBSFN	Non-MBSFN
Cell Id			0	1
Time Offset between	n Cells	μs	2.5 (synchro	nous cells)
ABS pattern (Not	e 5)		N/A	0000010001, 0000000001
RLM/RRM Measurement Pattern (Note 6			000000001, 000000001	N/A
CSI Subframe Sets	C _{CSI,0}		0000010001, 000000001	N/A
(Note 7)	C _{CSI,1}		1100101000 1100111000	N/A
Number of control OFDM symbols			2	2
ACK/NACK feedback	k mode		Multiplexing	N/A
PDSCH transmission	n mode		3	N/A
Cyclic prefix			Normal	Normal

- Note 1: $P_B = 1$
- Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 5: ABS pattern as defined in [9].
- Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].
- Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 9: SIB-1 will not be transmitted in Cell2 in this test.

Table 8.2.2.3.3-2: Minimum Performance Large Delay CDD (FRC) - Non-MBSFN ABS

Test Number	Reference Channel	OCNG	Pattern	Cond	gation itions te 1)	Correlation Matrix and Antenna	Reference \	/alue	UE Category
		Cell 1	Cell 2	Cell 1	Cell 2	Configuration	Fraction of Maximum Throughput (%) Note 5	Maximum (dB) Throughput (Note	
1	R.11 TDD Note 4	OP.1 TDD	OP.1 TDD	EVA 5	EVA 5	2x2 Low	70	14.0	≥2

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

SNR corresponds to \widehat{E}_s/N_{oc2} of cell 1. Note 2:

Note 3:

The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated Note 4: PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms. Note 5:

Table 8.2.2.3.3-3: Test Parameters for Large Delay CDD (FRC) - MBSFN ABS

Parameter		Unit	Cell 1	Cell 2
Uplink downlink confi	guration		1	1
Special subframe conf	iguration		4	4
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	N/A
	N_{oc1}	dBm/15kHz	-102 (Note 2)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A
	N_{oc3}	dBm/15kHz	-94.8 (Note 4)	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.2.3.3-4	6
$BW_Channel$		MHz	10	10
Subframe Configu	ration		Non-MBSFN	MBSFN
Cell Id			0	126
Time Offset between	n Cells	μs	2.5 (synchror	nous cells)
ABS pattern (Not	e 5)		N/A	000000001 000000001
RLM/RRM Measuremen Pattern (Note 6			000000001 000000001	N/A
CSI Subframe Sets	C _{CSI,0}		000000001 000000001	N/A
(Note 7)	C _{CSI,1}		1100111000 1100111000	N/A
MBSFN Subframe Allocation (Note 10)			N/A	000010
Number of control OFD	M symbols		2	2
ACK/NACK feedbac			Multiplexing	N/A
PDSCH transmission	n mode		3	N/A
Cyclic prefix			Normal	Normal

- Note 1: $P_B = 1$.
- Note 2: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10,#11, #12, #13 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbol #0 of a subframe overlapping with the aggressor ABS
- Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 5: ABS pattern as defined in [9]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes.
- Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 9: SIB-1 will not be transmitted in Cell2 in this test.
- Note 10: MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation.

Table 8.2.2.3.3-4: Minimum Performance Large Delay CDD (FRC) - MBSFN ABS

Test Number	Reference Channel	OCNG	Pattern	Cond	gation itions te 1)	Correlation Matrix and Antenna	Reference \	/alue	UE Category
		Cell 1	Cell 2	Cell 1	Cell 2	Configuration	Fraction of Maximum (dB) Throughput (Note (%) Note 5 2)		
1	R.11 TDD Note 4	OP.1 TDD	OP.1 TDD	EVA 5	EVA 5	2x2 Low	70	12.2	≥2

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

8.2.2.3.4 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

The requirements for non-MBSFN ABS are specified in Table 8.2.2.3.4-2, with the addition of parameters in Table 8.2.2.3.4-1. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell with CRS assistance information. In Table 8.2.2.3.4-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.2.2.3.4-1: Test Parameters for Large Delay CDD (FRC) - Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink confi	guration		1	1	1
Special subframe con	figuration		4	4	4
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	N/A	N/A
	N_{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.2.3.4-2	Reference Value in Table 8.2.2.3.4-2	Reference Value in Table 8.2.2.3.4-2
BW _{Channel}		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift between	een Cells	Hz	N/A	300	-100
Cell Id			0	1	126
ABS pattern (No	te 5)		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Measur Subframe Pattern (I			0000000001 0000000001	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		0000000001 0000000001	N/A	N/A
(Note7)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
Number of control symbols	OFDM		2	Note 8	Note 8
ACK/NACK feedbac	k mode		Multiplexing	N/A	N/A
PDSCH transmissio			3	Note 9	Note 9
Cyclic prefix			Normal	Normal	Normal

- Note 1: $P_{R} = 1$.
- Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 5: ABS pattern as defined in [9].
- Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
- Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
- Note 10: The number of the CRS ports in Cell1, Cell2 and Cell 3 is the same.
- Note 11: SIB-1 will not be transmitted in Cell2 and Cell 3 in this test.

Table 8.2.2.3.4-2: Minimum Performance Large Delay CDD (FRC) - Non-MBSFN ABS

	Refer ence	$\mathbf{L}_{s}/\mathbf{W}_{oc2}$		OCNG Pattern			Propagation Conditions (Note1)			Correlation Matrix and	Reference	• Value	UE Cate	
	Chan nel	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughp ut (%) Note 5	SNR (dB) (Note 3)	gory	
1	R.11 TDD Note 4	9	7	OP.1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	EVA5	2x2 Low	70	14.2	≥2	
2	R.35 TDD Note 4	9	1	OP.1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	EVA5	2x2 Low	70	22.7	≥2	

- Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
- Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
- Note 3: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.
- Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

8.2.2.4 Closed-loop spatial multiplexing performance

8.2.2.4.1 Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.2.4.1-2, with the addition of the parameters in Table 8.2.2.4.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.2.4.1-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1	Test 2
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	0
N_{oc} at antenna port	t	dBm/15kHz	-98	-98
Precoding granularit	у	PRB	6	50
PMI delay (Note 2)		ms	10 or 11	10 or 11
Reporting interval		ms	1 or 4 (Note 3)	1 or 4 (Note 3)
Reporting mode			PUSCH 1-2	PUSCH 3-1
CodeBookSubsetRestric	ction		001111	001111
bitmap				
ACK/NACK feedback m	ode		Multiplexing	Multiplexing
PDSCH transmission m	ode		4	4

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

Table 8.2.2.4.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	value	UE
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput	SNR (dB)	Category
						(%)		
1	10 MHz	R.10 TDD	OP.1 TDD	EVA5	2x2 Low	70	-3.1	≥1
2	10 MHz	R.10 TDD	OP.1 TDD	EPA5	2x2 High	70	-2.8	≥1

8.2.2.4.1A Minimum Requirement Single-Layer Spatial Multiplexing 4 Tx Antenna Port

The requirements are specified in Table 8.2.2.4.1A-2, with the addition of the parameters in Table 8.2.2.4.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband and frequency selective precoding.

Table 8.2.2.4.1A-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
Precoding granul	arity	PRB	6
PMI delay (Note	2)	ms	10 or 11
Reporting interv	/al	ms	1 or 4 (Note 3)
Reporting mod	le		PUSCH 1-2
CodeBookSubsetR	estricti		00000000000000000
on bitmap			00000000000000000
			0000000000000111
			1111111111111
ACK/NACK feed	oack		Multiplexing
mode			
PDSCH transmis	sion		4
mode			
Note 1: $P_B = 1$.			
Note 2: If the UE	reports	in an available up	link reporting instance

Table 8.2.2.4.1A-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

applied at the eNB downlink before SF#(n+4).

will alternate between 1ms and 4ms.

Note 3:

at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be

For Uplink - downlink configuration 1 the reporting interval

Test	Bandwidth	Reference	OCNG Propagation Correlation Referen		Reference	/alue	UE	
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.13 TDD	OP.1 TDD	EVA5	4x2 Low	70	-3.5	≥1

8.2.2.4.1B Enhanced Performance Requirement Type A – Single-Layer Spatial Multiplexing 2 Tx Antenna Port with TM4 interference model

The requirements are specified in Table 8.2.2.4.1B-2, with the addition of the parameters in Table 8.2.2.4.1B-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-

one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 4 interference model defined in clause B.5.3. In Table 8.2.2.4.1B-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.2.4.1B-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model

Parameter		Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3	-3
	σ	dB	0	0	0
Cell-specific reference	signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna po	ort	dBm/15kHz	-98	N/A	N/A
DIP (Note 2)		dB	N/A	-1.73	-8.66
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	2
Number of control OFDM	symbols		2	2	2
PDSCH transmission			6	N/A	N/A
Interference mode	el		N/A	As specified in clause B.5.3	As specified in clause B.5.3
Probability of occurrence of	Rank 1	%	N/A	80	80
transmission rank in interfering cells	Rank 2	%	N/A	20	20
Precoding granular	rity	PRB	50	6	6
PMI delay (Note 4		ms	10 or 11	N/A	N/A
Reporting interva	ıĺ	ms	5	N/A	N/A
Reporting mode			PUCCH 1-1	N/A	N/A
CodeBookSubsetRestricti	on bitmap		001111	N/A	N/A
ACK/NACK feedback			Multiplexing	N/A	N/A
Physical channel for CQI	reporting		PUSCH(Note 6)	N/A	N/A
cqi-pmi-Configuration	Index		4	N/A	N/A

- Note 1: $P_{B} = 1$
- Note 2: The respective received power spectral density of each interfering cell relative to N_{oc} is defined by its associated DIP value as specified in clause B.5.1.
- Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.
- Note 4: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
- Note 5: All cells are time-synchronous.
- Note 6: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Table 8.2.2.4.1B-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		pagat onditio		Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of SINR Maximum (dB) Throughput (Note (%) 2)		gory
1	R.47 TDD	OP. 1 TD D	N/A	N/A	EV A5	EV A5	EV A5	2x2 Low	70	1.1	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{ac} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.2.2.4.1C Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Ports (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

The requirements are specified in Table 8.2.2.4.1C-2, with the addition of parameters in Table 8.2.2.4.1C-1. The purpose is to verify the closed loop rank-one performance with wideband precoding if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell with CRS assistance information. In Table 8.2.2.4.1C-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.2.2.4.1C-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) - Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink confi	guration		1	1	1
Special subframe con	figuration		4	4	4
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	N/A	N/A
	N_{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.2.4.1C-2	12	10
BW _{Channel}		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset between Cells		μs	N/A	3	-1
Frequency shift between	een Cells	Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (No	te 5)		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Measur Subframe Pattern (I			000000001 000000001	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		000000001 000000001	N/A	N/A
(Note7)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
Number of control symbols	OFDM		2	Note 8	Note 8
ACK/NACK feeback	c mode		Multiplexing	N/A	N/A
PDSCH transmission mode			6	Note 9	Note 9
Precoding granul		PRB	50	N/A	N/A
PMI delay (Note		ms	10 or 11	N/A	N/A
Reporting interval		ms	1 or 4 (Note 11)	N/A	N/A
Peporting mod			PUSCH 3-1	N/A	N/A
CodeBookSubsetRestriction bitmap			1111	N/A	N/A
Cyclic prefix	•		Normal	Normal	Normal

- Note 1: $P_{p} = 1$.
- Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 5: ABS pattern as defined in [9].
- Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
- Note 9: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
- Note 10: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
- Note 11: For Uplink downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
- Note 12: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
- Note 13: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Table 8.2.2.4.1C-2: Minimum Performance Single-Layer Spatial Multiplexing (FRC)- Non-MBSFN ABS

Test Numbe	Reference r Channel	oc	OCNG Pattern			Propagation Conditions (Note1)		Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configuration (Note 2)	Fraction of Maximum Throughput (%) Note 5	SNR (dB) (Note 3)	gory
1	R.11 TDD Note 4	OP.1 TDD	OP.1 FDD	OP.1 TDD	EPA5	EPA5	EPA5	2x2 High	70	6.4	≥2

- Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
- Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.
- Note 3: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.
- Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 5: The maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.

8.2.2.4.1D Enhanced Performance Requirement Type B - Single-layer Spatial Multiplexing 2 Tx Antenna Port with TM4 interference model

The requirements are specified in Table 8.2.2.4.1D-2, with the addition of the parameters in Table 8.2.2.4.1D-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 4 interference model defined in clause B.6.3. In Table 8.2.2.4.1D-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.2.2.4.1D-1: Test Parameters for Single-layer Spatial Multiplexing (FRC) with TM4 interference model

Parameter		Unit	Cell 1	Cell 2		Cell 3		
Uplink downlink Cor	nfiguration		1	1			1	
Special subframe co	onfiguration		4		4		4	
	$ ho_{\scriptscriptstyle A}$	dB	-3	-	3	-3		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-	3	-	3	
	σ	dB	0	(0		0	
Cell-specific referen	nce signals		Antenna ports 0,1	Antenna	ports 0,1	Antenna	ports 0,1	
N_{oc} at antenna port	İ.	dBm/15 kHz			-98			
Test number (Note	4)			Test 1	Test 2	Test 1	Test 2	
\hat{E}_s/N_{oc}		dB	N/A	13.91	3.28	3.34	0.74	
Cell Id				6	1	1	6	
CFI indicated in PCFICH in normal subframes				3	Random from set {1,2,3}	3	Random from set {1,2,3}	
CFI indicated in PC subframes	FICH in special			2	Random from set {1,2}	2	Random from set {1,2}	
BW _{Channel}		MHz	10	10		10		
Cyclic Prefix			Normal	Noi	rmal	No	Normal	
Number of control C normal subframes			3	;	3	3		
Number of control C special subframes	·		2	:	2		2	
PDSCH transmission	n mode		4		4		4	
Interference model			N/A		cified in e B.6.3		cified in e B.6.3	
Precoding			Random wideband precoding per TTI	As specified in clause B.6.3		As specified in clause B.6.3		
Time offset to cell 1		us	N/A	2			3	
Frequency offset to cell 1		Hz	N/A		00		00	
MBSFN			Not configured		nfigured	Not configured {dB-6, dB-3, dB0}		
r12 1	p-aList-r12 transmissionMode List-r12		N/A N/A		B-3, dB0} 4,8,9}		B-3, dB0} 4,8,9}	

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells. Note 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7]. Note 4: Test 1 and Test 2 are defined in Table 8.2.2.4.1D-2.

Table 8.2.2.4.1D-2: Minimum Performance for Enhanced Performance Requirement Type B, Single-layer Spatial Multiplexing (FRC) with TM4 interference model

Test Num	Referenc e	ОС	NG Patt	ern		opagati onditior		Correlation Matrix and	Reference	e Value	UE Categor
	Channel	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughp ut (%)	SNR (dB) (Note 2)	у
1	R.11-12 TDD	OP.1 TDD	N/A	N/A	EVA 5	EVA 5	EVA 5	2x2 Low	85	16.1	≥1
2	R.11-11 TDD	OP.1 TDD	N/A	N/A	EPA 5	EPA 5	EPA 5	2x2 Low	85	9.5	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to $\hat{E}_{\rm s}/N_{ac}$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.2.2.4.1E Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Ports with CRS assistance information

The requirements are specified in Table 8.2.2.4.1E-2, with the addition of parameters in Table 8.2.2.4.1E-1. The purpose is to verify the closed loop rank-one performance with wideband precoding when CRS assistance information [7] is configured. In Table 8.2.2.4.1E-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.2.2.4.1E-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter	Parameter		Cell 1	Cell 2	Cell 3
Uplink downlink config	guration		1	1	1
Special subframe configuration			4	4	4
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	0	0

N_{oc} at antenna port		dBm/15kHz	-98	N/A	N/A
Ê _s /N _{oc}			Reference Value in Table 8.2.2.4.1E-2	[10.45]	[4.6]
BW _{Channel}		MHz	10	10	10
Subframe Config	Subframe Configuration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset bety	veen Cells	μs	N/A	3	-1
Frequency shift	between Cells	Hz	N/A	300	-100
Cell Id			0	1	128
Cell-specific refe	erence signals		Ante	enna ports 0,1	
Number of contr symbols	ol OFDM		2	2	2
	Interference model		N/A	As specified in clause B.5.3	As specified in clause B.5.3
Probability of oc transmission in i	currence of nterference cells	%	N/A	20	20
Probability of occurrence of	Rank 1	%	N/A	80	80
transmission rank in interfering cells	Rank 2	%	N/A	20	20
ACK/NACK feeb	ACK/NACK feeback mode		Multiplexing	N/A	N/A
PDSCH transmission mode			4	N/A	N/A
Precoding granularity		PRB	50	N/A	N/A
PMI delay (Note 2)		ms	10 or 11	N/A	N/A
Reporting interval		ms	1 or 4 (Note 3)	N/A	N/A
Peporting mode			PUCCH 1-1	N/A	N/A
CodeBookSubset bitmap	CodeBookSubsetRestriction		001111	N/A	N/A
Cyclic prefix			Normal	Normal	Normal
1					

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

Table 8.2.2.4.1E-2: Minimum Performance Single-Layer Spatial Multiplexing (FRC)

Test Number	Reference Channel	OC	NG Patt	ern	Propagation Conditions (Note1)		Correlation Matrix and	Reference	Value	UE Cate	Ì	
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	gory	
1	TBD	OP.1 TDD	N/A	N/A	EVA5	EVA5	EVA5	2x2 Low	70	TBD	≥2	Ī

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. Note 3: SNR corresponds to $\hat{\mathbf{E}}_{\mathbf{g}}/N_{og}$ of cell 1.

8.2.2.4.2 Minimum Requirement Multi-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.2.4.2-2, with the addition of the parameters in Table 8.2.2.4.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

Table 8.2.2.4.2-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter	•	Unit	Test 1-2	Test 3
Danielink name	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)
	σ	dB	0	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98	-98
Precoding grant	Precoding granularity		50	8
PMI delay (Not	PMI delay (Note 2)		10 or 11	10 or 11
Reporting inte	rval	ms	1 or 4 (Note 3)	1 or 4 (Note 3)
Reporting mo	de		PUSCH 3-1	PUSCH 1-2
ACK/NACK feedba	ck mode		Bundling	Bundling
CodeBookSubsetRestriction bitmap			110000	110000
PDSCH transmission mode			4	4
Number of OFDM symbols for PDCCH per component carrier		OFDM symbol	2	1

Note 1: $P_{R} = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n

based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate

between 1ms and 4ms.

Table 8.2.2.4.2-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference	/alue	UE	UE DL
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category	category
1	10 MHz	R.35 TDD	OP.1 TDD	EPA5	2x2 Low	70	19.5	≥2	≥6
2	10 MHz	R.11-1 TDD	OP.1 TDD	ETU70	2x2 Low	70	13.9	≥2	≥6
3	20 MHz 256QA M	R. 65 TDD	OP.1 TDD	EVA5	2x2 Low	70	24.9	11-12	≥11

8.2.2.4.2A Enhanced Performance Requirement Type C Multi-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.2.2.4.2A-2, with the addition of the parameters in Table 8.2.2.4.2A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband precoding.

Table 8.2.2.4.2A-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter	ı	Unit	Test 1
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	-3
allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
Precoding granu	larity	PRB	50
PMI delay (Not	e 2)	ms	10 or 11
Reporting inte	rval	ms	1 or 4 (Note 3)
Reporting mo	de		PUSCH 3-1
ACK/NACK feedba	ck mode		Bundling
CodeBookSubsetRe	estriction		110000
bitmap			
PDSCH transmission	on mode		4

Note 1: $P_{R} = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF

not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval

will alternate between 1ms and 4ms.

Table 8.2.2.4.2A-2: Enhanced Performance Requirement Type C for Multi-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	/alue	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.11-1 TDD	OP.1 TDD	ETU70	2x2 Medium	70	17.8	≥2

8.2.2.4.3 Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port

For single carrier, the requirements are specified in Table 8.2.2.4.3-2, with the addition of the parameters in Table 8.2.2.4.3-1 and the downlink physical channel setup according to Annex C.3.2.

For CA with 2 DL CCs, the requirements are specified in Table 8.2.2.4.3-4, with the addition of the parameters in Table 8.2.2.4.3-3 and the downlink physical channel setup according to Annex C.3.2.The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

For CA with 3 DL CCs, the requirements are specified in Table 8.2.2.4.3-7, based on single carrier requirement specified in Table 8.2.2.4.3-5, with the addition of the parameters in Table 8.2.2.4.3-3 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.2.4.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-6
allocation	Downlink power allocation $\rho_{\scriptscriptstyle B}$		-6 (Note 1)
	σ	dB	3
$N_{\it oc}$ at antenna	N_{oc} at antenna port		-98
Precoding granu	Precoding granularity		6
PMI delay (Not	e 2)	ms	10 or 11
Reporting inte	rval	ms	1 or 4 (Note 3)
Reporting mo	de		PUSCH 1-2
ACK/NACK feedba	ck mode		Bundling
CodeBookSubsetRestriction			000000000000000000000000000000000000000
bitmap	bitmap		00001111111111111111100000000
			0000000
PDSCH transmission	on mode	_	4

Note 1: $P_B = 1$.

If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this Note 2:

reported PMI cannot be applied at the eNB downlink before SF#(n+4)

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate

between 1ms and 4ms.

Note 4: Void. Note 5: Void. Note 6: Void.

Table 8.2.2.4.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagatio	Correlation	Reference v	/alue	UE
number	width	Channel	Pattern	n Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.36 TDD	OP.1 TDD	EPA5	4x2 Low	70	15.7	≥2
Note 1:	Void							

Table 8.2.2.4.3-3: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA

Parameter	ı	Unit	Value
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
Precoding granu	larity	PRB	8
PMI delay (Not	e 2)	ms	10 or 11
Reporting interval		ms	1 or 4 (Note 3)
Reporting mo	de		PUSCH 1-2
ACK/NACK feedba	ck mode		PUCCH format 1b with channel
			selection for Tests in Table
			8.2.2.4.3-4; PUCCH format 3 for
			Tests in Table 8.2.2.4.3-7
CodeBookSubsetRe	estriction		000000000000000000000000000000000000000
bitmap			00001111111111111111100000000
·			00000000
CSI request field (Note 4)		'10'
PDSCH transmission	on mode		4

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n

based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate

between 1ms and 4ms.

Note 4: Multiple CC-s under test are configured as the 1st set of serving cells by high

layers.

Note 5: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.2.4.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for CA with 2DL CCs

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference	value	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	2x20 MHz	R.43 TDD	OP.1 TDD (Note 1)	EVA5	4x2 Low	70	11.1	≥5
2	20MHz +15MH z	R.43 TDD for 20MHz CC	OP.1 TDD (Note 1)	EVA5	4x2 Low	70	10.7	≥5
		R.43-5 TDD for 15MHz CC	OP.1 TDD (Note 1)				10.6	

Note 1: The OCNG pattern applies for each CC.

Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Table 8.2.2.4.3-5: Single carrier performance for multiple CA configurations

			Propa-	Correlation	Referenc	e value
Band- width	Reference channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)
1.4MHz	R.43-1 TDD	OP.1 TDD	EVA5	4x2 Low	70	11.0
3MHz	R.43-2 TDD	OP.1 TDD	EVA5	4x2 Low	70	9.8
5MHz	R.43-3 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.0
10 MHz	R.43-4 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.5
15MHz	R.43-5 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.6
20MHz	R.43 TDD	OP. 1 TDD	EVA5	4x2 Low	70	10.7

Table 8.2.2.4.3-6: Void

Table 8.2.2.4.3-7: Minimum performance (FRC) based on single carrier performance for CA with 3 DL CCs

Test num.	CA Band-width combination	Requirement	UE category				
1	3x20MHz	As specified in Table 8.2.2.4.3-5 per CC	≥5				
2	20MHz+20MHz+15MHz	As specified in Table 8.2.2.4.3-5 per CC	≥5				
Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3							

8.2.2.4.3A Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port for dual connectivity

For dual connectivity the requirements are specified in Table 8.2.2.4.3A-3, based on single carrier requirement specified in Table 8.2.2.4.3A-2, with the addition of the parameters in Table 8.2.2.4.3A-1 and the downlink physical channel setup according to Annex C.3.2.The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding by using dual connectivity.

Table 8.2.2.4.3A-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for dual connectivity

Parameter		Unit	Value
Danielink name	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
N_{oc} at antenna port	t	dBm/15kHz	-98
Precoding granulari	ty	PRB	6 for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, and 8 for 15MHz CCs and 20MHz CCs
PMI delay (Note 2)		ms	10 or 11
Reporting interval		ms	1 or 4 (Note 3)
Reporting mode			PUSCH 1-2
CodeBookSubsetRe bitmap	estriction		00000000000000000000000000000000000000
PDSCH transmissio	n mode		4
ACK/NACK transmi	ssion		Separate ACK/NACK feedbacks with PUCCH format 1b on the MCG and SCG
CSI feedback			Separate PUSCH feedbacks on the MCG and SCG
Time offset between and SCG CC	MCG CC	μs	0 for UE under test supporting synchronous dual connectivity; 334 for UE under test supporting both asynchronous and synchrounous dual connectivity (Note 5)
based on	PMI estima	tion at a downlink S	eporting instance at subrame SF#n SF not later than SF#(n-4), this NB downlink before SF#(n+4)

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate

between 1ms and 4ms.

The same PDSCH transmission mode is applied to each component carrier. Note 4:

Note 5: As defined in TS36.300 [11].

If the UE supports both SCG bearer and Split bearer, the SCG bearer is Note 6:

configured.

Table 8.2.2.4.3A-2: Single carrier performance for multiple dual connectivity configurations

			Drono	Correlation	Reference	value
Band- width	Reference channel	OCNG pattern	Propa- gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)
1.4MHz	R.43-1 TDD	OP.1 TDD	EVA5	4x2 Low	70	11.0
3MHz	R.43-2 TDD	OP.1 TDD	EVA5	4x2 Low	70	9.8
5MHz	R.43-3 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.0
10 MHz	R.43-4 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.5
15MHz	R.43-5 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.6
20MHz	R.43 TDD	OP. 1 TDD	EVA5	4x2 Low	70	10.7

Table 8.2.2.4.3A-3: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for dual connectivity

1	2x20 MHz	As specified in Table 8.2.2.4.3A-2 per CC	≥5		
Note 1:	The OCNG pattern applies for each	CC.			
Note 2:	ote 2: The applicability of requirements for different dual connectivity configurations and bandwidth				
	combination sets is defined in 8.1.2.	3A.			

8.2.2.4.4 Minimum Requirement Multi-Layer Spatial Multiplexing 4 Tx Antenna Port for dual connectivity

For dual connectivity the requirements are specified in Table 8.2.2.4.4-1, with the addition of the parameters in Table 8.2.2.4.4-2 and the downlink physical channel setup according to Annex C.3.2.The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding by using dual connectivity.

Table 8.2.2.4.4-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for dual connectivity

Parameter	•	Unit	Value			
Develiels never	$ ho_{\scriptscriptstyle A}$	dB	-6			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)			
	σ	dB	3			
$N_{\scriptscriptstyle oc}$ at antenna	port	dBm/15kHz	-98			
Precoding granu	ularity	PRB	6 for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, and 8 for 15MHz CCs and 20MHz CCs			
PMI delay (Not	e 2)	ms	10 or 11			
Reporting inte	rval	ms	1 or 4 (Note 3)			
Reporting mo	de		PUSCH 1-2			
CodeBookSubsetRo bitmap	estriction		00000000000000000000000000000000000000			
PDSCH transmission	on mode		4			
ACK/NACK transr	mission		Separate ACK/NACK feedbacks with PUCCH format 1b on the MCG and SCG			
CSI feedbac	k		Separate PUSCH feedbacks on the MCG and SCG			
Time offset between and SCG Co		μs	0 for synchronous dual connectivity; 334 for asynchronous dual connectivity (Note 5).			
Note 1: $P_{R} = 1$.						
Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)						
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.						
Note 4: The same PDSCITITATISMISSION mode is applied to each component carrier. Note 5: As defined in TS36.300 [11]. Note 6: If the UE supports both SCG bearer and Split bearer, the SCG bearer is configured.						

Table 8.2.2.4.4-2: Single carrier performance for multiple dual connectivity configurations

			Propa-	Correlation	Reference va		
Band- width	Reference channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	
1.4MHz	R.43-1 TDD	OP.1 TDD	EVA5	4x2 Low	70	11.0	
3MHz	R.43-2 TDD	OP.1 TDD	EVA5	4x2 Low	70	9.8	
5MHz	R.43-3 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.0	
10 MHz	R.43-4 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.5	
15MHz	R.43-5 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.6	
20MHz	R.43 TDD	OP. 1 TDD	EVA5	4x2 Low	70	10.7	

Table 8.2.2.4.4-3: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for dual connectivity

Test num. Band-widt		Band-width combination	Requirement	UE category			
1	1 2x20 MHz		As specified in Table 8.2.2.4.4-2 per CC	≥5			
Note 1:	The	OCNG pattern applies for each CC.					
Note 2:	Note 2: The applicability of requirements for different dual connectivity configurations and bandwidth combination sets is						
	defin	ned in 8.1.2.3A.					

8.2.2.5 MU-MIMO

8.2.2.6 [Control channel performance: D-BCH and PCH]

8.2.2.7 Carrier aggregation with power imbalance

The requirements in this section verify the ability of an intraband adjacent carrier aggregation UE to demodulate the signal transmitted by the PCell or SCell in the presence of a stronger SCell or PCell signal on an adjacent frequency. Throughput is measured on the PCell or SCell only.

8.2.2.7.1 Minimum Requirement

For CA, the requirements are specified in Table 8.2.2.7.1-2, with the addition of the parameters in Table 8.2.2.7.1-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.2.2.7.1-1: Test Parameters for CA

Paramete	r	Unit	Test 1	Test 2
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)
	σ	dB	0	0
$N_{\it oc}$ at antenna poi	rt	dBm/15kHz	Off (Note 2)	Off (Note 2)
Symbols for unused	d PRBs		OCNG (Note 3)	OCNG (Note 3)
Modulation			64 QAM	64 QAM
Maximum number of transmission	of HARQ		1	1
Redundancy version sequence	n coding		{0}	{0}
PDSCH transmission of PCell	on mode		1	3
PDSCH transmission of SCell	on mode		3	1
OCNG Pattern	PCell		OP.1 TDD	OP.5 TDD
OCNG Fallell	SCell		OP.5 TDD	OP.1 TDD
Propagation PCell			Clause B.1	Clause B.1
Conditions SCell			Clause B.1	Clause B.1
Correlation Matrix	Correlation Matrix PCell		1x2	2x2
and Antenna	SCell		2x2	1x2

Note 1: $P_B = 0$.

Note 2: No external noise sources are applied.

Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated

pseudo random data.

Note 4: Void.

Table 8.2.2.7.1-2: Minimum performance (FRC) for CA

Test Number	Bandwidth (MHz)		Reference channel		Power at port (dBr	antenna n/15KHz)	Referen Fraction of Through		UE Category
	PCell	SCell	PCell SCell		\hat{E}_{s_PCell}	\hat{E}_{s_SCell}	PCell	SCell	
					for PCell	for Scell			
1	20	20	R.49 TDD	NA	-85	-79	85	NA	≥5
2	20	15	NA	R.49-1 TDD	-79	-85.8	NA	85	≥5

Note 1: The OCNG pattern for PCell is used to fill the control channel. The OCNG pattern for SCell is used to fill the control channel and PDSCH.

Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

8.2.2.8 Intra-band contiguous carrier aggregation with minimum channel spacing

The requirements in this section verify the ability of an UE supporting intraband contiguous carrier aggregation with minimum channel spacing to demodulate the signal transmitted by the PCell and SCell(s). Throughput is measured on each cell. The minimum channel spacing of intra-band contiguous carrier aggregation refers to the possible minimum channel spacing as any multiple of 300 kHz less than the nominal channel spacing defined in 5.7.1A.

8.2.2.8.1 Minimum Requirement

For CA the requirements are specified in Table 8.2.2.8.1-2, with the addition of the parameters in Table 8.2.2.8.1-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.2.2.8.1-1: Test Parameters for CA

	Parameter	Unit	Test 1-2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0
power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
	σ	dB	0
$N_{\it oc}$ at anter	nna port	dBm/15kHz	-98
Symbols for	unused PRBs		OCNG (Note 2)
Modulation			64QAM
ACK/NACK feedback mode			PUCCH format 1b with channel selection for Test 1; PUCCH format 3 for Test 2
PDSCH trans	smission mode		1

 $P_B = 0$ Note 1:

These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated Note 2:

pseudo random data, which is QPSK modulated.

The same PDSCH transmission mode is applied to each component carrier. Note 3:

Table 8.2.2.8.1-2: Minimum performance (FRC) for intra-band CA with minimum channel spacing

Test	Bandwidth Reference		OCNG	Propagation	Correlation	Reference	value	UE
number		Channel	Pattern	Condition	Matrix and Antenna Configurati on	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	2x20MHz	R.9 TDD	OP.1 TDD (Note 1)	EVA5	1x2 Low	70	17.16	≥5
		R.9 TDD	OP.1 TDD (Note 1)			70	17.16	
2	3x20MHz	R.9 TDD	OP.1 TDD (Note 1)	EVA5	1x2 Low	70	17.16	≥5
		R.9 TDD	OP.1 TDD (Note 1)			70	17.16	
		R.9 TDD	OP.1 TDD (Note 1)			70	17.16	

The OCNG pattern applies for each CC. Note 1:

The applicability and test rules of requirements for different CA configurations and bandwidth combination sets Note 2: are defined in 8.1.2.3.

TDD FDD CA (Fixed Reference Channel) 8.2.3

The parameters specified in Table 8.2.3-1 are valid for all the TDD FDD CA tests unless otherwise stated.

Table 8.2.3-1: Common Test Parameters

Parameter		Unit	Value
Uplink downlink configuration TDD CC only			1
Special subframe configu 2) for TDD CC only	ration (Note		4
Inter-TTI Distance			1
Maximum number of HARQ processes per	FDD PCell	Processes	8 for FDD and TDD CCs
component carrier	TDD PCell	Processes	11 for FDD CC; 7 for TDD CC
Maximum number of HAF transmission	RQ		4
Redundancy version codi	ng sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM
Number of OFDM symbo PDCCH per component of		OFDM symbols	4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths
Cyclic Prefix			Normal
Cell_ID			0
Cross carrier scheduling			Not configured
ACK/NACK feedback mo	de		PUCCH format 3
Downlink HARQ-ACK	FDD PCell		As specified in Clause 7.3.3 in TS36.213 [6]
timing	TDD PCell		As specified in Clause 7.3.4 in TS36.213 [6]
Note 1: as specified in Note 2: as specified in			

The applicability of ther requirements are specified in Clause 8.1.2.3. The single carrier performance with different bandwidths for multiple CA configurations specified in Clause 8.2.3 cannot be applied for UE single carrier test.

8.2.3.1 Single-antenna port performance

The single-antenna performance in a given multi-path fading environments is determined by the SNR for which a certain relative information bit throughput of the reference measurement channels in Annex A.3.3 is achieved. The purpose of these tests is to verify the single-antenna performance with different channel models and MCS.

8.2.3.1.1 Minimum Requirement for FDD PCell

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.1.1-4 based on single carrier requirement specified in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3, with the addition of the parameters in Table 8.2.3.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.1.1-5 based on single carrier requirement specified in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3, with the addition of the parameters in Table 8.2.3.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.1.1-6 based on single carrier requirement specified in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3, with the addition of the parameters in Table 8.2.3.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with FDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.1.1-7 based on single carrier requirement specified in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3, with the addition of the parameters in Table 8.2.3.1.1-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.3.1.1-1: Test Parameters for CA

Par	ameter	Unit	Value
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0
power	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
allocation	σ	dB	0
N_{oc} at ϵ	antenna port	dBm/15kHz	-98
Symbols fo	Symbols for unused PRBs		OCNG (Note 2)
Modulation			QPSK
PDSCH tran	nsmission mode		1

Note 1: $P_{B} = 0$.

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs

shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 3: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.3.1.1-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)

Band-	Reference	OCNG	Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.4 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.3
3 MHz	R.42-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.1
5MHz	R.42-2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.0
10MHz	R.2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.7
15MHz	R.42-3 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.6
20MHz	R.42 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.7

Table 8.2.3.1.1-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)

Band-	Reference	OCNG	Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.4 TDD	OP.1 TDD	EVA5	1x2 Low	70	-0.6
3 MHz	R.42-1 TDD	OP.1 TDD	EVA5	1x2 Low	70	-0.8
5MHz	R.42-2 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.2
10MHz	R.2 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.6
15MHz	R.42-3 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.4
20MHz	R.42 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.4

Table 8.2.3.1.1-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)

Test numbe	CA Ban	dwidth com (MHz)	bination	Minimum performance requirement	UE Category					
r	Total	FDD CC	TDD CC							
1	2x20	20	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5					
2	20+10	10	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5					
3	20+15	15	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5					
Note 1:	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.									
Note 2:	30usec tim assigned o		e between F	Cell and any SCell is applied in inter-band CA case, where PC	cell can be					

Table 8.2.3.1.1-5: Minimum performance for multiple CA configurations with 3DL CCs (FRC)

Test number	CA Bandwidth combination (MHz)		bination	Minimum performance requirement	UE Category			
	Total	FDD CC	TDD CC					
1	3x20	20	2x20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5			
2	20+20+15	15	2x20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5			
3	20+20+10	10	2x20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5			
4	3x20	2x20	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5			
5	20+20+15	20+15	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5			
6	20+20+10	20+10	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5			
Note 1:	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.							
Note 2:	30usec timin	-	between PC	Cell and any SCell is applied in inter-band CA case, where PCo	ell can be			

Table 8.2.3.1.1-6: Minimum performance for multiple CA configurations with 4DL CCs (FRC)

Test numbe					Minimum performance requirement	UE Category
r	Total	FDD CC	TDD CC			
1	4x20	20	3x20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥8	
2	4x20	2×20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥8	
3	3x20+15	20+15	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥8	
4	2×15+2x 20	2×15	2x20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥8	
5	3x20+15	2×20+15	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥8	
6	2×15+2x 20	2x15+20	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥8	
Note 1:	The applica 8.1.2.3B.	ability of requi	rements fo	or different CA configurations and bandwidth combination sets	is defined in	
Note 2:	30usec tim	•	between I	PCell and any SCell is applied in inter-band CA case, where P	Cell can be	

Table 8.2.3.1.1-7: Minimum performance for multiple CA configurations with 5DL CCs (FRC)

Test number	CA Bandwidth combination (MHz)		nation	Minimum performance requirement	UE Category			
	Total	FDD CC	TDD CC					
1	15+4×20	15+2×20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11			
2	2×15+3×20	2×15+20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11			
Note 1:	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.							
Note 2:	30usec timing assigned on a		etween PC	ell and any SCell is applied in inter-band CA case, where PCell of	can be			

8.2.3.1.2 Minimum Requirement for TDD PCell

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.1.2-4 based on single carrier requirement specified in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3, with the addition of the parameters in Table 8.2.3.1.2-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with TDD PCell with 3DL CCs, the requirements are specified in Table 8.2.3.1.2-5 based on single carrier requirement specified in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3, with the addition of the parameters in Table 8.2.3.1.2-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with TDD PCell with 4DL CCs, the requirements are specified in Table 8.2.3.1.2-6 based on single carrier requirement specified in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3, with the addition of the parameters in Table 8.2.3.1.2-1 and the downlink physical channel setup according to Annex C.3.2.

For TDD FDD CA with TDD PCell with 5DL CCs, the requirements are specified in Table 8.2.3.1.2-7 based on single carrier requirement specified in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3, with the addition of the parameters in Table 8.2.3.1.2-1 and the downlink physical channel setup according to Annex C.3.2.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.3.1.2-1: Test Parameters for CA

Pa	rameter	Unit	Value
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0
power	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
allocation	σ	dB	0
N_{oc} at	antenna port	dBm/15kHz	-98
Symbols fo	or unused PRBs		OCNG (Note 2)
Мо	dulation		QPSK
PDSCH tra	nsmission mode		1

Note 1: $P_{R} = 0$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 3: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.3.1.2-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)

Band-			Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.4 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.3
3 MHz	R.42-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.1
5MHz	R.42-2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.0
10MHz	R.2 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.7
15MHz	R.42-3 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.6
20MHz	R.42 FDD	OP.1 FDD	EVA5	1x2 Low	70	-1.7

Table 8.2.3.1.2-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)

Band-	Reference	erence OCNG	Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.4 TDD	OP.1 TDD	EVA5	1x2 Low	70	-0.6
3 MHz	R.42-1 TDD	OP.1 TDD	EVA5	1x2 Low	70	-0.8
5MHz	R.42-2 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.2
10MHz	R.2 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.6
15MHz	R.42-3 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.4
20MHz	R.42 TDD	OP.1 TDD	EVA5	1x2 Low	70	-1.4

Table 8.2.3.1.2-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)

Test	Test Aggregated Bandwidth (MHz) numbe r Total FDD CC TDD CC		Aggregated Bandwidth (MHz) Minimum performance requirement		UE
numbe r			TDD CC		Category
1	2x20	20	20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5
2	20+10	10	20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5
3	20+15	15	20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B

Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC.

Table 8.2.3.1.2-5: Minimum performance for multiple CA configurations with 3DL CCs (FRC)

Test	Aggregate	d Bandwi	dth (MHz)	Minimum performance requirement	UE
numbe r	Total	FDD CC	TDD CC		Category
1	3x20	20	2x20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5
2	20+20+15	15	2x20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5
3	20+20+10	10	2x20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5
4	3x20	2x20	20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5
5	20+20+15	20+15	20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5
6	20+20+10	20+10	20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥5

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.

Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC.

Table 8.2.3.1.2-6: Minimum performance for multiple CA configurations with 4DL CCs (FRC)

Test numbe	CA Bandwidth combination (MHz)		ination	Minimum performance requirement	UE Category
r	Total	FDD CC	TDD CC		
1	4x20	20	3x20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥8
2	4x20	2×20	2×20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥8
3	3x20+15	20+15	2×20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥8
4	2×15+2x 20	2×15	2x20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥8
5	3x20+15	2×20+15	20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥8
6	2×15+2x 20	2x15+20	20	As defined in Table 8.2.3.1.2-2 and Table 8.2.3.1.2-3 per CC	≥8

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.

Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC.

Table 8.2.3.1.2-7: Minimum performance for multiple CA configurations with 5DL CCs (FRC)

Test	Aggregated Bandwidth (MHz)		(MHz)	Minimum performance requirement	UE
number	Total	FDD CC	TDD CC		Category
1	15+4×20	15+2×20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11
2	2×15+3×20	2×15+20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11

Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.

Note 2: 30usec timing difference between PCell and any SCell is applied in inter-band CA case, where PCell can be assigned on any CC.

8.2.3.2 Open-loop spatial multiplexing performance 2Tx Antenna port

8.2.3.2.1 Minimum Requirement for FDD PCell

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.2.1-4 based on single carrier requirement specified in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3, with the addition of the parameters in Table 8.2.3.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.2.1-5 based on single carrier requirement specified in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3, with the addition of the parameters in Table 8.2.3.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.2.1-6 based on single carrier requirement specified in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3, with the addition of the parameters in Table 8.2.3.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

For TDD FDD CA with FDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.2.1-7 based on single carrier requirement specified in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3, with the addition of the parameters in Table 8.2.3.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.3.2.1-1: Test Parameters for Large Delay CDD (FRC) for CA

Parameter	i	Unit	Value
5 " 1	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
PDSCH transmission	on mode		3

Note 1: $P_R = 0$.

Note 2: The same PDSCH transmission mode is applied to each

component carrier.

Table 8.2.3.2.1-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)

Band-			Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.11-5 FDD	OP.1 FDD	EVA70	2x2 Low	70	13.6
3 MHz	R.11-6 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.3
5MHz	R.11-2 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.3
10MHz	R.11 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.9
15MHz	R.11-7 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.8
20MHz	R.30 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.9

Table 8.2.3.2.1-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)

Band-			Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.11-5 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.2
3 MHz	R.11-6 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.8
5MHz	R.11-7 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.6
10MHz	R.11-8 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.8
15MHz	R.11-9 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.9
20MHz	R.30-1 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.0

Table 8.2.3.2.1-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)

Test	Aggrega	ted Bandwi	dth (MHz)	Minimum performance requirement	UE
numbe r Total		FDD CC TDD CC			Category
1	2x20	20	20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
2	20+10	10	20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
3	20+15	15	20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
Note 1:	The application 8.1.2.3B	ability of requ	uirements for	different CA configurations and bandwidth combination sets is	defined in

Table 8.2.3.2.1-5: Minimum performance for multiple CA configurations with 3DL CCs (FRC)

		ed Bandwi	dth (MHz)	Minimum performance requirement	UE
numbe r	Total	FDD CC	TDD CC		Category
1	3x20	20	2x20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
2	20+20+15	15	2x20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
3	20+20+10	10	2x20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
4	3x20	2x20	20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
5	20+20+15	20+15	20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
6	20+20+10	20+10	20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥5
Note 1:	The applical	oility of requ	uirements for	different CA configurations and bandwidth combination sets is	defined in

Table 8.2.3.2.1-6: Minimum performance for multiple CA configurations with 4DL CCs (FRC)

Test	Aggregate	d Bandwidth	(MHz)	Minimum performance requirement	UE
numb er	Total	FDD CC	TDD CC		Category
1	4x20	20	3x20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥8
2	4x20	2×20	2×20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥8
3	3x20+15	20+15	2×20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥8
4	2×15+2x2 0	2×15	2x20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥8
5	3x20+15	2×20+15	20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥8
6	2×15+2×2 0	2x15+20	20	As defined in Table 8.2.3.2.1-2 and Table 8.2.3.2.1-3 per CC	≥8
Note 1:	The applica 8.1.2.3B.	ability of requi	rements fo	or different CA configurations and bandwidth combination sets	is defined in

Table 8.2.3.2.1-7: Minimum performance for multiple CA configurations with 5DL CCs (FRC)

Test	Aggregated Bandwidth (MHz)			Minimum performance requirement	UE		
number	mber Total FDD CC TDD		TDD		Category		
			CC				
1	15+4×20	15+2×20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11		
2	2×15+3×20	2×15+20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11		
Note 1:	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in						
	8.1.2.3B.			-			

8.2.3.2.1A Soft buffer management test for FDD PCell

For TDD-FDD CA, the requirements are specified in Table 8.2.3.2.1A-2, with the addition of the parameters in Table 8.2.3.2.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the UE performance with proper instantaneous buffer implementation for FDD as PCell.

Table 8.2.3.2.1A-1: Test Parameters for CA

	Parameter	Unit	Value		
			FDD Carrier	TDD Carrier	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	
power	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	
allocation	σ	dB	0	0	
N_{oc} at antenna port		dBm/15kHz	-98	-98	
PDSCH	transmission mode		3	3	

Note 1: $P_{R} = 1$.

Note 2: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.3.2.1A-2: Minimum performance (FRC) for CA

						Correl	Reference v	alue	
Test num.	Band-width		Reference channel	OCNG pattern	Propa- gation condi-tion	ation matrix and anten na config	Fraction of maximum throughput (%)	SNR (dB)	UE cate gory
1	PCell	20MHz	R.35-1 FDD	OP.1 FDD (Note 1)	EVA70	2x2	70	16.4	3
!	SCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA/U	Low	70	16.3	3
2	PCell	20MHz	R.35-1 FDD	OP.1 FDD (Note 1)	EVA70	2x2	70	16.3	4
	SCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA/U	Low	70	16.3	4
3	PCell	10MHz	R.35-3 FDD	OP.1 FDD (Note 1)	EVA70	2x2	70	16.0	3
3	SCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVATO	Low	70	16.3	3
4	PCell	10MHz	R.35-3 FDD	OP.1 FDD (Note 1)	F)/A70	2x2	70	16.0	4
4	SCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA70	Low	70	16.3	
_	PCell	15MHz	R.35-2 FDD	OP.1 FDD (Note 1)	F)/A70	2x2	70	16.0	2
5	SCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA70	Low	70	16.3	3
	PCell	15MHz	R.35-2 FDD	OP.1 FDD (Note 1)	E)/A70	2x2	70	16.0	4
6	SCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA70	Low	70	16.3	4

Note 1: The OCNG pattern applies for each CC.

Note 2: The applicability and test rules of requirements for different CA configurations and bandwidth combination sets are defined in 8.1.2.3B.

8.2.3.2.2 Minimum Requirement for TDD PCell

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.2.2-4 based on single carrier requirement specified in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3, with the addition of the parameters in Table 8.2.3.2.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

For TDD FDD CA with TDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.2.2-5 based on single carrier requirement specified in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3, with the addition of the parameters in Table 8.2.3.2.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

For TDD FDD CA with TDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.2.2-6 based on single carrier requirement specified in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3, with the addition of the parameters in Table 8.2.3.2.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

For TDD FDD CA with TDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.2.2-7 based on single carrier requirement specified in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3, with the addition of the parameters in Table 8.2.3.2.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 2 transmitter antennas.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.3.2.2-1: Test Parameters for Large Delay CDD (FRC) for CA

Parameter		Unit	Value
Danielinkaan	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
PDSCH transmission	on mode		3

Note 1: $P_B = 0$.

Note 2: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.3.2.2-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)

Band-	Reference	OCNG	Propagation	Correlation	Reference value	
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.11-5 FDD	OP.1 FDD	EVA70	2x2 Low	70	13.6
3 MHz	R.11-6 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.3
5MHz	R.11-2 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.3
10MHz	R.11 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.9
15MHz	R.11-7 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.8
20MHz	R.30 FDD	OP.1 FDD	EVA70	2x2 Low	70	12.9

Table 8.2.3.2.2-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)

Band-	Reference	OCNG	Propagation	Correlation	Reference value	
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.11-5 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.2
3 MHz	R.11-6 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.8
5MHz	R.11-7 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.6
10MHz	R.11-8 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.8
15MHz	R.11-9 TDD	OP.1 TDD	EVA70	2x2 Low	70	12.9
20MHz	R.30-1 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.0

Table 8.2.3.2.2-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)

Test	Aggrega	ted Bandwi	dth (MHz)	Minimum performance requirement	UE
numbe r	Total	FDD CC	TDD CC		Category
1	2x20	20	20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
2	20+10	10	20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
3	20+15	15	20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
Note 1:	The applica 8.1.2.3B	ability of requ	irements for	different CA configurations and bandwidth combination sets is	defined in

Table 8.2.3.2.2-5: Minimum performance for multiple CA configurations with 3DL CCs (FRC)

Test	Aggregate	ed Bandwid	th (MHz)	Minimum performance requirement	UE
number	Total	FDD CC	TDD CC		Category
1	3x20	20	2x20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
2	20+20+15	15	2x20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
3	20+20+10	10	2x20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
4	3x20	2x20	20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
5	20+20+15	20+15	20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
6	20+20+10	20+10	20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥5
Note 1:	The applicabil 8.1.2.3B.	lity of require	ments for dif	ferent CA configurations and bandwidth combination sets is	s defined in

Table 8.2.3.2.2-6: Minimum performance for multiple CA configurations with 4DL CCs (FRC)

Test	Aggregat	ed Bandwidt	h (MHz)	Minimum performance requirement	UE
numbe r	Total FDD CC		TDD CC		Category
1	4x20	20	3x20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥8
2	4x20	2×20	2×20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥8
3	3x20+15	20+15	2×20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥8
4	2×15+2x 20	2×15	2x20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥8
5	3x20+15	2×20+15	20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥8
6	2×15+2x 20	2x15+20	20	As defined in Table 8.2.3.2.2-2 and Table 8.2.3.2.2-3 per CC	≥8
Note 1:	The applica	ability of requi	rements fo	or different CA configurations and bandwidth combination sets	is defined in

Table 8.2.3.2.2-7: Minimum performance for multiple CA configurations with 5DL CCs (FRC)

Test	Aggregated Bandwidth (MHz)		(MHz)	Minimum performance requirement	UE				
number	Total	FDD CC	TDD CC		Category				
1	15+4×20	15+2×20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11				
2	2×15+3×20	2×15+20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11				
Note 1:		he applicability of requirements for different CA configurations and bandwidth combination sets is defined in							
	8.1.2.3B.								

8.2.3.2.2A Soft buffer management test for TDD PCell

For TDD-FDD CA, the requirements are specified in Table 8.2.3.2.2A-2, with the addition of the parameters in Table 8.2.3.2.2A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the UE performance with proper instantaneous buffer implementation for TDD as PCell.

Table 8.2.3.2.2A-1: Test Parameters for CA

	Parameter		Value		
			FDD Carrier	TDD Carrier	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	
power	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	
allocation	σ	dB	0	0	
N_{oc} at antenna port		dBm/15kHz	-98	-98	
PDSCH transmission mode			3	3	

Note 1: $P_B = 1$.

Note 2: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.3.2.2A-2: Minimum performance (FRC) for CA

						Correl	Reference v	alue	
Test num.	Band	l-width	Reference channel	OCNG pattern	Propa- gation condi-tion	ation matrix and anten na config	Fraction of maximum throughput (%)	SNR (dB)	UE cate gory
1	PCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1))	EVA70	2x2	70	16.3	3
'	SCell	20MHz	R.35-1 FDD	OP.1 FDD (Note 1	EVA/U	Low	70	16.2	9
2	PCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA70	2x2	70	16.2	4
2	SCell	20MHz	R.35-1 FDD	OP.1 FDD (Note 1)	EVATO	Low	70	16.2	4
3	PCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	F)/A70	2x2	70	16.1	3
3	SCell	10MHz	R.35-3 FDD	OP.1 FDD (Note 1)	EVA70	Low	70	16.0	3
4	PCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	E)/A70	2x2	70	16.2	4
4	SCell	10MHz	R.35-3 FDD	OP.1 FDD (Note 1)	EVA70	Low	70	15.8	4
_	PCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	E)/A70	2x2	70	16.2	2
5	SCell	15MHz	R.35-2 FDD	OP.1 FDD (Note 1)	EVA70	Low	70	15.8	3
6	PCell	20MHz	R.35-1 TDD	OP.1 TDD (Note 1)	F)/A70	2x2	70	16.2	
6	SCell	15MHz	R.35-2 FDD	OP.1 FDD (Note 1)	EVA70	Low	70	15.8	4

Note 1: The OCNG pattern applies for each CC.

Note 2: The applicability and test rules of requirements for different CA configurations and bandwidth combination sets are defined in 8.1.2.3B.

8.2.3.3 Closed-loop spatial multiplexing performance 4Tx Antenna Port

8.2.3.3.1 Minimum Requirement for FDD PCell

For TDD FDD CA with FDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.3.1-4 based on single carrier requirement specified in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3, with the addition of the parameters in Table 8.2.3.3.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

For TDD FDD CA with FDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.3.1-5 based on single carrier requirement specified in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3, with the addition of the parameters in Table 8.2.3.3.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

For TDD FDD CA with FDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.3.1-6 based on single carrier requirement specified in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3, with the addition of the parameters in Table 8.2.3.3.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

For TDD FDD CA with FDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.3.1-7 based on single carrier requirement specified in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3, with the addition of the parameters in Table 8.2.3.3.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.3.3.1-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA

Paramete	r	Unit	Value
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
$N_{\it oc}$ at antenn	a port	dBm/15kHz	-98
Precoding gran	Precoding granularity		Wideband precoding for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs
DMI dolov (Noto 2)	FDD CC	ms	8
PMI delay (Note 2)	TDD CC	ms	10 or 11
Reporting interval	FDD CC	ms	1
Reporting interval	TDD CC	ms	1 or 4 (Note 3)
Reporting m	ode		PUSCH 1-2
CodeBookSubsetF	Restriction		000000000000000000000000000000000000000
bitmap			00001111111111111111100000000
			0000000
CSI request field	(Note 3)		'10'
PDSCH transmiss	ion mode		4

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this

reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher

Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.

Note 5: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.3.3.1-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD PCell and SCell (FRC)

Band-			Propagation	Correlation			
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	
1.4 MHz	R.14-4 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.4	
3 MHz	R.14-5 FDD	OP.1 FDD	EVA5	4x2 Low	70	9.5	
5MHz	R.14-6 FDD	OP.1 FDD	EVA5	4x2 Low	70	9.5	
10MHz	R.14 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.1	
15MHz	R.14-7 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.1	
20MHz	R.14-3 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.3	

Table 8.2.3.3.1-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD SCell (FRC)

Band-	Band- Reference		Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.43-1 TDD	OP.1 TDD	EVA5	4x2 Low	70	11.0
3 MHz	R.43-2 TDD	OP.1 TDD	EVA5	4x2 Low	70	9.8
5MHz	R.43-3 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.0
10MHz	R.43-4 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.5
15MHz	R.43-5 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.6
20MHz	R.43 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.7

Table 8.2.3.3.1-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)

Test	Aggrega	ted Bandwi	dth (MHz)	Minimum performance requirement	UE			
numbe r	Total FDD CC		TDD CC		Category			
1	2x20	20	20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
2	20+10	10	20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
3	20+15	15	20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
Note 1:	The applica 8.1.2.3B	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in						

Table 8.2.3.3.1-5: Minimum performance for multiple CA configurations with 3DL CCs (FRC)

Test	Aggregated Bandwidth (MHz)			Minimum performance requirement	UE			
number	Total FDD CC		TDD CC		Category			
1	3x20	20	2x20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
2	20+20+15	15	2x20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
3	20+20+10	10	2x20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
4	3x20	2x20	20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
5	20+20+15	20+15	20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
6	20+20+10	20+10	20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥5			
Note 1:	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3B.							

Table 8.2.3.3.1-6: Minimum performance for multiple CA configurations with 4DL CCs (FRC)

Test	Aggregat	ed Bandwidt	h (MHz)	Minimum performance requirement	UE
numbe r	Total FDD CC		TDD CC		Category
1	4x20	20	3x20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥8
2	4x20	2×20	2×20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥8
3	3x20+15	20+15	2×20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥8
4	2×15+2x 20	2×15	2x20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥8
5	3x20+15	2×20+15	20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥8
6	2×15+2x 20	2x15+20	20	As defined in Table 8.2.3.3.1-2 and Table 8.2.3.3.1-3 per CC	≥8
Note 1:	The application 8.1.2.3B.	ability of requi	rements fo	r different CA configurations and bandwidth combination sets	is defined in

Table 8.2.3.3.1-7: Minimum performance for multiple CA configurations with 5DL CCs (FRC)

Test	33 3 3 4 4 7		(MHz)	Minimum performance requirement	UE				
number Total FDD CC TDD CC				Category					
1	15+4×20	15+2×20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11				
2	2×15+3×20	2×15+20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11				
Note 1:	The applicabili	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in							
	8.1.2.3B								

8.2.3.3.2 Minimum Requirement for TDD PCell

For TDD FDD CA with TDD PCell and 2DL CCs, the requirements are specified in Table 8.2.3.3.2-4 based on single carrier requirement specified in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3, with the addition of the parameters in Table 8.2.3.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

For TDD FDD CA with TDD PCell and 3DL CCs, the requirements are specified in Table 8.2.3.3.2-5 based on single carrier requirement specified in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3, with the addition of the parameters in Table 8.2.3.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

For TDD FDD CA with TDD PCell and 4DL CCs, the requirements are specified in Table 8.2.3.3.2-6 based on single carrier requirement specified in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3, with the addition of the parameters in Table 8.2.3.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

For TDD FDD CA with TDD PCell and 5DL CCs, the requirements are specified in Table 8.2.3.3.2-7 based on single carrier requirement specified in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3, with the addition of the parameters in Table 8.2.3.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-two performance with wideband and frequency selective precoding.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.3.3.2-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA

Paramete	er	Unit	Value
Danielink name	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
$N_{\it oc}$ at antenn	a port	dBm/15kHz	-98
Precoding gran	Precoding granularity		Widelband pre-coding for 1.4MHz, 4 for 3MHz and 5MHz CCs, 6 for 10MHz CCs, 8 for 15MHz and 20MHz CCs
DMI dolov (Noto 2)	FDD CC	ms	8
PMI delay (Note 2)	TDD CC	ms	10 or 11
Departing interval	FDD CC	ms	1
Reporting interval	TDD CC	ms	1 or 4 (Note 3)
Reporting m	ode		PUSCH 1-2
CodeBookSubsetRestriction bitmap			00000000000000000000000000000000000000
CSI request field (Note 3)			'10'
PDSCH transmiss	ion mode		TM4
NI (A D 1			

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this

reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: Multiple CC-s under test are configured as the 1st set of serving cells by higher layers

Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 3.

Note 5: The same PDSCH transmission mode is applied to each component carrier.

Table 8.2.3.3.2-2: Single carrier performance with different bandwidths for multiple CA configurations for FDD SCell (FRC)

Band-			Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.14-4 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.4
3 MHz	R.14-5 FDD	OP.1 FDD	EVA5	4x2 Low	70	9.5
5MHz	R.14-6 FDD	OP.1 FDD	EVA5	4x2 Low	70	9.5
10MHz	R.14 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.1
15MHz	R.14-7 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.1
20MHz	R.14-3 FDD	OP.1 FDD	EVA5	4x2 Low	70	10.3

Table 8.2.3.3.2-3: Single carrier performance with different bandwidths for multiple CA configurations for TDD PCell and SCell (FRC)

Band-	Reference	OCNG	Propagation	Correlation	Reference	value
width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)
1.4 MHz	R.43-1 TDD	OP.1 TDD	EVA5	4x2 Low	70	11.0
3 MHz	R.43-2 TDD	OP.1 TDD	EVA5	4x2 Low	70	9.8
5MHz	R.43-3 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.0
10MHz	R.43-4 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.5
15MHz	R.43-5 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.6
20MHz	R.43 TDD	OP.1 TDD	EVA5	4x2 Low	70	10.7

Table 8.2.3.3.2-4: Minimum performance for multiple CA configurations with 2DL CCs (FRC)

Test	Aggregated Bandwidth (MHz)			Minimum performance requirement	UE
numbe r	Total	FDD CC	TDD CC		Category
1	2x20	20	20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥5
2	20+10	10	20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥5
3	20+15	15	20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	≥5
Note 1:	The applica 8.1.2.3B	ability of requ	irements for	different CA configurations and bandwidth combination sets is	defined in

Table 8.2.3.3.2-5: Minimum performance for multiple CA configurations with 3DL CCs (FRC)

Test	Aggregat	ed Bandwi	dth (MHz)	Minimum performance requirement	UE
numbe r	Total	FDD CC	TDD CC		Category
1	3x20	20	2x20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥5
2	20+20+1 5	15	2x20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥5
3	20+20+1 0	10	2x20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥5
4	3x20	2x20	20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥5
5	20+20+1 5	20+15	20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥5
6	20+20+1 0	20+10	20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥5
Note 1:	The applica 8.1.2.3B.	ability of requ	uirements for	different CA configurations and bandwidth combination sets is	s defined in

Table 8.2.3.3.2-6: Minimum performance for multiple CA configurations with 4DL CCs (FRC)

Test	Aggregat	ed Bandwidt	h (MHz)	Minimum performance requirement	UE
numbe r	Total	FDD CC	TDD CC		Category
1	4x20	20	3x20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥8
2	4x20	2×20	2×20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥8
3	3x20+15	20+15	2×20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥8
4	2×15+2x 20	2×15	2x20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥8
5	3x20+15	2×20+15	20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥8
6	2×15+2x 20	2x15+20	20	As defined in Table 8.2.3.3.2-2 and Table 8.2.3.3.2-3 per CC	≥8
Note 1:	The application 8.1.2.3B.	ability of requi	rements fo	r different CA configurations and bandwidth combination sets	is defined in

Table 8.2.3.3.2-7: Minimum performance for multiple CA configurations with 5DL CCs (FRC)

Test	Aggregated Bandwidth (MHz)		(MHz)	Minimum performance requirement	UE
number	Total	FDD CC	TDD CC		Category
1	15+4×20	15+2×20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11
2	2×15+3×20	2×15+20	2×20	As defined in Table 8.2.3.1.1-2 and Table 8.2.3.1.1-3 per CC	8, ≥11
Note 1:	The applicabili 8.1.2.3B.	ity of requirer	ments for c	lifferent CA configurations and bandwidth combination sets is def	fined in

8.3 Demodulation of PDSCH (User-Specific Reference Symbols)

8.3.1 FDD

The parameters specified in Table 8.3.1-1 are valid for FDD unless otherwise stated.

Table 8.3.1-1: Common Test Parameters for User-specific Reference Symbols

Parameter	Unit	Value
Cyclic prefix		Normal
Cell ID		0
Inter-TTI Distance		1
Number of HARQ processes	Processes	8
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM and 256QAM
Number of OFDM symbols for PDCCH	OFDM symbols	2
Precoder update granularity		Frequency domain: 1 PRG for Transmission modes 9 and 10 Time domain: 1 ms
Note 1: Void. Note 2: Void.		

8.3.1.1 Single-layer Spatial Multiplexing

For single-layer transmission on antenna ports 7 or 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.3.1.1-1 and 8.3.1.1-2, with the addition of the parameters in Table 8.3.1.1-3 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify rank-1 performance on one of the antenna ports 7 or 8 with and without a simultaneous transmission on the other antenna port, and to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power.

Table 8.3.1.1-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations

parameter		Unit	Test 1	Test 2	Test 3
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)
	σ	dB	-3	-3	-3
Beamforming mo	del		Annex B.4.1	Annex B.4.1	Annex B.4.1
Cell-specific refere	ence			Antenna ports 0,1	
CSI reference sign	nals		Antenna ports 15,,18	Antenna ports 15,,18	Antenna ports 15, , 18
CSI-RS periodicity subframe offse $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	t	Subframes	5/2	5/2	5/2
CSI reference sig configuration	nal		0	3	0
Zero-power CSI- configuration I _{CSI-RS} / ZeroPowerCSI-F bitmap		Subframes / bitmap	3 / 0001000000000000	3 / 0001000000000000	3 / 00010000000000000
N_{oc} at antenna p	ort	dBm/15kHz	-98	-98	-98
Symbols for unus PRBs	ed		OCNG (Note 4)	OCNG (Note 4)	OCNG (Note 4)
Number of alloca resource blocks (No		PRB	50	50	50
Simultaneous transmission	,		No	Yes (Note 3, 5)	No
PDSCH transmiss mode	sion		9	9	9

- Note 1: $P_{R} = 1$.
- Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.
- Note 3: Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.
- Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.
- Note 5: The two UEs' scrambling identities $n_{\rm SCID}$ are set to 0 for CDM-multiplexed DM RS with interfering simultaneous transmission test cases.

Table 8.3.1.1-2: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations

Test	Bandwidt	Reference	OCNG	Propagation	Correlation	Reference	Reference value		UE DL
number	h and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughpu t (%)	SNR (dB)	Category	Cat- egory
1	10 MHz QPSK 1/3	R.43 FDD	OP.1 FDD	EVA5	2x2 Low	70	-1	≥1	≥6
3	10MHz 256QAM	R. 66 FDD	OP.1 FDD	EPA5	2x2 Low	70	24.3	11-12	≥11

Table 8.3.1.1-3: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations

Test	Bandwidth	Reference	OCNG Propagation	Correlation	Reference value		UE	
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
2	10 MHz 64QAM 1/2	R.50 FDD	OP.1 FDD	EPA5	2x2 Low	70	21.9	≥2
Note 1:	The reference	channel applie	s to both the	input signal unde	er test and the inte	rfering signal.		

8.3.1.1A Enhanced Performance Requirement Type A – Single-layer Spatial Multiplexing with TM9 interference model

The requirements are specified in Table 8.3.1.1A-2, with the addition of the parameters in Table 8.3.1.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4. In 8.3.1.1A-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

Table 8.3.1.1A-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model

paramete	r	Unit	Cell 1	Cell 2
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referer	nce signals		Antenna ports 0,1	Antenna ports 0,1
CSI reference s	signals		Antenna ports 15,,18	N/A
CSI-RS periodic subframe offset T_{CSI}	$_{ extsf{-RS}}$ / $\Delta_{ extsf{CSI-RS}}$	Subframes	5/2	N/A
CSI reference configuration			0	N/A
$N_{\it oc}$ at antenn	a port	dBm/15kH z	-98	N/A
DIP (Note	2)	dB	N/A	-1.73
BW _{Channe}	I	MHz	10	10
Cyclic Pref	ix		Normal	Normal
Cell Id			0	126
Number of contro symbols	ol OFDM		2	2
PDSCH transmiss	ion mode		9	N/A
Beamforming I	model		As specified in clause B.4.3 (Note 4, 5)	N/A
Interference n	nodel		N/A	As specified in clause B.5.4
Probability of occurrence of	Rank 1		N/A	70
transmission rank in interfering cells	Rank 2		N/A	30
Precoder update g	ranularity	PRB	50	6
PMI delay (No	ote 5)	Ms	8	N/A
Reporting into	erval	Ms	5	N/A
Reporting m	ode		PUCCH 1-1	N/A
CodeBookSubsetF bitmap	Restriction		000000000000000 0000000000000000 000000	N/A
Symbols for unus	ed PRBs		OCNG (Note 6)	N/A
Simultaneous trar			No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test	N/A
Physical channel reporting			PUSCH(Note 8)	N/A
cqi-pmi-Configura			5	N/A

Note 1: $P_{R} = 1$

Note 2: The respective received power spectral density of each interfering cell relative to N_{oc} ' is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4:	The precoder in clause B.4.3 follows UE recommended PMI.
Note 5:	If the UE reports in an available uplink reporting instance at subrame SF#n based
	on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI
	cannot be applied at the eNB downlink before SF#(n+4).
Note 6:	These physical resource blocks are assigned to an arbitrary number of virtual UEs
	with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs
	shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 7:	All cells are time-synchronous.
Note 8:	To avoid collisions between CQI reports and HARQ-ACK it is necessary to report
	both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in
	downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on
	PUSCH in uplink subframe SF#8 and #3.

Table 8.3.1.1A-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model

Test Number	Referenc e		NG tern		gation itions	Correlatio n Matrix	Reference Value		UE Categor
	Channel	Cell 1	Cell 2	Cell 1	Cell 2	and Antenna Configurat ion (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	у
1	R.48 FDD	OP.1 FDD	N/A	EVA5	EVA5	4x2 Low	70	-1.1	≥1

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{ac} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

8.3.1.1B Single-layer Spatial Multiplexing (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

The requirements are specified in Table 8.3.1.1B -2, with the addition of parameters in Table 8.3.1.1B -1. The purpose is to verify the performance of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell with CRS assistance information. In Table 8.3.1.1B -1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.3.1.1B-1: Test parameters of TM9-Single-Layer (2 CSI-RS ports) – Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	0	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	-3 (Note 1)	-3 (Note 1)
anocation	σ	dB	-3	N/A	N/A
	N_{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 2	12	10
$BW_Channel$		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift between	en Cells	Hz	N/A	300	-100
Cell Id			0	1	126
Cell-specific referenc	e signals		А	ntenna ports 0,1	
CSI reference sig	ınals		Antenna ports 15,16	N/A	N/A
CSI-RS periodicity subframe offso $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	et s	Subframes	5/2	N/A	N/A
CSI reference signation			8	N/A	N/A
Zero-power CSI- configuration I _{CSI-RS} / ZeroPower bitmap	-RS	Subframes / bitmap	[3 / 00100000000000 00]	N/A	N/A
ABS pattern (No	te 5)		N/A	11000000 11000000 11000000 11000000 11000000	11000000 11000000 11000000 11000000
RLM/RRM Measur Subframe Pattern (I			10000000 10000000 10000000 10000000 1000000	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		11000000 11000000 11000000 11000000 11000000	N/A	N/A
(Note7)	$C_{\text{CSI,1}}$		00111111 00111111 00111111 00111111 00111111	N/A	N/A
Number of control symbols	OFDM		2	Note 8	Note 8
PDSCH transmissio	n mode		TM9-1layer	Note 9	Note 9
Precoding granul	arity		Frequency domain: 1 PRG Time domain: 1 ms	N/A	N/A
Beamforming mo Cyclic prefix			Annex B.4.1 Normal	N/A Normal	N/A Normal
2 j c p . o i i x		I.			

Reference Value

UE

Note 1:	$P_B = 1$.
Note 2:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 3:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5:	ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 6:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 7:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
Note 8:	The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9:	Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
Note 10:	If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 11: Note 12:	· · · · · · · · · · · · · · · · · · ·
Note 12:	

Table 8.3.1.1B-2: Minimum Performance of TM9-Single-Layer (2 CSI-RS ports) - Non-MBSFN ABS

Propagation

Correlation

Number	Channel				Cond	Conditions (Note1)		Matrix and			Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	gory
1	R.51 FDD	OP.1 FDD	OP.1 FDD	OP.1 FDD		EVA5		2x2 Low	70	7.8	≥2
Note 1: Note 2:	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.										

Note 3: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.

OCNG Pattern

Reference

8.3.1.1C Enhanced Performance Requirement Type B – Single-layer Spatial Multiplexing with TM9 interference model

The requirements are specified in Table 8.3.1.1C-2, with the addition of the parameters in Table 8.3.1.1C-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7, 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4. In 8.3.1.1C-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.3.1.1C-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM9 interference model

Para	meter		Unit	Cell 1	Cell 2	Cell 3
		$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power alloc	ation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0
		σ	dB	-3	-3	-3
Cell-specific reference	e signa	ls		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port			dBm/15kHz		-98	
\hat{E}_s/N_{oc}			dB	N/A	13.91	3.34
BW _{Channel}				10	10	10
Cyclic Prefix				Normal	Normal	Normal
Cell Id				0	1	6
Number of control OF	FDM sy	mbols		3	3	3
CFI indicated in PCF	ICH			3	3	3
PDSCH transmission	mode			9	9	9
Interference model				N/A	As specified in clause B.6.4	As specified in clause B.6.4
Precoding				Random wideband precoding per TTI	As specified in clause B.6.4	As specified in clause B.6.4
CSI reference signals	6			Antenna ports 15, 16, 17, 18	Antenna ports 15, 16	Antenna ports 15, 16
CSI-RS periodicity an $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	nd subfi	ame offset	Subframes	10 / 1	10 / 1	10 / 1
CSI reference signal	configu	ration		5	6	7
Zero-power CSI-RS configuration I _{CSI-RS} /ZeroPowerCSI-RS bitmap			Subframes / bitmap	6 / 1000000000 00000	6 / 010000000000 0000	6 / 00100000000 00000
Time offset to cell 1			us	N/A	2	3
Frequency offset to cell 1			Hz	N/A	200	300
MBSFN			Not configured	Not configured	Not configured	
r12	r12			N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
(Note 4) transmissionModeList -r12			N/A	{2,3,4,8,9}	{2,3,4,8,9}	
Note 1: D = 1						

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: CSI-RS configurations are according to [4] subclause 6.10.5.2.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.3.1.1C-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM9 interference model

Test Num	Referenc e	ОС	NG Patt	ern		opagat onditio		Correlation Matrix and Antenna Configuration			Reference	UE Categ	
ber	Channel	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	ory
1	R.69 FDD	OP. 1 FD D	N/A	N/A	EP A5	EP A5	EP A5	4x2 Low	2x2 Low	2x2 Low	85	18.5	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

8.3.1.1D Enhanced Performance Requirement Type B – Single-layer Spatial Multiplexing with CRS interference model

The requirements are specified in Table 8.3.1.1D-2, with the addition of the parameters in Table 8.3.1.1D-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by the CRS of the interfering cell, applying the CRS interference model defined in clause B.6.5. In 8.3.1.1D-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.3.1.1D-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with CRS interference model

Param	neter		Unit	Cell 1	Cell 2	Cell 3
		$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power alloca	ition	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0
		σ	dB	-3	-3	-3
Cell-specific reference signals				Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port			dBm/15kHz		-98	
\hat{E}_s/N_{oc}			dB	N/A	13.91	3.34
BW _{Channel}			MHz	10	10	10
Cyclic Prefix				Normal	Normal	Normal
Cell Id				0	1	6
Number of control OFE	DM sy	mbols		3	3	3
CFI indicated in PCFIC	CH			3 3		3
PDSCH transmission r	mode			8 N/A		N/A
Interference model				N/A	As specified in clause B.6.5	As specified in clause B.6.5
Precoding				Random wideband precoding per TTI	N/A	N/A
Time offset to cell 1			us	N/A	2	3
Frequency offset to cel	II 1	_	Hz	N/A	200	300
MBSFN				Not configured	Not configured	Not configured
NeighCellsInfo- r12 p-aList-r12		-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
(Note 3) transmissionModeList -r12				N/A	{2,3,4,8,9}	{2,3,4,8,9}

Note 1: $P_{R} = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.3.1.1D-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with CRS interference model

Test Number	Reference Channel	OCI	NG Pat	tern		opagat onditio		Correlation Matrix and	Reference	Reference Value	
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.71 FDD	OP. 1 FD D	N/A	N/A	EP A5	EP A5	EP A5	2x2 Low	85	14.3	≥2

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to \hat{E}_{s}/N_{oc} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.3.1.1E Enhanced Performance Requirement Type B – Single-layer Spatial Multiplexing with TM3 interference model

The requirements are specified in Table 8.3.1.1E-2, with the addition of the parameters in Table 8.3.1.1E-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 3 interference model defined in clause B.6.2. In 8.3.1.1E-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.3.1.1E-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM3 interference model

Pa	rameter	Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	0	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	-3	-3
	σ	dB	-3	0	0
Cell-specific refere	nce signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna poi	rt	dBm/15kHz		-98	
\hat{E}_s/N_{oc}		dB	N/A	3.28	0.74
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	6
Number of control	OFDM symbols		3	3	3
CFI indicated in PC			3	Random from {1,2,3}	Random from {1,2,3}
PDSCH transmissi	on mode		8 3		3
Interference model			N/A	As specified in clause B.6.2	As specified in clause B.6.2
Precoding			Random wideband precoding per TTI	As specified in clause B.6.2	As specified in clause B.6.2
Time offset to cell '	1	us	N/A	2	3
Frequency offset to	cell 1	Hz	N/A	200	300
MBSFN			Not configured	Not configured	Not configured
NeighCellsInfo- r12 p-aList-r12			N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
(Note 4)	transmissionModeList -r12		N/A	{2,3,4,8,9}	{2,3,4,8,9}
Note 1: P = 1			N/A	{2,3,4,8,9}	{2,3

Note 1: $P_{R} = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: CSI-RS configurations are according to [4] subclause 6.10.5.2.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.3.1.1E-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM3 interference model

Test Number	Reference Channel	OCI	NG Pat	tern	Propagation Conditions		Correlation Matrix and			Reference Value	
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.70 FDD	OP. 1 FD D	N/A	N/A	EP A5	EP A5	EP A5	2x2 Low	85	11.5	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to \hat{E}_s/N_{ac} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.3.1.1F Enhanced Performance Requirement Type B – Single-layer Spatial Multiplexing with TM10 serving cell configuration and TM9 interference model

The requirements are specified in Table 8.3.1.1F-2, with the addition of the parameters in Table 8.3.1.1F-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the

serving cell when the PDSCH transmission configured with TM10 in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.6.3. The NAICS network assistance is provided when the serving cell TM10 is configured with QCL-type A and PCID based DM-RS scrambling. The neighbouring cell has transmission mode TM9 and NeighCellsInfo-r12 for interfering cell indicates presence of TM9. In 8.3.1.1F-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.3.1.1F-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM10 serving cell configuration and TM9 interference model

Para	meter		Unit	Cell 1	Cell 2	Cell 3
		$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power alloc	ation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0
		σ	dB	-3	-3	-3
Cell-specific reference	e signals	3		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port			dBm/15kHz		-98	
\hat{E}_s/N_{oc}			dB	N/A	13.91	3.34
BW _{Channel}			MHz	10	10	10
Cyclic Prefix				Normal	Normal	Normal
Cell Id				0	1	6
Number of control OF	FDM sym	bols		3	3	3
CFI indicated in PCF				3	3	3
PDSCH transmission	mode			10	9	9
Interference model				N/A	As specified in clause B.6.4	As specified in clause B.6.4
Precoding				Random wideband precoding per TTI	As specified in clause B.6.4	As specified in clause B.6.4
CSI reference signals	3			Antenna ports 15, 16, 17, 18	Antenna ports 15, 16	Antenna ports 15, 16
CSI-RS periodicity an $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	nd subfra	me offset	Subframes	10 / 1	10 / 1	10 / 1
CSI reference signal	configura	ation		5	6	7
Zero-power CSI-RS of I _{CSI-RS} /ZeroPowerCS			Subframes / bitmap	6 / 10000000000 00000	6 / 01000000000 0000	6 / 00100000000 00000
Time offset to cell 1			us	N/A	2	3
Frequency offset to cell 1			Hz	N/A	200	300
MBSFN			Not configured	Not configured	Not configured	
NeighCellsInfo- r12 p-aList-r12			N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}	
(Note 4) transmissionModeList -r12			N/A	{2,3,4,8,9}	{2,3,4,8,9}	

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: CSI-RS configurations are according to [4] subclause 6.10.5.2.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.3.1.1F-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM10 serving cell configuration and TM9 interference model

Test Number	Referenc e Channel	OCI	NG Pat	tern	ern Propagation Correlation Conditions Matrix and Antenna Configuration		Reference	UE Cate gory					
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	
1	R.69 FDD	OP. 1 FD D	N/A	N/A	EP A5	EP A5	EP A5	4x2 Low	2x2 Low	2x2 Low	85	18.2	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

8.3.1.1G Single-layer Spatial Multiplexing (CRS assistance information is configured)

The requirements are specified in Table 8.3.1.1G-2, with the addition of parameters in Table 8.3.1.1G-1. The purpose is to verify the performance of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell with CRS assistance information. In Table 8.3.1.1G-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1, Cell2 and Cell 3 is according to Annex C.3.2. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.3.1.1G-1: Test parameters of TM9-Single-Layer (2 CSI-RS ports)

Parameter	r	Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)
	σ	dB	-3	-3	-3
N_{oc} at antenna port		dBm/15kHz	-98	N/A	N/A
$\hat{\mathbf{E}}_{s}/N_{oc}$		dB	Reference Value in Table 2	[10.45]	[4.6]
BW _{Channel}		MHz	10	10	10
Subframe Configuration	on		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset between	Cells	μs	N/A	3	-1
Frequency shift between	en Cells	Hz	N/A	300	-100
Cell Id			0	1	128
Cell-specific reference	e signals		A		
CSI reference signals			Antenna ports 15,16	N/A	N/A
CSI-RS periodicity an offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	d subframe	Subframes	5/2	N/A	N/A
CSI reference signal configuration			8	N/A	N/A
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPower bitmap	rCSI-RS	Subframes / bitmap	[3 / 0010000000000 000]	N/A	N/A
Number of control OF symbols	DM		2	2	2
PDSCH transmission	mode		TM9-1layer	N/A	N/A
Precoding granularity			Frequency domain: 1 PRG Time domain: 1 ms	N/A	N/A
Beamforming model			Annex B.4.1	N/A	N/A
Interference model			N/A	As specified in clause B.5.4	As specified in clause B.5.4
Probability of occurrent transmission in interfer		%		20	20
Probability of occurrence of		%	N/A	80	80
transmission rank in interfering cells	Rank 2	%	N/A	20	20
Cyclic prefix			Normal	Normal	Normal

Note 1: $P_B = 1$.

If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at Note 2: the eNB downlink before SF#(n+4).

The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.

Note 3:

SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test. Note 4:

Note 5: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.

Table 8.3.1.1G-2: Minimum Performance of TM9-Single-Layer (2 CSI-RS ports)

		OCNG Pattern			Propagation Conditions (Note1)		Correlation Matrix and	Reference	Value	UE	
Test Number	Reference Channel	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	Cate gory
1	TBD	OP.1 FDD	OP.1 FDD	OP.1 FDD		EVA5		2x2 Low	70	TBD	≥2

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.

Note 3: SNR corresponds to $\mathbb{E}_{\mathfrak{s}}/N_{\mathfrak{o}\mathfrak{o}}$ of cell 1.

8.3.1.2 Dual-Layer Spatial Multiplexing

For dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.3.1.2-2, with the addition of the parameters in Table 8.3.1.2-1 where Cell 1 is the serving cell and Cell 2 is the interfering cell. The downlink physical channel setup is set according to Annex C.3.2. The purpose of these tests is to verify the rank-2 performance for full RB allocation, to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

Table 8.3.1.2-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations

Parameter		Unit	Test 1		
		Onit	Cell 1	Cell 2	
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	4	0	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	4 (Note 1)	0	
	σ	dB	-3	-3	

Cell-specific reference signals		Antenna ports 0 and 1	Antenna ports 0 and 1
Cell ID		0	126
CSI reference signals		Antenna ports 15,16	NA
Beamforming model		Annex B.4.2	NA
CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	Subframes	5/2	NA
CSI reference signal configuration		8	NA
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap	Subframes / bitmap	3 / 00100000000000000	NA
$N_{\it oc}$ at antenna port	dBm/15kHz	-98	-98
\hat{E}_s/N_{oc}		Reference Value in Table 8.3.1.2-2	7.25dB
Symbols for unused PRBs		OCNG (Note 2)	NA
Number of allocated resource blocks (Note 2)	PRB	50	NA
Simultaneous transmission		No	NA
PDSCH transmission mode		9	Blanked

Note 1: $P_R = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.1.2-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations

Test number	Bandwidth and MCS	Reference Channel		NG tern		gation dition	Correlation Matrix and	Reference	value	UE Categ
			Cell1	Cell 2	Cell 1	Cell 2	Antenna Configurati on	Fraction of Maximum Throughput (%)	SNR (dB)	ory
1	10 MHz 16QAM 1/2	R.51 FDD	OP.1 FDD	N/A	ETU5	ETU5	2x2 Low	70	14.2	≥2

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

Note 3: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1.

8.3.1.2A Enhanced Performance Requirement Type C - Dual-Layer Spatial Multiplexing

The requirements are specified in Table 8.3.1.2A-2, with the addition of the parameters in Table 8.3.1.2A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of this test is to verify rank two performance for full RB allocation upon antenna ports 7 and 8.

Table 8.3.1.2A-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations

parameter		Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
	σ	dB	-3
Cell-specific reference signals	ence		Antenna ports 0 and 1
CSI reference sig	nals		Antenna ports 15,16
Beamforming mo	del		Annex B.4.2
CSI-RS periodicity subframe offse $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	et	Subframes	5/2
CSI reference sig configuration	ınal		8
Zero-power CSI- configuration I _{CSI-RS} / ZeroPowerCSI- bitmap		Subframes / bitmap	3 / 00100000000000000
N_{oc} at antenna p	oort	dBm/15kHz	-98
Symbols for unus PRBs	sed		OCNG (Note 2)
Number of alloca resource blocks (N		PRB	50
Simultaneous transmission			No
PDSCH transmis mode	sion		9
Note 1: D = 1			

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per

virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random

data, which is QPSK modulated.

Table 8.3.1.2A-2: Enhanced Performance Requirement Type C for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	value	UE
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz 16QAM 1/2	R.51 FDD	OP.1 FDD	EPA5	2x2 Medium	70	[17.4]	≥2

8.3.1.3 Performance requirements for DCI format 2D and non Quasi Co-located Antenna Ports

8.3.1.3.1 Minimum requirement with Same Cell ID (with single NZP CSI-RS resource)

The requirements are specified in Table 8.3.1.3.1-3, with the additional parameters in Table 8.3.1.3.1-1 and Table 8.3.1.3.1-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission point share the same Cell ID. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching according to the

'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling defined in [6], configured according to Table 8.3.1.3.1-2. In Tables 8.3.1.3.1-1 and 8.3.1.3.1-2, transmission point 1 (TP 1) is the serving cell and transmission point 2 (TP 2) transmits PDSCH. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Table 8.3.1.3.1-1: Test Parameters for quasi co-location type B: same Cell ID

Paramete	Parameter		TP 1	TP 2
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referer	nce signals		Antenna ports 0,1	(Note 2)
CSI-RS 0 antenr	na ports		NA	Port {15,16}
qcl-CSl-RS-Configl CSI-RS 0 period subframe offset T _{CSI}	icity and -RS / ∆csi-RS	Subframes	NA	5/2
qcl-CSI-RS-Configl CSI-RS 0 config	uration		NA	8
csi-RS-ConfigZPId- power CSI-RS 0 co I _{CSI-RS} / ZeroPower CSI-R	nfiguration		NA	2/ 0000010000000000
$N_{\it oc}$ at antenna	a port	dBm/15kH z	-98	-98
\widehat{E}_s/N_{oc}	\widehat{E}_s/N_{oc}		Reference point in Table 8.3.1.3.1-3	Reference point in Table 8.3.1.3.1-3
BW _{Channel}	BW _{Channel}		10	10
Cyclic Pref	ïx		Normal	Normal
Cell Id			0	0
Number of contro symbols	ol OFDM		2	2
PDSCH transmiss	ion mode		Blanked	10
Number of alloca	ted PRB	PRB	NA	50
qcl-Operation, PD Mapping and Qu Location Indic	asi-Co-		Туре	B, '00'
Time offset between	een TPs	μs	NA	Reference point in Table 8.3.1.3.1-3
Frequency error be	tween TPs	Hz	NA	0
Beamforming model			NA	Port 7 as specified in clause B.4.1
Symbols for unus	ed PRBs		NA	OCNG (Note 3)

Note 1: $P_{B} = 1$

Noet 2: REs for antenna ports 0 and 1 have zero transmission power.

Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.1.3.1-2: Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set index	Parameter	s in each PQI set	hypothesi	smission is for each Set
	NZP CSI-RS Index (For quasi	ZP CSI-RS configuration	TP 1	TP 2

	co-location)			
PQI set	CSI-RS 0	ZP CSI-RS 0	Blanked	PDSCH

Table 8.3.1.3.1-3: Minimum performance for quasi co-location type B: same Cell ID

Test Number	Reference Channel		CN tern	Time offset between	Propag Condi (Not	itions	Correlation Matrix and Antenna	Reference \	/alue	UE Category
		TP 1	TP 2	TPs (μs)	TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	R.52 FDD	NA	OP.1 FDD	2	EPA5	EPA5	2x2 Low	70	12.1	≥2
2	R.52 FDD	NA	OP.1 FDD	-0.5	EPA5	EPA5	2x2 Low	70	12.6	≥2

Note 1: The propagation conditions for TP 1 and TP 2 are statistically independent.

Note 2: The correlation matrix and antenna configuration apply for TP 1 and TP 2.

Note 3: SNR corresponds to \hat{E}_s/N_{oc} of TP 2 as defined in clause 8.1.1.

8.3.1.3.2 Minimum requirements with Same Cell ID (with multiple NZP CSI-RS resources)

The requirements are specified in Table 8.3.1.3.2-3, with the additional parameters in Tables 8.3.1.3.2-1 and 8.3.1.3.2-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission point share the same Cell ID. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling defined in [6]. In Tables 8.3.1.3.2-1 and 8.3.1.3.2-2, transmission point 1 (TP 1) is the serving cell transmitting PDCCH, synchronization signals and PBCH, and transmission point 2 (TP 2) has same Cell ID as TP 1. Multiple NZP CSI-RS resources and ZP CSI-RS resources are configured. In each sub-frame, DL PDSCH transmission is dynamically switched between 2 TPs with multiple PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator and downlink transmission hypothesis are defined in Table 8.3.1.3.2-2. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Table 8.3.1.3.2-1: Test Parameters for timing offset compensation with DPS transmission

paramete	r	Unit	TP 1	TP 2
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3

Beamforming model		N/A	As specified in clause B.4.1
Cell-specific reference signals		Antenna ports 0,1	(Note 2)
CSI reference signals 0		Antenna ports {15,16}	N/A
CSI-RS 0 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	Subframes	5/2	N/A
CSI reference signal 0 configuration		0	N/A
CSI reference signals 1		N/A	Antenna ports {15,16}
CSI-RS 1 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	Subframes	N/A	5/2
CSI reference signal 1 configuration		N/A	8
Zero-power CSI-RS 0 configuration I _{CSI-RS} / ZeroPower CSI-RS bitmap	Subframes /bitmap	2/ 001000000000000000	N/A
Zero-power CSI-RS1 configuration I _{CSI-RS} / ZeroPower CSI-RS bitmap _S	Subframes /bitmap	N/A	2/ 00000100000000000
\widehat{E}_s/N_{oc}	dB	Reference Value in Table 8.3.1.3.2-3	Reference Value in Table 8.3.1.3.2-3
$N_{\it oc}$ at antenna port	dBm/15kH z	-98	-98
BW _{Channel}	MHz	10	10
Cyclic Prefix		Normal	Normal
Cell Id		0	0
Number of control OFDM symbols		2	2
Timing offset between TPs		N/A	Reference Value in Table 8.3.1.3.2-3
Frequency offset between TPs	Hz	N/A	0
Number of allocated resource blocks	PRB	50	50
PDSCH transmission mode		10	10
Probability of occurrence of PDSCH transmission(Note 3)	%	30	70
Symbols for unused PRBs		OCNG (Note 4)	OCNG (Note 4)

Note 1: $P_{R} = 1$

Note 2: REs for antenna ports 0 and 1 have zero transmission power.

Note 3: PDSCH transmission from TPs shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TPs are specified.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 3:

Table 8.3.1.3.2-2: Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set index	Parameter	Parameters in each PQI set					
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2			
PQI set 0	CSI-RS 0	ZP CSI-RS 0	PDSCH	Blanked			
PQI set 3	CSI-RS 1	Blanked	PDSCH				

Table 8.3.1.3.2-3: Performance Requirements for timing offset compensation with DPS transmission

Test Number	Timing offset(us)	Reference Channel		NG Propagation Correlation tern Conditions Matrix and		Reference Value		UE Category		
			TP 1	TP 2	TP 1	TP 2	Antenna Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	2	R.53 FDD	OP.1 FDD	OP.1 FDD	EPA5	EPA5	2x2 Low	70	12.2	≥2
2	-0.5	R.53 FDD	OP.1 FDD	OP.1 FDD	EPA5	EPA5	2x2 Low	70	12.5	≥2
Note 1: Note 2:		ition conditions					dependent. for each of TP 1 and	TP 2.		

8.3.1.3.3 Minimum requirement with Different Cell ID and Colliding CRS (with single NZP CSI-RS resource)

SNR corresponds to E_s/N_{ac} of both TP 1 and TP 2 as defined in clause 8.1.1.

The requirements are specified in Table 8.3.1.3.3-2, with the additional parameters in Table 8.3.1.3.3-1. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission points have different Cell ID and colliding CRS. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the frequency difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' signalling defined in [6]. In Table 8.3.1.3.3-1, transmission point 1 (TP 1) is serving cell transmitting PDCCH, synchronization signals and PBCH, and transmission point 2 (TP 2) transmits PDSCH with different Cell ID. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Table 8.3.1.3.3-1: Test Parameters for quasi co-location type B with different Cell ID and Colliding CRS

paramete	r	Unit	TP 1	TP 2
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	0	0
	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3

Beamforming model		N/A	As specified in clause B.4.2	
Cell-specific reference signals		Antenna ports 0,1	Antenna ports 0,1	
CSI reference signals 0		N/A	Antenna ports {15,16}	
CSI-RS 0 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	Subframes	N/A	5/2	
CSI reference signal 0 configuration		N/A	0	
Zero-power CSI-RS 0 configuration I _{CSI-RS} / ZeroPower CSI-RS bitmap	Subframes /bitmap	N/A	2/ 00100000000000000	
\hat{E}_s/N_{oc}	dB	Reference point in Table 8.3.1.3.3-2 + 4dB	Reference Value in Table 8.3.1.3.3-2	
$N_{\scriptscriptstyle oc}$ at antenna port	dBm/15kH z	-98	-98	
BW _{Channel}	MHz	10	10	
Cyclic Prefix		Normal	Normal	
Cell Id		0	126	
Number of control OFDM symbols		1	2	
Timing offset between TPs	us	N/A	0	
Frequency offset between TPs	Hz	N/A	200	
qcl-Operation, 'PDSCH RE Mapping and Quasi-Co- Location Indicator'		Type B, '00'		
PDSCH transmission mode		Blank	10	
Number of allocated resource block		N/A	50	
Symbols for unused PRBs		N/A	OCNG(Note2)	

Note 1: $P_B = 1$

These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs Note 2: shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.1.3.3-2: Performance Requirements for quasi co-location type B with different Cell ID and **Colliding CRS**

Test Number	Reference Channel	OC Pat	_	Cond	gation itions te1)	Correlation Matrix and Antenna	Reference	Reference Value		
		TP1 TP2		TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)		
1	R.54 FDD	N/A	OP.1 FDD	EPA5	ETU5	2x2 Low	70	14.4	≥2	

Note 1:

The propagation conditions for TP.1 and TP.2 are statistically independent.

Correlation matrix and antenna configuration parameters apply for each of TP.1 and TP.2. Note 2:

SNR corresponds to \hat{E}_{s}/N_{oc} of TP.2 as defined in clause 8.1.1. Note 3:

8.3.1.3.4 Minimum requirement with Different Cell ID and non-colliding CRS (with single NZP CSI-RS resource and CRS assistance information is configured)

The requirements are specified in Table 8.3.1.3.4-3, with the additional parameters in Table 8.3.1.3.4-1 and Table 8.3.1.3.4-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where three transmission points have different Cell ID and non-colliding CRS. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the frequency difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' signalling defined in [6]. Further, the test verifies that the UE, configured with the CRS assistance information [7], can mitigate interference from CRS for demodulation. The CRS assistance information [7] includes TP 3. In Table 8.3.1.3.4-1, transmission point 1 (TP 1) is serving cell transmitting PDCCH, synchronization signals and PBCH, transmission point 2 (TP 2) transmits PDSCH with different Cell ID, and Transmission point 3 (TP 3) is the aggressor transmission point. The downlink physical channel setup for TP 1 is according to Table C.3.4-1, for TP 2 is according to Table C.3.4-2, and for TP 3 is according to Annex C.3.2.

Table 8.3.1.3.4-1: Test Parameters for quasi co-location type B with different Cell ID and non-Colliding CRS when CRS assistance information is configured

paramete	er	Unit	TP 1	TP 2	TP 3
Desirable nesses	$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0
	σ	dB	-3	-3	-3
Beamforming mode	I		N/A	Port 7 as specified in clause B.4.1	N/A
Cell-specific referen	nce signals		Antenna ports 0,1 Antenna ports 0,1		Antenna ports 0,1
CSI reference signa			N/A	Antenna ports {15,16}	N/A
CSI-RS 0 periodicity subframe offset T_{CS}	$_{I-RS}$ / Δ_{CSI-RS}	Subframes	N/A	5/2	N/A
CSI reference signal configuration	al O		N/A	0	N/A
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPower CSI-RS		Subframes /bitmap	N/A	2/ 00100000000000000	N/A
\hat{E}_s/N_{oc}		dB	TBD	Reference Value in Table 8.3.1.3.4-3	TBD
$N_{\it oc}$ at antenna por	t	dBm/15kH z	-98	-98	N/A
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	128
Number of control C symbols	OFDM		1 2		2
Timing offset between	en TPs	us	N/A	-0.5	3
Frequency offset be		Hz	N/A	200	-100
qcl-Operation, PDS Mapping and Quasi Location Indicator'			Type B, '00'		N/A
PDSCH transmission	n mode		Blank	10	9
Number of allocated block	d resource		N/A	50	N/A
Symbols for unused	I PRBs		N/A	OCNG(Note2)	N/A
Interference model			N/A	N/A	As specified in clause B.5.4
Probability of occurr transmission in inter cells		%	N/A	N/A	20
Probability of occurrence of	Rank 1	%	N/A	N/A	80
transmission rank in interfering cells	Rank 2	%	N/A	N/A	20

Note 1:

These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. Note 2:

Table 8.3.1.3.4-2: Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set index	Parameter	DL transmission hypothesis for each PQI Set		
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2
PQI set 0	CSI-RS 0	ZP CSI-RS 0	Blanked	PDSCH

Table 8.3.1.3.4-3: Performance Requirements for quasi co-location type B with different Cell ID and non-Colliding CRS when CRS assistance information is configured

	Refere	OCI	NG Patte	rn		ropagatio litions (N		Correlation Matrix and	Reference \	/alue	UE	
	Test nce Number Chann el	Chann	TP 1	TP 2	TP3	TP 1	TP 2	TP3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	Cate gory
	1	TBD	N/A	OP.1 FDD	N/A	EVA5	EVA5	EVA5	2x2 Low	70	TBD	≥2

Note 1: The propagation conditions for TP.1, TP.2 and TP.3 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of TP.1, TP.2 and TP.3.

Note 3: SNR corresponds to \hat{E}_{s}/N_{oc} of TP.2 as defined in clause 8.1.1.

8.3.1.3.5 Minimum requirements with different Cell ID and non-colliding CRS (with multiple NZP CSI-RS resources and CRS assistance information is configured)

The requirements are specified in Table 8.3.1.3.5-3, with the additional parameters in Tables 8.3.1.3.5-1 and 8.3.1.3.5-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where three transmission points have different Cell ID and non-colliding CRS. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling defined in [6]. Further, the test verifies that the UE, configured with the CRS assistance information [7], can mitigate interference from CRS for demodulation. The CRS assistance information [7] includes TP 3. In Tables 8.3.1.3.5-1 and 8.3.1.3.5-2, transmission point 1 (TP 1) is the serving cell transmitting PDCCH, synchronization signals and PBCH, Transmission point 2 (TP 2) has different Cell ID as TP 1, and Transmission point 3 (TP 3) is the aggressor transmission point. Multiple NZP CSI-RS resources and ZP CSI-RS resources are configured. In each sub-frame, DL PDSCH transmission is dynamically switched between TP 1 and TP 2 with multiple PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator and downlink transmission hypothesis are defined in Table 8.3.1.3.5-2. The downlink physical channel setup for TP 1 is according to Table C.3.4-1, for TP 2 is according to Table C.3.4-2, and for TP 3 is according to Annex C.3.2.

Table 8.3.1.3.5-1: Test Parameters for timing offset compensation with DPS transmission with CRS assistance information

paramet	er	Unit	TP 1	TP 2	TP 3
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0
	σ	dB	-3	-3	-3
Beamforming mod	el		As specified in clause B.4.1	As specified in clause B.4.1	N/A
Cell-specific refere	nce signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
CSI reference sign	als 0		Antenna ports {15,16}	N/A	N/A
CSI-RS 0 periodici subframe offset $T_{\rm C}$		Subframes	5/2	N/A	N/A
CSI reference sign configuration	al 0		0	N/A	N/A
CSI reference sign	als 1		N/A	Antenna ports {15,16}	N/A
CSI-RS 1 periodici subframe offset $T_{\rm C}$	ty and _{SI-RS} / ∆ _{CSI-RS}	Subframes	N/A	5/2	N/A
CSI reference sign configuration	al 1		N/A	8	N/A
Zero-power CSI-Riconfiguration I _{CSI-RS} / ZeroPower CSI-RS		Subframes /bitmap	2/ 00100000000000000	N/A	N/A
Zero-power CSI-Riconfiguration	er CSI-RS1		N/A	2/ 0000010000000000	N/A
\hat{E}_s/N_{oc}		dB	Reference Value in Table 8.3.1.3.5-3	Reference Value in Table 8.3.1.3.5-3	TBD
$N_{\it oc}$ at antenna po	rt	dBm/15kH z	-98	-98	N/A
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	128
Number of control symbols	OFDM		2	2	2
Timing offset between	een TPs		N/A	-0.5	3
Frequency offset b		Hz	N/A	200	-100
Number of allocate blocks	ed resource	PRB	50	50	N/A
PDSCH transmissi			10	10	9
Probability of occu PDSCH transmissi		%	30	70	N/A
Symbols for unuse	d PRBs		OCNG (Note 3)	OCNG (Note 3)	N/A
Interference model			N/A	N/A	As specified in clause B.5.4
Probability of occu transmission in inte cells			N/A	N/A	20
Probability of occurrence of transmission	ank 1	%	N/A	N/A	80

rank in interfering cells	Rank 2	%	N/A	N/A	20						
Note 1: $P_B = 1$ Note 2: PDSCH transmission from TPs shall be randomly determined independently for each subframe.											
			•	. ,	ir odbirdino.						
vir	Probabilities of occurrence of PDSCH transmission from TPs are specified. These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.										

Table 8.3.1.3.5-2: Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set index	Parameter	Parameters in each PQI set						
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2				
PQI set 0	CSI-RS 0	ZP CSI-RS 0	PDSCH	Blanked				
PQI set 1	CSI-RS 1	Blanked	PDSCH					

Table 8.3.1.3.5-3: Performance Requirements for timing offset compensation with DPS transmission

_	Refere	oci	OCNG Pattern			opagations (N		Correlation Matrix and	Reference Value		UE
Test Number	nce Chann el	TP 1	TP 2	TP3	TP 1	TP 2	TP3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	Cate
1	TBD	OP.1 FDD	OP.1 FDD	N/A	EVA5	EVA5	EVA5	2x2 Low	70	TBD	≥2
Note 1:	The propa	gation co	onditions	for TP.	I, TP.2 a	nd TP.3 a	are statist	ically independe	ent.		
Note 2:									1, TP.2 and TP.3	3.	
Note 3:	SNR corre	esponds t	to \widehat{E}_s/Λ	I_{oc} of T	P.2 as d	efined in	clause 8.	1.1.			

8.3.2 TDD

The parameters specified in Table 8.3.2-1 are valid for TDD unless otherwise stated.

Table 8.3.2-1: Common Test Parameters for User-specific Reference Symbols

Parameter	Unit	Value				
Uplink downlink configuration (Note 1)		1				
Special subframe configuration (Note 2)		4				
Cyclic prefix		Normal				
Cell ID		0				
Inter-TTI Distance		1				
Number of HARQ processes	Processes	7				
Maximum number of HARQ transmission		4				
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM and 256QAM				
Number of OFDM symbols for PDCCH	OFDM symbols	2				
Precoder update granularity		Frequency domain: 1 PRB for Transmission mode 8, 1 PRG for Transmission modes 9 and 10 Time domain: 1 ms				
ACK/NACK feedback mode		Multiplexing				
Note 1: as specified in Table 4.2-2 in TS 36.211 [4] Note 2: as specified in Table 4.2-1 in TS 36.211 [4]						

8.3.2.1 Single-layer Spatial Multiplexing

For single-layer transmission on antenna port 5, the requirements are specified in Table 8.3.2.1-2, with the addition of the parameters in Table 8.3.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the demodulation performance using user-specific reference signals with full RB or single RB allocation.

Table 8.3.2.1-1: Test Parameters for Testing DRS

Parameter		Unit	Test 1 Test 2		Test 3	Test 4	
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	0	0	0	0	
	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1) 0 (Note 1) 0		0 (Note 1)	0 (Note 1)	
	σ	dB	0	0	0	0	
Cell-specific refere	ence		Antenna port 0				
Beamforming mo	del		Annex B.4.1				
$N_{\it oc}$ at antenna port		dB/15kHz	-98	-98	-98	-98	
Symbols for unused PRBs			OCNG (Note 2)			OCNG (Note 2)	
PDSCH transmission mode			7	7	7	7	

Note 1: $P_{B} = 0$.

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.2.1-2: Minimum performance DRS (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference value		UE
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz QPSK 1/3	R.25 TDD	OP.1 TDD	EPA5	2x2 Low	70	-0.8	≥1
2	10 MHz 16QAM 1/2	R.26 TDD	OP.1 TDD	EPA5	2x2 Low	70	7.0	≥2
	5MHz 16QAM 1/2	R.26-1 TDD	OP.1 TDD	EPA5	2x2 Low	70	7.0	1
3	10 MHz 64QAM 3/4	R.27 TDD	OP.1 TDD	EPA5	2x2 Low	70	17.0	≥2
	10 MHz 64QAM 3/4	R.27-1 TDD	OP.1 TDD	EPA5	2x2 Low	70	17.0	1
4	10 MHz 16QAM 1/2	R.28 TDD	OP.1 TDD	EPA5	2x2 Low	30	1.7	≥1

For single-layer transmission on antenna ports 7 or 8 upon detection of a PDCCH with DCI format 2B, the requirements are specified in Table 8.3.2.1-4 and 8.3.2.1-5, with the addition of the parameters in Table 8.3.2.1-3 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify rank-1 performance on one of the antenna ports 7 or 8 with and without a simultaneous transmission on the other antenna port.

Table 8.3.2.1-3: Test Parameters for Testing CDM-multiplexed DM RS (single layer)

Parameter		Unit	Test 1	Test 2	Test 3	Test 4	Test 5
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	0	0	0	0	0
	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)
	σ	dB	-3	-3	-3	-3	-3
Cell-specific reference signals	е		Antenna port 0 and antenna port 1				
Beamforming mode			Annex B.4.1				
$N_{\it oc}$ at antenna port		dBm/15kHz	-98	-98	-98	-98	-98
Symbols for unused PF	Symbols for unused PRBs						OCNG (Note 4)
Simultaneous transmission			No	No	No	Yes (Note 3, 5)	Yes (Note 3, 5)
PDSCH transmission mode			8	8	8	8	8

Note 1: $P_R = 1$.

Note 2: The modulation symbols of the signal under test is mapped onto antenna port 7 or 8.

Note 3: Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 5: The two UEs' scrambling identities $n_{\rm SCID}$ are set to 0 for CDM-multiplexed DM RS with interfering simultaneous transmission test cases.

Table 8.3.2.1-4: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC)

Test	Bandwidt	Reference	OCNG	Propagation	Correlation	Reference	value	UE
number	h and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughpu t (%)	SNR (dB)	Category
1	10 MHz QPSK 1/3	R.31 TDD	OP.1 TDD	EVA5	2x2 Low	70	-1.0	≥1
2	10 MHz 16QAM 1/2	R.32 TDD	OP.1 TDD	EPA5	2x2 Medium	70	7.7	≥2
	5MHz 16QAM 1/2	R.32-1 TDD	OP.1 TDD	EPA5	2x2 Medium	70	7.7	1
3	10 MHz 64QAM 3/4	R.33 TDD	OP.1 TDD	EPA5	2x2 Low	70	17.7	≥2
	10 MHz 64QAM 3/4	R.33-1 TDD	OP.1 TDD	EPA5	2x2 Low	70	17.7	1

Table 8.3.2.1-5: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	/alue	UE			
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category			
4	10 MHz	R.32 TDD	OP.1 TDD	EPA5	2x2 Medium	70	21.9	≥2			
	16QAM 1/2	(Note 1)									
5	10 MHz	R.34 TDD	OP.1 TDD	EPA5	2x2 Low	70	22.0	≥2			
	64QAM 1/2	(Note 1)									
Note 1:	The reference	The reference channel applies to both the input signal under test and the interfering signal.									

8.3.2.1A Single-layer Spatial Multiplexing (with multiple CSI-RS configurations)

For single-layer transmission on antenna ports 7 or 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.3.2.1A-2 and 8.3.2.1A-3, with the addition of the parameters in Table 8.3.2.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify rank-1 performance on one of the antenna ports 7 or 8 with and without a simultaneous transmission on the other antenna port, and to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power.

Table 8.3.2.1A-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations

Parameter		Unit	Test 1	Test 2	Test 3			
Daniel a a a a a a	$ ho_{\scriptscriptstyle A}$	dB	0	0	0			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)			
	σ	dB	-3	-3	-3			
Cell-specific refere	ence			Antenna ports 0,1				
CSI reference sign	nals		Antenna ports 15,,22	Antenna ports 15,,18	Antenna ports 15,,18			
Beamforming model CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$			Annex B.4.1	Annex B.4.1	Annex B.4.1			
		Subframes	5 / 4	5 / 4	5 / 4			
CSI reference sig configuration			1	3	3			
Zero-power CSI- configuration I _{CSI-RS} / ZeroPowerCSI-I bitmap		Subframes / bitmap	4 / 0010000100000000	4 / 001000000000000000	4/ 001000000000000000			
N_{oc} at antenna p	ort	dBm/15kHz	-98	-98	-98			
Symbols for unus PRBs	sed		OCNG (Note 4)	OCNG (Note 4)	OCNG (Note 4)			
Number of alloca resource blocks (No		PRB	50	50	100			
Simultaneous transmission	,		No	Yes (Note 3, 5)	No			
PDSCH transmission mode			9	9	9			

Note 1: $P_R = 1$.

Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.

Note 3: Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 5: The two UEs' scrambling identities $n_{\rm SCID}$ are set to 0 for CDM-multiplexed DM RS with interfering simultaneous transmission test cases.

Table 8.3.2.1A-2: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations

Test	Bandwidt	Reference	OCNG	Propagation	Correlation	Reference	value	UE	UE DL
number	h and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughpu t (%)	SNR (dB)	Category	Cat- egory
1	10 MHz QPSK 1/3	R.50 TDD	OP.1 TDD	EVA5	2x2 Low	70	-0.6	≥1	≥6
3	20MHz 256QAM	R. 66 TDD	OP.1 TDD	EPA5	2x2 Low	70	24.3	11-12	≥11

Table 8.3.2.1A-3: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	UE		
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category	
2	10 MHz 64QAM 1/2	R.44 TDD	OP.1 TDD	EPA5	2x2 Low	70	22.1	≥2	
Note 1: The reference channel applies to both the input signal under test and the interfering signal.									

8.3.2.1B Enhanced Performance Requirement Type A – Single-layer Spatial Multiplexing with TM9 interference model

The requirements are specified in Table 8.3.2.1B-2, with the addition of the parameters in Table 8.3.2.1B-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed-loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4. In 8.3.2.1B-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

Table 8.3.2.1B-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model

paramete	r	Unit	Cell 1	Cell 2
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referer	nce signals		Antenna ports 0,1	Antenna ports 0,1
CSI reference s			Antenna ports 15,,18	N/A
CSI-RS periodic subframe offset $T_{\rm CSI}$	$_{ extsf{-RS}}$ / $\Delta_{ extsf{CSI-RS}}$	Subframes	5 / 4	N/A
CSI reference configuration			0	N/A
$N_{\it oc}$ at antenn	a port	dBm/15kH z	-98	N/A
DIP (Note	2)	dB	N/A	-1.73
BW _{Channe}	I	MHz	10	10
Cyclic Pref	ix		Normal	Normal
Cell Id			0	126
Number of contro symbols	ol OFDM		2	2
PDSCH transmiss	ion mode		9	N/A
Beamforming model			As specified in clause B.4.3 (Note 4, 5)	N/A
Interference n	nodel		N/A	As specified in clause B.5.4
Probability of occurrence of	Rank 1		N/A	70
transmission rank in interfering cells	Rank 2		N/A	30
Precoder update g	ranularity	PRB	50	6
PMI delay (No	ote 5)	ms	10 or 11	N/A
Reporting into	erval	ms	5	N/A
Reporting m	ode		PUCCH 1-1	N/A
CodeBookSubsetF bitmap	Restriction		000000000000000 00000000000000000 000000	N/A
Symbols for unus	ed PRBs		OCNG (Note 6)	N/A
Simultaneous tran			No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test	N/A
Physical channel reporting			PUSCH(Note 8)	N/A
cqi-pmi-Configura			4	N/A

Note 1: $P_B = 1$

Note 2: The respective received power spectral density of each interfering cell relative to N_{oc} ' is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4:	The precoder in clause B.4.3 follows UE recommended PMI.
Note 5:	If the UE reports in an available uplink reporting instance at subrame SF#n based
	on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI
	cannot be applied at the eNB downlink before SF#(n+4).
Note 6:	These physical resource blocks are assigned to an arbitrary number of virtual UEs
	with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs
	shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 7:	All cells are time-synchronous.
Note 8:	To avoid collisions between CQI reports and HARQ-ACK it is necessary to report
	both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in
	downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on
	PUSCH in uplink subframe SF#8 and #3.

Table 8.3.2.1B-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model

Test Number	Referenc e		NG tern		gation itions			alue	UE Categor
	Channel	Cell 1	Cell 2	Cell 1	Cell 2	and Antenna Configurat ion (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	у
1	R.48 TDD	OP.1 TDD	N/A	EVA5	EVA5	4x2 Low	70	-1.0	≥1

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

8.3.2.1C Single-layer Spatial Multiplexing (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

The requirements are specified in Table 8.3.2.1.C -2, with the addition of parameters in Table 8.3.2.1.C -1. The purpose is to verify the performance of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell with CRS assistance information. In Table 8.3.2.1.C -1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.3.2.1.C-1: Test parameters of TM9-Single-Layer (2 CSI-RS ports) – Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink Conf	iguration		1	1	1
Special subframe con	figuration		4	4	4
	$ ho_{\scriptscriptstyle A}$	dB	0	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	-3 (Note 1)	-3 (Note 1)
	σ	dB	-3	N/A	N/A
	N_{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 2	12	10
BW _{Channel}		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift between	een Cells	Hz	N/A	300	-100
Cell Id			0	1	126
Cell-specific reference	e signals		A	ntenna ports 0,1	
CSI reference sig	ınals		Antenna ports 15,16	N/A	N/A
CSI-RS periodicity subframe offse $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	et	Subframes	5 / 4	N/A	N/A
CSI reference significant configuration			8	N/A	N/A
Zero-power CSI- configuration I _{CSI-RS} / ZeroPower bitmap	-RS	Subframes / bitmap	[4 / 00100000000000 00]	N/A	N/A
ABS pattern (No	•		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Measur Subframe Pattern (I			000000001 000000001	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		000000001 000000001	N/A	N/A
(Note7)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
Number of control symbols	OFDM		2	Note 8	Note 8
PDSCH transmissio	n mode		TM9-1layer	Note 9	Note 9
Precoding granularity			Frequency domain: 1 PRG Time domain: 1 ms	N/A	N/A
Beamforming mo			Annex B.4.1	N/A	N/A
Cyclic prefix			Normal	Normal	Normal

Note 1:	$P_B = 1$.
Note 2:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a
	subframe overlapping with the aggressor ABS.
Note 3:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 4:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 5:	ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the
	definition of the reference channel.
Note 6:	Time-domain measurement resource restriction pattern for PCell measurements as defined
	in [7]
Note 7:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
Note 8:	The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 9:	Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.
Note 10:	If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
Note 11:	For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.
Note 12:	The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 13:	SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.
Note 14:	The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.

Table 8.3.2.1.C-2: Minimum Performance of TM9-Single-Layer (2 CSI-RS ports) – Non-MBSFN ABS

	Test Number	Reference Channel	OC	NG Patt			Correlation Matrix and	Reference	UE Cate			
			Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	gory
	1	R.51 TDD	OP.1 TDD	OP.1 TDD	OP.1 TDD		EVA5		2x2 Low	70	8.5	≥2
	Note 1:	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.										
Note O. The completion rectific and entering configuration can be for Call 4. Call 9.									1 - II O I O - II O			

Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.

SNR corresponds to \hat{E}_s/N_{oc2} of cell 1. Note 3:

Enhanced Performance Requirement Type B - Single-layer Spatial 8.3.2.1D Multiplexing with TM9 interference

The requirements are specified in Table 8.3.2.1D-2, with the addition of the parameters in Table 8.3.2.1D-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 9 interference model defined in clause B.6.4. In 8.3.2.1D-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.3.2.1D-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM9 interference model

Paramet	er	Unit	Cell 1	Cell 2	Cell 3
Uplink downlink Configura	ation		1	1	1
Special subframe configu	ration		4	4	4
	$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power allocation	n $ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0
	σ	dB	-3	-3	-3
Cell-specific reference sig	gnals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port	dBm/15kHz		-98		
\hat{E}_s/N_{oc}		dB	N/A	13.91	3.34
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	6
Number of control OFDM normal subframes	symbols in		3	3	3
CFI indicated in PCFICH subframes	in normal		3	3	3
Number of control OFDM special subframes	symbols in		2	2	2
CFI indicated in PCFICH	in special		2	2	2
subframes				_	
PDSCH transmission mo	de		9	9	9
Interference model			N/A	As specified in clause B.6.4	As specified in clause B.6.4
Precoding			Random wideband precoding per TTI	As specified in clause B.6.4	As specified in clause B.6.4
CSI reference signals			Antenna ports 15, 16, 17, 18	Antenna ports 15, 16	Antenna ports 15, 16
CSI-RS periodicity and su $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	ubframe offset	Subframes	10 / 4	10 / 4	10 / 4
CSI reference signal conf	iguration		5	6	7
Zero-power CSI-RS confi I _{CSI-RS} /ZeroPowerCSI-RS	Subframes / bitmap	9 / 10000000000 00000	9 / 010000000000 0000	9 / 00100000000 00000	
Time offset to cell 1		us	N/A	2	3
Frequency offset to cell 1	Hz	N/A	200	300	
MBSFN			Not configured	Not configured	Not configured
NeighCellsInfo- p-al	ist-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
(Note 4) tran	smissionModeList		N/A	{2,3,4,8,9}	{2,3,4,8,9}

Note 1:

Cell 1 is the serving cell. Cell 2, 3 are the interfering cells. CSI-RS configurations are according to [4] subclause 6.10.5.2. NeighCellsInfo-r12 is described in subclause 6.3.2 of [7]. Note 2: Note 3:

Note 4:

Table 8.3.2.1D-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM9 interference model

Test Numb	Reference Channel	OCI	NG Pat	tern	Propagation Correlation Matrix and Conditions Antenna Configuration			Reference	UE Cate				
er		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.69 TDD	OP. 1 TD D	N/A	N/A	EP A5	EP A5	EP A5	4x2 Low	2x2 Low	2x2 Low	85	18.0	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to \hat{E}_{s}/N_{ac} of Cell 1 as defined in clause 8.1.1.

8.3.2.1E Enhanced Performance Requirement Type B – Single-layer Spatial Multiplexing with CRS interference model

The requirements are specified in Table 8.3.2.1E-2, with the addition of the parameters in Table 8.3.2.1E-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by the CRS of the interfering cell, applying the CRS interference model defined in clause B.6.5. In 8.3.2.1E-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.3.2.1E-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with CRS interference model

Parar	meter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink Confi				1	1	1
Special subframe con	figuratio	n		4	4	4
		$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power allocation		$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0
		σ	dB	-3	-3	-3
Cell-specific reference	e signals	•		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port			dBm/15kHz		-98	
\hat{E}_s/N_{oc}			dB	N/A	13.91	3.34
BW _{Channel}			MHz	10	10	10
Cyclic Prefix				Normal	Normal	Normal
Cell Id				0	1	6
Number of control OF normal subframes	DM sym	bols in		3	3	3
CFI indicated in PCFI subframes	CH in no	ormal		3	3	3
Number of control OF special subframes	DM sym	bols in		2	2	2
CFI indicated in PCFI subframes	CH in sp	ecial		2	2	2
PDSCH transmission	mode			8	N/A	N/A
Interference model				N/A	As specified in clause B.6.5	As specified in clause B.6.5
Precoding				Random wideband precoding per TTI	N/A	N/A
Time offset to cell 1			us	N/A	2	3
Frequency offset to cell 1			Hz	N/A	200	300
MBSFN			Not configured	Not configured	Not configured	
NeighCellsInfo- r12 p-aList-r12			N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}	
(Note 3) transmissionModeList -r12				N/A	{2,3,4,8,9}	{2,3,4,8,9}
Note 1: $P_{p} = 1$						

Note 1: $P_B = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.3.2.1E-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with CRS interference model

Test Number	Reference Channel	OCI	NG Pat	tern	Propagation Conditions		Correlation Reference Value Matrix and			UE Cate	
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.71 TDD	OP. 1 TD D	N/A	N/A	EP A5	EP A5	EP A5	2x2 Low	85	14.0	≥2

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.3.2.1F Enhanced Performance Requirement Type B – Single-layer Spatial Multiplexing with TM3 interference

The requirements are specified in Table 8.3.2.1F-2, with the addition of the parameters in Table 8.3.2.1F-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of two interfering cells applying transmission mode 3 interference model defined in clause B.6.2. In 8.3.2.1F-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.3.2.1F-1: Test Parameters for Testing CDM-multiplexed DM RS (Single-layer) with TM3 interference model

Parai	meter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink Confi				1	1	1
Special subframe con	ıfigurat	ion		4	4	4
		$ ho_{\scriptscriptstyle A}$	dB	0	-3	-3
Downlink power allocation	ation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	-3	-3
		σ	dB	-3	0	0
Cell-specific reference	e signa	ls		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port			dBm/15kHz		-98	
\hat{E}_s/N_{oc}			dB	N/A	3.28	0.74
BW _{Channel}			MHz	10	10	10
Cyclic Prefix				Normal	Normal	Normal
Cell Id				0	1	6
Number of control OF normal subframes	DM sy	mbols in		3	3	3
CFI indicated in PCFI subframes	CH in	normal		3	Random from set {1,2,3}	Random from set {1,2,3}
Number of control OF special subframes	DM sy	mbols in		2	2	2
CFI indicated in PCFI subframes		special		2	Random from set {1,2}	Random from set {1,2}
PDSCH transmission	mode			8	3	3
Interference model				N/A	As specified in clause B.6.2	As specified in clause B.6.2
Precoding			Random wideband precoding per TTI	As specified in clause B.6.2	As specified in clause B.6.2	
Time offset to cell 1		_	us	N/A	2	3
Frequency offset to cell 1		Hz	N/A	200	300	
MBSFN			Not configured	Not configured	Not configured	
NeighCellsInfo- r12	p-aList	-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
` '	transm -r12	issionModeList		N/A	{2,3,4,8,9}	{2,3,4,8,9}
Note 1: D 1					<u> </u>	

Note 1: $P_R = 1$

Note 2: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 3: CSI-RS configurations are according to [4] subclause 6.10.5.2.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.3.2.1F-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS with TM3 interference model

Test Number	Reference Channel	OCI	NG Pat	tern	Propagation Conditions		Correlation Reference Value Matrix and			UE Cate	
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	gory
1	R.70 TDD	OP. 1 TD D	N/A	N/A	EP A5	EP A5	EP A5	2x2 Low	85	11.3	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SNR corresponds to $\hat{E}_{\rm s}/N_{\rm ac}$ of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.

8.3.2.1G Enhanced Performance Requirement Type B – Single-layer Spatial Multiplexing with TM10 serving cell configuration and TM9 interference model

The requirements are specified in Table 8.3.2.1G-2, with the addition of the parameters in Table 8.3.2.1G-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission configured with TM10 in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.6.3. The NAICS network assistance is provided when the serving cell TM10 is configured with QCL-type A and PCID based DM-RS scrambling. The neighbouring cell has transmission mode TM9 and NeighCellsInfo-r12 for interfering cell indicates presence of TM9. In 8.3.2.1G-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

Table 8.3.2.1G-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) Multiplexing with TM10 serving cell configuration and TM9 interference model

Parameter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink Configuration			1	1	1
Special subframe configuration	ion		4	4	4
1	$ ho_{\scriptscriptstyle A}$	dB	0	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0
	σ	dB	-3	-3	-3
Cell-specific reference signa	ls		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port		dBm/15kHz		-98	
\widehat{E}_s/N_{oc}		dB	N/A	13.91	3.34
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	6
Number of control OFDM sy normal subframes			3	3	3
CFI indicated in PCFICH in r subframes	normal		3	3	3
Number of control OFDM sy special subframes			2	2	2
CFI indicated in PCFICH in subframes	special		2	2	2
PDSCH transmission mode			10	9	9
Interference model			N/A	As specified in clause B.6.4	As specified in clause B.6.4
Precoding			Random wideband precoding per TTI	As specified in clause B.6.4	As specified in clause B.6.4
CSI reference signals			Antenna ports 15, 16, 17, 18	Antenna ports 15, 16	Antenna ports 15, 16
CSI-RS periodicity and subfite $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	ame offset	Subframes	10 / 4	10 / 4	10 / 4
CSI reference signal configu	ration		5	6	7
Zero-power CSI-RS configur	Subframes / bitmap	9 / 10000000000 00000	9 / 01000000000 0000	9 / 00100000000 00000	
Time offset to cell 1		us	N/A	2	3
Frequency offset to cell 1	Hz	N/A	200	300	
MBSFN			Not configured	Not configured	Not configured
NeighCellsInfo- r12 p-aList			N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
(Note 4) transm		N/A	{2,3,4,8,9}	{2,3,4,8,9}	

Note 1: $P_B = 1$

Note 2:

Cell 1 is the serving cell. Cell 2, 3 are the interfering cells. CSI-RS configurations are according to [4] subclause 6.10.5.2. Note 3:

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 8.3.2.1G-2: Minimum Performance for Enhanced Performance Requirement Type B, CDM-multiplexed DM RS Multiplexing with TM10 serving cell configuration and TM9 interference model

Test Number	Reference Channel	OCI	NG Pat	tern		opagat onditio		Correlation Matrix and Antenna Configurati on		ind na	Reference Value		UE Cate gory
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	C ell 1	C ell 2	C ell 3	Fraction of Maximum Throughput (%)	SNR (dB) (Note 2)	
1	R.69 TDD	OP. 1 TD D	N/A	N/A	EP A5	EP A5	EP A5	4x 2 Lo w	2x 2 Lo w	2x 2 Lo w	85	18.0	≥1

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{ac} of Cell 1 as defined in clause 8.1.1.

8.3.2.1H Single-layer Spatial Multiplexing (CRS assistance information is configured)

The requirements are specified in Table 8.3.2.1H-2, with the addition of parameters in Table 8.3.2.1H-1. The purpose is to verify the performance of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell with CRS assistance information. In Table 8.3.2.1H-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1, Cell 2 and Cell 3 is according to Annex C.3.2. The CRS assistance information [7] includes Cell 2 and Cell 3.

Table 8.3.2.1H-1: Test parameters of TM9-Single-Layer (2 CSI-RS ports)

Parar	meter	Unit	Cell 1	Cell 2	Cell 3		
Uplink downlink	Configuration		1	1	1		
Special subframe	e configuration		4	4	4		
	$ ho_{\scriptscriptstyle A}$	dB	0	0	0		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)		
anodation	σ	dB	-3	-3	-3		
N_{oc} at antenna p	oort	dBm/15kHz	-98	N/A	N/A		
Ê _s /N _{oc}		dB	Reference Value in Table 2	[10.45]	[4.6]		
BW _{Channel}		MHz	10	10	10		
Subframe Config	juration		Non-MBSFN	Non-MBSFN	Non-MBSFN		
Time Offset betw	veen Cells	μs	N/A	3	-1		
Frequency shift b	oetween Cells	Hz	N/A	300	-100		
Cell Id			0	1	126		
Cell-specific refe	rence signals		A	Antenna ports 0,1			
CSI reference sig	gnals		Antenna ports 15,16	N/A	N/A		
CSI-RS periodici subframe offset $T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$	ty and	Subframes	5/4	N/A	N/A		
CSI reference significant	gnal		8	N/A	N/A		
Zero-power CSI-configuration I _{CSI-RS} / Zeroi bitmap	PowerCSI-RS	Subframes / bitmap	[4 / 0010000000000 000]	N/A	N/A		
Number of control symbols	ol OFDM		2	2	2		
PDSCH transmis	ssion mode		TM9-1layer	N/A	N/A		
Interference mod	del		N/A	As specified in clause B.5.4	As specified in clause B.5.4		
Probability of occ transmission in i		%		20	20		
Probability of occurrence of transmission			N/A	80	80		
rank in interfering cells	interfering Rank 2		N/A	20	20		
Precoding granu	larity		Frequency domain: 1 PRG Time domain: 1 ms	N/A	N/A		
Beamforming mo	odel		Annex B.4.1	N/A	N/A		
Cyclic prefix			Normal	Normal	Normal		

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

Note 4: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.

Note 5: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Note 6: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.

Table 8.3.2.1H-2: Minimum Performance of TM9-Single-Layer (2 CSI-RS ports)

			OCNG Pattern			opagations (N		Correlation Matrix and	Reference Value		UE
Test Number	Reference Channel	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	Cate gory
1	TBD	OP.1 TDD	OP.1 TDD	OP.1 TDD		EVA5		2x2 Low	70	TBD	≥2

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.

Note 3: SNR corresponds to $\mathbb{E}_{\mathfrak{s}}/N_{\mathfrak{o}\mathfrak{o}}$ of cell 1.

8.3.2.2 Dual-Layer Spatial Multiplexing

For dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2B, the requirements are specified in Table 8.3.2.2-2, with the addition of the parameters in Table 8.3.2.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the rank-2 performance for full RB allocation.

Table 8.3.2.2-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer)

Parame	ter	Unit	Test 1	Test 2	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0	0	
power	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)	
allocation	σ	dB	-3	-3	
Cell-spec reference symbol	ce		Antenna port 0 and antenna p		
Beamforn model			Annex B.4.2		
N_{oc} at ant	enna	dBm/15kHz	-98	-98	
Symbols unused P			OCNG (Note 2)	OCNG (Note 2)	
Number of allocated resource blocks		PRB	50	50	
PDSCH transmission mode			8	8	

Note 1: $P_B = 1$.

Note 2: These physical resource blocks are assigned to an arbitrary

number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo

random data, which is QPSK modulated.

Table 8.3.2.2-2: Minimum performance for CDM-multiplexed DM RS (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	/alue	UE
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz QPSK 1/3	R.31 TDD	OP.1 TDD	EVA5	2x2 Low	70	4.5	≥2
2	10 MHz 16QAM 1/2	R.32 TDD	OP.1 TDD	EPA5	2x2 Medium	70	21.7	≥2

8.3.2.2A Enhanced Performance Requirement Type C - Dual-Layer Spatial Multiplexing

The requirements are specified in Table 8.3.2.2A-2, with the addition of the parameters in Table 8.3.2.2A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the rank-2 performance for full RB allocation upon antenna ports 7 and 8.

Table 8.3.2.2A-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer)

Parame	ter	Unit	Test 1
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0
power	$\rho_{\scriptscriptstyle B}$	dB	0 (Note 1)
allocation	σ	dB	-3
Cell-sper reference symbol	ce		Antenna port 0 and antenna port 1
Beamforn mode	_		Annex B.4.2
N_{oc} at ant	enna	dBm/15kHz	-98
Symbols unused P			OCNG (Note 2)
Number allocate resource b	ed	PRB	50
PDSCH transmission mode			8
Note 1:	D = 1		

Note 1: $P_{R} = 1$.

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one

an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.2.2A-2: Enhanced Performance Requirement Type C for CDM-multiplexed DM RS (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference value		UE
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz 16QAM 1/2	R.32 TDD	OP.1 TDD	EPA5	2x2 Medium	70	[17.0]	≥2

8.3.2.3 Dual-Layer Spatial Multiplexing (with multiple CSI-RS configurations)

For dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.3.2.3-2, with the addition of the parameters in Table 8.3.2.3-1 where Cell 1 is the serving cell and Cell 2 is the interfering cell. The downlink physical channel setup is set according to Annex C.3.2. The purpose of these tests is to verify the rank-2 performance for full RB allocation, to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

Table 8.3.2.3-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations

Parameter		l lmi4	Test 1			
		Unit	Cell 1	Cell 2		
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	4	0		
allocation	$ ho_{\scriptscriptstyle B}$	dB	4 (Note 1)	0		

σ	dB	-3	-3
Cell-specific reference signals		Antenna ports 0 and 1	Antenna ports 0 and 1
Cell ID		0	126
CSI reference signals		Antenna ports 15,16	NA
Beamforming model		Annex B.4.2	NA
CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$	Subframes	5 / 4	NA
CSI reference signal configuration		8	NA
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap	Subframes / bitmap	4 / 001000000000000000	NA
$N_{\it oc}$ at antenna port	dBm/15kHz	-98	-98
\widehat{E}_s/N_{oc}		Reference Value in Table 8.3.2.3-2	Test specific, 7.25dB
Symbols for unused PRBs		OCNG (Note 2)	NA
Number of allocated resource blocks (Note 2)	PRB	50	NA
Simultaneous transmission		No	NA
PDSCH transmission mode		9	Blanked

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.2.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations

Test number	Bandwidth and MCS	Reference Channel	OCNG Pattern		Propagation Condition		Correlation Matrix and	Reference	UE Cate	
			Cell 1	Cell 2	Cell 1	Cell 2	Antenna Configurati on	Fraction of Maximum Throughput (%)	SNR (dB)	gory
1	10 MHz 16QAM 1/2	R.51 TDD	OP.1 TDD	N/A	ETU5	ETU5	2x2 Low	70	14.8	≥2

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

Note 3: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1.

8.3.2.4 Performance requirements for DCI format 2D and non Quasi Co-located Antenna Ports

8.3.2.4.1 Minimum requirement with Same Cell ID (with single NZP CSI-RS resource)

The requirements are specified in Table 8.3.2.4.1-3, with the additional parameters in Table 8.3.2.4.1-1 and Table 8.3.2.4.1-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission point share the same Cell ID. In particular the

test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling defined in [6], configured according to Table 8.3.2.4.1-2. In Tables 8.3.2.4.1-1 and 8.3.2.4.1-2, transmission point 1 (TP 1) is the serving cell and transmission point 2 (TP 2) transmits PDSCH. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Table 8.3.2.4.1-1: Test Parameters for quasi co-location type B: same Cell ID

Paramete	Parameter		TP 1	TP 2
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referer	nce signals		Antenna ports 0,1	(Note 2)
CSI-RS 0 antenr	na ports		NA	Port {15,16}
qcI-CSI-RS-ConfigNZPId-r11, CSI-RS 0 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$		Subframes	NA	5/4
qcl-CSI-RS-Configl CSI-RS 0 config	uration		NA	8
csi-RS-ConfigZPId-r11, Zero- power CSI-RS 0 configuration I _{CSI-RS} / ZeroPower CSI-RS bitmap			NA	4/ 0000010000000000
$N_{\it oc}$ at antenna port		dBm/15kH z	-98	-98
\widehat{E}_s/N_{oc}		dB	Reference point in Table 8.3.2.4.1-3	Reference point in Table 8.3.2.4.1-3
BW _{Channe}	ı	MHz	10	10
Cyclic Pref	ix		Normal	Normal
Cell Id			0	0
Number of contro symbols	ol OFDM		2	2
PDSCH transmiss	ion mode		Blanked	10
Number of alloca	ted PRB	PRB	NA	50
qcl-Operation, 'PDSCH RE Mapping and Quasi-Co- Location Indicator'			Туре	B, '00'
Time offset between	een TPs	μs	NA	Reference point in Table 8.3.2.4.1-3
Frequency error be	tween TPs	Hz	NA	0
Beamforming i	model		NA	Port 7 as specified in clause B.4.1
Symbols for unus	ed PRBs		NA	OCNG (Note 3)

Note 1: $P_{R} = 1$

Noet 2: REs for antenna ports 0 and 1 have zero transmission power.

Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.2.4.1-2: Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set	Parameters in each PQI set	DL transmission
		hypothesis for each

index							
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2			
PQI set 0	CSI-RS 0	ZP CSI-RS 0	Blanked	PDSCH			

Table 8.3.2.4.1-3: Minimum performance for quasi co-location type B: same Cell ID

Test Number	Reference Channel	OGCN pattern		Time offset between	Propagation Conditions (Note1)		Correlation Matrix and Antenna	Reference Value		UE Category
		TP 1	TP 2	TPs (μs)	TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	R.52 TDD	NA	OP.1 TDD	2	EPA5	EPA5	2x2 Low	70	12	≥2
2	R.52 TDD	NA	OP.1 TDD	-0.5	EPA5	EPA5	2x2 Low	70	12.4	≥2

Note 1: The propagation conditions for TP 1 and TP 2 are statistically independent.

Note 2: The correlation matrix and antenna configuration apply for TP 1 and TP 2.

Note 3: SNR corresponds to \hat{E}_s/N_{ac} of TP 2 as defined in clause 8.1.1.

8.3.2.4.2 Minimum requirements with Same Cell ID (with multiple NZP CSI-RS resources)

The requirements are specified in Table 8.3.2.4.2-3, with the additional parameters in Tables 8.3.2.4.2-1 and 8.3.2.4.2-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission point share the same Cell ID. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling defined in [6]. In Tables 8.3.2.4.2-1 and 8.3.2.4.2-2, transmission point 1 (TP 1) is the serving cell transmitting PDCCH, synchronization signals and PBCH, and transmission point 2 (TP 2) has same Cell ID as TP 1. Multiple NZP CSI-RS resources and ZP CSI-RS resources are configured. In each sub-frame, DL PDSCH transmission is dynamically switched between 2 TPs with multiple PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator and downlink transmission hypothesis are defined in Table 8.3.2.4.2-2. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Table 8.3.2.4.2-1: Test Parameters for timing offset compensation with DPS transmission

parameter		Unit	TP 1	TP 2
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3

Beamforming model		N/A	As specified in clause B.4.1
Cell-specific reference signals		Antenna ports 0,1	(Note 2)
CSI reference signals 0		Antenna ports {15,16}	N/A
CSI-RS 0 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	Subframes	5 / 4	N/A
CSI reference signal 0 configuration		0	N/A
CSI reference signals 1		N/A	Antenna ports {15,16}
CSI-RS 1 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	Subframes	N/A	5 / 4
CSI reference signal 1 configuration		N/A	8
Zero-power CSI-RS 0 configuration I _{CSI-RS} / ZeroPower CSI-RS bitmap	Subframes /bitmap	4/ 00100000000000000	N/A
Zero-power CSI-RS1 configuration I _{CSI-RS} / ZeroPower CSI-RS bitmap _S	Subframes /bitmap	N/A	4/ 0000010000000000
\widehat{E}_s/N_{oc}	dB	Reference Value in Table 8.3.2.4.2-3	Reference Value in Table 8.3.2.4.2-3
$N_{_{oc}}$ at antenna port	dBm/15kH z	-98	-98
BW _{Channel}	MHz	10	10
Cyclic Prefix		Normal	Normal
Cell Id		0	0
Number of control OFDM symbols		2	2
Timing offset between TPs		N/A	Reference Value in Table 8.3.2.4.2-3
Frequency offset between TPs	Hz	N/A	0
Number of allocated resource blocks	PRB	50	50
PDSCH transmission mode		10	10
Probability of occurrence of PDSCH transmission(Note 3)	%	30	70
Symbols for unused PRBs		OCNG (Note 4)	OCNG (Note 4)

Note 1: $P_{p} = 1$

Note 2: REs for antenna ports 0 and 1 have zero transmission power.

Note 3: PDSCH transmission from TPs shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TPs are specified.

Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.2.4.2-2: Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set index	Parameter	Parameters in each PQI set					
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2			
PQI set 0	CSI-RS 0	ZP CSI-RS 0	PDSCH	Blanked			
PQI set 1	CSI-RS 1	Blanked	PDSCH				

Table 8.3.2.4.2-3: Performance Requirements for timing offset compensation with DPS transmission

Test Number	Timing offset(us)	Reference Channel	OCNG Propagation Pattern Conditions		Correlation Reference Value Matrix and		UE Category			
			TP 1	TP 2	TP 1	TP 2	Antenna Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	2	R.53 TDD	OP.1 TDD	OP.1 TDD	EPA5	EPA5	2x2 Low	70	12.3	≥2
2	-0.5	R.53 TDD	OP.1 TDD	OP.1 TDD	EPA5	EPA5	2x2 Low	70	12.5	≥2
Note 1: Note 2: Note 3:	Note 1: The propagation conditions for TP 1 and TP 2 are statistically independent. Note 2: Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.									

8.3.2.4.3 Minimum requirement with Different Cell ID and Colliding CRS (with single NZP CSI-RS resource)

The requirements are specified in Table 8.3.2.4.3-2, with the additional parameters in Table 8.3.2.4.3-1. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission points have different Cell ID and colliding CRS. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the frequency difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' signalling defined in [6]. In Table 8.3.2.4.3-1, transmission point 1 (TP 1) is serving cell transmitting PDCCH, synchronization signals and PBCH, and transmission point 2 (TP 2) transmits PDSCH with different Cell ID. The downlink physical channel setup for TP 1 is according to Table C.3.4-1 and for TP 2 according to Table C.3.4-2.

Table 8.3.2.4.3-1: Test Parameters for quasi co-location type B with different Cell ID and Colliding CRS

parameter		Unit	TP 1	TP 2	
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	0	0	
	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	
	σ	dB	-3	-3	

Beamforming model		N/A	As specified in clause B.4.2	
Cell-specific reference signals		Antenna ports 0,1	Antenna ports 0,1	
CSI reference signals 0		N/A	Antenna ports {15,16}	
CSI-RS 0 periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	Subframes	N/A	5 / 4	
CSI reference signal 0 configuration		N/A	0	
Zero-power CSI-RS 0 configuration I _{CSI-RS} / ZeroPower CSI-RS bitmap	Subframes /bitmap	N/A	4/ 00100000000000000	
\hat{E}_s/N_{oc}	dB	Reference point in Table 8.3.2.4.3-2 + 4dB	Reference Value in Table 8.3.2.4.3-2	
$N_{\it oc}$ at antenna port	dBm/15kH z	-98	-98	
BW _{Channel}	MHz	10	10	
Cyclic Prefix		Normal	Normal	
Cell Id		0	126	
Number of control OFDM symbols		1	2	
Timing offset between TPs	us	N/A	0	
Frequency offset between TPs	Hz	N/A	200	
qcl-Operation, PDSCH RE Mapping and Quasi-Co- Location Indicator'		Type B, '00'		
PDSCH transmission mode		Blank	10	
Number of allocated resource block		N/A	50	
Symbols for unused PRBs		N/A	OCNG(Note2)	

Note 1: $P_B = 1$

These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs Note 2: shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.2.4.3-2: Performance Requirements for quasi co-location type B with different Cell ID and **Colliding CRS**

Test Number	Reference Channel	OCNG Pattern		Propagation Conditions (Note1)		Correlation Matrix and Antenna	Reference	e Value	UE Category	
		TP 1	TP 2	TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)		
1	R.54 TDD	N/A	OP.1 TDD	EPA5	ETU5	2x2 Low	70	14.7	≥2	

Note 1:

The propagation conditions for TP 1 and TP 2 are statistically independent.

Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2. Note 2:

SNR corresponds to \hat{E}_{s}/N_{oc} of TP 2 as defined in clause 8.1.1. Note 3:

8.3.2.4.4 Minimum requirement with Different Cell ID and non-Colliding CRS (with single NZP CSI-RS resource and CRS assistance information is configured)

The requirements are specified in Table 8.3.2.4.4-3, with the additional parameters in Table 8.3.2.4.4-1 and Table 8.3.2.4.4-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where three transmission points have different Cell ID and non-colliding CRS. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the frequency difference between two transmission points, channel parameters estimation and rate matching behaviour according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' signalling defined in [6]. Further, the test verifies that the UE, configured with the CRS assistance information [7], can mitigate interference from CRS for demodulation. The CRS assistance information [7] includes TP 3. In Table 8.3.2.4.4-1, transmission point 1 (TP 1) is serving cell transmitting PDCCH, synchronization signals and PBCH, transmission point 2 (TP 2) transmits PDSCH with different Cell ID, and Transmission point 3 (TP 3) is the aggressor transmission point. The downlink physical channel setup for TP 1 is according to Table C.3.4-1, for TP 2 is according to Table C.3.4-2, and for TP 3 is according to Annex C.3.2.

Table 8.3.2.4.4-1: Test Parameters for quasi co-location type B with different Cell ID and non-colliding CRS when CRS assistance information is configured

param	eter	Unit	TP 1	TP 2	TP 3	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0	0	
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0	
	σ	dB	-3	-3	-3	
Beamforming mo	del		N/A	Port 7 as specified in clause B.4.1	N/A	
Cell-specific refe	rence signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1	
CSI reference sig	nals 0		N/A	Antenna ports {15,16}	N/A	
CSI-RS 0 periodi subframe offset 7		Subframes	N/A	5 / 4	N/A	
CSI reference sig			N/A	0	N/A	
Zero-power CSI- configuration I _{CSI-RS} / ZeroPower CSI-I-		Subframes /bitmap	N/A	4/ 00100000000000000	N/A	
\widehat{E}_s/N_{oc}		dB	TBD	Reference Value in Table 8.3.2.4.4-3	TBD	
$N_{\it oc}$ at antenna p	oort	dBm/15kH z	-98	-98	N/A	
BW _{Channel}		MHz	10	10	10	
Cyclic Prefix			Normal	Normal	Normal	
Cell Id	Cell Id		0	1	128	
Number of contro symbols	ol OFDM		1	2	2	
Timing offset bety	ween TPs	us	N/A	-0.5	3	
Frequency offset	between TPs	Hz	N/A	200	-100	
qcl-Operation, 'P Mapping and Qua Location Indicato	asi-Co-		Туре	N/A		
PDSCH transmis	sion mode		Blank	10	9	
Number of alloca block	ted resource		N/A	50	N/A	
Symbols for unus	sed PRBs		N/A	OCNG(Note2)	N/A	
Interference mod	el		N/A	N/A	As specified in clause B.5.4	
Probability of occ transmission in in cells		%	N/A	N/A	20	
Probability of occurrence of	Rank 1	%	N/A	N/A	80	
transmission	Rank 2	%	N/A	N/A	20	

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Table 8.3.2.4.4-2: Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set index	Parameter	Parameters in each PQI set					
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2			
PQI set 0	CSI-RS 0	ZP CSI-RS 0	Blanked	PDSCH			

Table 8.3.2.4.4-3: Performance Requirements for quasi co-location type B with different Cell ID and non-Colliding CRS when CRS assistance information is configured

Refere		OCNG Pattern				opagations (N		Correlation Matrix and	Reference Value		UE
Test Number	nce Chann el	TP 1	TP 2	TP3	TP 1	TP 2	TP3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	Cate gory
1	TBD	N/A	OP.1 FDD	N/A	EVA5	EVA5	EVA5	2x2 Low	70	TBD	≥2

Note 1: The propagation conditions for TP.1, TP.2 and TP.3 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of TP.1, TP.2 and TP.3.

Note 3: SNR corresponds to \hat{E}_s/N_{oc} of TP.2 as defined in clause 8.1.1.

8.3.2.4.5 Minimum requirements with different Cell ID and non-colliding CRS (with multiple NZP CSI-RS resources and CRS assistance information is configured)

The requirements are specified in Table 8.3.2.4.5-3, with the additional parameters in Tables 8.3.2.4.5-1 and 8.3.2.4.5-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where three transmission point have the different Cell ID and non-colliding CRS. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling defined in [6]. Further, the test verifies that the UE, configured with the CRS assistance information [7], can mitigate interference from CRS for demodulation. The CRS assistance information [7] includes TP 3. In Tables 8.3.2.4.5-1 and 8.3.2.4.5-2, transmission point 1 (TP 1) is the serving cell transmitting PDCCH, synchronization signals and PBCH, Transmission point 2 (TP 2) has different Cell ID as TP 1, and Transmission point 3 (TP3) is the aggressor transmission point. Multiple NZP CSI-RS resources and ZP CSI-RS resources are configured. In each sub-frame, DL PDSCH transmission is dynamically switched between TP 1 and TP 2 with multiple PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator and downlink transmission hypothesis are defined in Table 8.3.2.4.5-2. The downlink physical channel setup for TP 1 is according to Table C.3.4-1, for TP 2 is according to Table C.3.4-2, and for TP 3 is according to Annex C.3.2

Table 8.3.2.4.5-1: Test Parameters for timing offset compensation with DPS transmission with CRS assistance information

parameter		Unit	TP 1	TP 2	TP 3	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0	0	
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	0	
	σ	dB	-3	-3	-3 N/A	
Beamforming m	odel		As specified in clause B.4.1	As specified in clause B.4.1	N/A	
Cell-specific refe	erence signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1	
CSI reference s	ignals 0		Antenna ports {15,16}	N/A	N/A	
CSI-RS 0 period subframe offset		Subframes	5 / 4	N/A	N/A	
CSI reference s configuration	ignal 0		0	N/A	N/A	
CSI reference s	ignals 1		N/A	Antenna ports {15,16}	N/A	
CSI-RS 1 period subframe offset		Subframes	N/A	5/4	N/A	
CSI reference s configuration			N/A	8	N/A	
Zero-power CSI configuration I _{CSI-RS} / ZeroPower CSI-		Subframes /bitmap	4/ 001000000000000000	N/A	N/A	
Zero-power CSI-RS1 configuration l _{CSI-RS} / ZeroPower CSI-RS bitmaps		Subframes /bitmap	N/A	4/	N/A	
\hat{E}_s/N_{oc}		dB	Reference Value in Table 8.3.2.4.5-3	Reference Value in Table 8.3.2.4.5-3	TBD	
N_{oc} at antenna	$N_{\it oc}$ at antenna port		-98	-98	N/A	
BW _{Channel}			10	10	10	
Cyclic Prefix			Normal	Normal	Normal	
Cell Id			0	1	128	
Number of contractions	rol OFDM		2	2	2	
Timing offset be	tween TPs		N/A	-0.5	3	
Frequency offse	t between TPs	Hz	N/A	200	-100	
Number of alloc blocks	ated resource	PRB	50	50	N/A	
PDSCH transmi	ssion mode		10	10	9	
Probability of oc PDSCH transmi		%	30	70	N/A	
Symbols for unu	, ,		OCNG (Note 3)	OCNG (Note 3)	N/A	
Interference mo	del		N/A	N/A	As specified in clause B.5.4	
Probability of octransmission in cells		%	N/A	N/A	20	
Probability of occurrence of transmission	Rank 1	%	N/A	N/A	80	
rank in interfering cells	Rank 2	%	N/A	N/A	20	

	P	- 1
Note 1	1 B	_ 1

Note 2: PDSCH transmission from TPs shall be randomly determined independently for each subframe.

Probabilities of occurrence of PDSCH transmission from TPs are specified.

Note 3: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data,

which is QPSK modulated.

Table 8.3.2.4.5-2: Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set index	Parameter	Parameters in each PQI set					
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2			
PQI set 0	CSI-RS 0	ZP CSI-RS 0	PDSCH	Blanked			
PQI set 1	CSI-RS 1	ZP CSI-RS 1	Blanked	PDSCH			

Table 8.3.2.4.5-3: Performance Requirements for timing offset compensation with DPS transmission

	Refere		OCNG Pattern			ropagations (N		Correlation Matrix and	Reference Value		UE
Test Number	nce Chann el	TP 1	TP 2	TP3	TP 1	TP 2	TP3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	Cate gory
1	TBD	OP.1 FDD	OP.1 FDD	N/A	EVA5	EVA5	EVA5	2x2 Low	70	TBD	≥2

Note 1: The propagation conditions for TP.1, TP.2 and TP.3 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of TP.1, TP.2 and TP.3.

Note 3: SNR corresponds to \hat{E}_s/N_{oc} of TP.2 as defined in clause 8.1.1.

8.4 Demodulation of PDCCH/PCFICH

The receiver characteristics of the PDCCH/PCFICH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). PDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of PDCCH

8.4.1 FDD

The parameters specified in Table 8.4.1-1 are valid for all FDD tests unless otherwise stated.

Table 8.4.1-1: Test Parameters for PDCCH/PCFICH

Parame	eter	Unit	Single antenna port	Transmit diversity
Number of PDC	CH symbols	symbols	2	2
Number of PHICH	H groups (N _g)		1	1
PHICH du	ration		Normal	Normal
Unused RE-s a	and PRB-s		OCNG	OCNG
Cell II)		0	0
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	0	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	0	-3
$N_{\it oc}$ at anter	nna port	dBm/15kHz	-98	-98
Cyclic pr	efix		Normal	Normal

8.4.1.1 Single-antenna port performance

For the parameters specified in Table 8.4.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.1.1-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	OCNG Pattern	Propagation Condition	Antenna configuration	Refer val	
						and correlation Matrix	Pm- dsg (%)	SNR (dB)
1	10 MHz	8 CCE	R.15 FDD	OP.1 FDD	ETU70	1x2 Low	1	-1.7

8.4.1.2 Transmit diversity performance

8.4.1.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.4.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.1.2.1-1: Minimum performance PDCCH/PCFICH

	Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference value	
	number		level	Channel	Pattern	Condition	configuration	Pm-dsg (%)	SNR (dB)
							and correlation		, ,
							Matrix		
Ī	1	10 MHz	4 CCE	R.16 FDD	OP.1 FDD	EVA70	2 x 2 Low	1	-0.6

8.4.1.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.4.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.1.2.2-1: Minimum performance PDCCH/PCFICH

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	5 MHz	2 CCE	R.17 FDD	OP.1 FDD	EPA5	4 x 2 Medium	1	6.3

8.4.1.2.3 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS)

For the parameters for non-MBSFN ABS specified in Table 8.4.1-1 and Table 8.4.1.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3-2. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3. In Table 8.4.1.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

For the parameters for MBSFN ABS specified in Table 8.4.1-1 and Table 8.4.1.2.3-3, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.3-4. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Table 8.4.1.2.3-1: Test Parameters for PDCCH/PCFICH - Non-MBSFN ABS

Paramete	r	Unit	Cell 1	Cell 2
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3
	N_{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A
	N_{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.4.1.2.3-	1.5
BW _{Channe}	1	MHz	10	10
Subframe Config	guration		Non-MBSFN	Non-MBSFN
Time Offset between	een Cells	μs	2.5 (synchro	nous cells)
Cell Id			0	1
ABS pattern (N	lote 4)		N/A	00000100 00000100 00000100 01000100 00000100
RLM/RRM Measureme Pattern (Not			00000100 00000100 00000100 00000100 00000100	N/A
CSI Subframe Sets	C _{CSI,0}		00000100 00000100 00000100 01000100 00000100	N/A
(Note 6)	C _{CSI,1}		11111011 11111011 11111011 10111011 11111011	N/A
Number of control OF			3	3
Number of PHICH of			1	N/A
PHICH dura			Extended	N/A
Unused RE-s and			OCNG	OCNG
Cyclic pref	IX		Normal	Normal

- Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
- Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 4: ABS pattern as defined in [9]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]:
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7];
- Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 8: SIB-1 will not be transmitted in Cell2 in the test.

Table 8.4.1.2.3-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS

Test Numb er	Aggregati on Level	Referen ce Channel	OCNG Pattern		Propagation Conditions (Note 1)		Correlation Matrix and Antenna	Reference Value	
			Cell 1	Cell 2	Cell 1	Cell 2	Configuration	Pm- dsg (%)	SNR (dB) (Note 2)
1	8 CCE	R15-1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	2x2 Low	1	-3.9

The propagation conditions for Cell 1 and Cell 2 are statistically independent. Note 1:

Note 2:

SNR corresponds to \hat{E}_s/N_{oc2} of cell 1. The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. Note 3:

Table 8.4.1.2.3-3: Test Parameters for PDCCH/PCFICH – MBSFN ABS

Parameter		Unit	Cell 1	Cell 2
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3
	N_{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A
	N_{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A
\hat{E}_s/N_{od}	.2	dB	Reference Value in Table 8.4.1.2.3-	1.5
BW _{Chann}	el	MHz	10	10
Subframe Conf	iguration		Non-MBSFN	MBSFN
Time Offset betw	een Cells	μs	2.5 (synchro	nous cells)
Cell Id			0	126
ABS pattern (Note 4)		N/A	0001000000 0100000010 0000001000 0000000
RLM/RRM Measuren Pattern (No			0001000000 0100000010 0000001000 0000000	N/A
CSI Subframe Sets	C _{CSI,0}		0001000000 0100000010 0000001000 0000000	N/A
(Note 6)	C _{CSI,1}		1110111111 1011111101 1111110111 1111111	N/A
MBSFN Subframe Allocation (Note 9)			N/A	001000 100001 000100 000000
Number of control O			3	3
Number of PHICH			1	N/A
PHICH dura			extended	N/A
Unused RE-s ar			OCNG	OCNG
Cyclic pre	XIIX		Normal	Normal

Note 1:	This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13
	of a subframe overlapping with the aggressor ABS.
Note 2:	This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS

- Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS Note 4: ABS pattern as defined in [9]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 8: SIB-1 will not be transmitted in Cell2 in this test.
- Note 9: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits is chosen for MBSFN subframe allocation.
- Note 10: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test.

Table 8.4.1.2.3-4: Minimum performance PDCCH/PCHICH – MBSFN ABS

Test Numb er	Aggregati on Level	Reference Channel		OCNG Pattern		Pattern		gation itions te 1)	Correlation Matrix and Antenna	Referer	nce Value
			Cell 1	Cell 2	Cell 1	Cell 2	Configurati on	Pm- dsg (%)	SNR (dB) (Note 2)		
1	8 CCE	R15-1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	2x2 Low	1	-4.2		

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to E_s/N_{ac2} of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

8.4.1.2.4 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

For the parameters for non-MBSFN ABS specified in Table 8.4.1-1 and Table 8.4.1.2.4-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.4-2.

For the parameters for MBSFN ABS specified in Table 8.4.1-1 and Table 8.4.1.2.4-3, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.2.4-4.

In Tables 8.4.1.2.4-1 and 8.4.1.2.4-3, Cell 1 is the serving cell, and Cell 2 and Cell3are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Table 8.4.1.2.4-1: Test Parameters for PDCCH/PCFICH - Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	Cell 3
PDCCH_RA PHICH_RA OCNG_RA Downlink power		dB	-3	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3	-3
	N_{oc1}	dBm/15kHz	-98(Note 1)	N/A	N/A
N_{oc} at antenna	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A	N/A
port	N_{oc3}	dBm/15kHz	-93 (Note 3)	N/A	N/A
\hat{E}_s/N		dB	Reference Value in Table 8.4.1.2.4-2	5	3
BW _{Ch}	annel	MHz	10	10	10
Subframe Co	onfiguration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset be	Time Offset between Cells		N/A	3	-1
Frequency shift	between Cells	Hz	N/A	300	-100
Cell	ld		0	126	1
ABS pattern	n (Note 4)		N/A	00000100 00000100 00000100 00000100 00000100	00000100 00000100 00000100 00000100 00000100
RLM/RRM Me Subframe Patt			00000100 00000100 00000100 00000100 00000100	N/A	N/A
CSI Subframe	C _{CSI,0}		00000100 00000100 00000100 00000100 00000100	N/A	N/A
Sets (Note 6)	C _{CSI,1}	C _{CSI,1}		N/A	N/A
Number of control OFDM symbols			11111011	Note 7	Note 7
Number of PHIC			1	N/A	N/A
PHICH d			Normal	N/A	N/A
Unused RE-s			OCNG	OCNG	OCNG
Cyclic	oretix		Normal	Normal	Normal

Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.

Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.

Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS

Note 4: ABS pattern as defined in [9]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.

Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7];

Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7];

Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.

Note 8: The number of the CRS ports in Cell1, Cell2 and Cell 3is the same.

Note 9: SIB-1 will not be transmitted in Cell2 and Cell 3 in the test.

Table 8.4.1.2.4-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	OCNG Pattern		OCNG Pattern Propagation Conditions (Note 1)				Correlation Matrix and	Referer	nce Value
			Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell3	Antenna Configuration (Note 2)	Pm- dsg (%)	SNR (dB) (Note 3)
1	8 CCE	R.15-2 FDD	OP.1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	EVA5	2x2 Low	1	-2.2

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.

Note 3: SNR corresponds to \hat{E}_{s}/N_{oc2} of cell 1.

Table 8.4.1.2.4-3: Test Parameters for PDCCH/PCFICH – MBSFN ABS

Paran		Unit	Cell 1	Cell 2	Cell 3
Downlink nower	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3	-3
Downlink power allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3	-3
	N_{oc1}	dBm/15kHz	-98(Note 1)	N/A	N/A
N_{oc} at antenna	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A	N/A
port	N_{oc3}	dBm/15kHz	-93 (Note 3)	N/A	N/A
\hat{E}_s/N		dB	Reference Value in Table 8.4.1.2.4-4	5	3
BW _C	nannel	MHz	10	10	10
Subframe Co	onfiguration		Non-MBSFN	MBSFN	MBSFN
Time Offset b	etween Cells	μs	N/A	3	-1
Frequency shift	between Cells	Hz	N/A	300	-100
Cell	ld		0	126	1
ABS patter	n (Note 4)		N/A	0001000000 0100000010 0000001000 0000000	0001000000 0100000010 0000001000 0000000
RLM/RRM Measu Pattern (0001000000 0100000010 0000001000 0000000	N/A	N/A
CSI Subframe	C _{CSI,0}		0001000000 0100000010 0000001000 0000000	N/A	N/A
Sets (Note 6)	C _{CSI,1}		1110111111 1011111101 1111110111 1111111	N/A	N/A
MBSFN Subframe Allocation (Note 7)			N/A	001000 100001 000100 000000	001000 100001 000100 000000
Number of control OFDM symbols			2	Note 8	Note 8
Number of PHICH groups (N_g)			1	N/A	N/A
PHICH duration			Normal	N/A	N/A
Unused RE-s			OCNG	OCNG	OCNG
Cyclic	prefix		Normal	Normal	Normal

Note 1:	This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
Note 2:	This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
Note 3:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4:	ABS pattern as defined in [9]. The 4 th , 12 th , 19 th and 27 th subframes indicated by ABS pattern
	are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated
	PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped
	with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition
	of the reference channel.
Note 5:	Time-domain measurement resource restriction pattern for PCell measurements as defined in
	[7].
Note 6:	As configured according to the time-domain measurement resource restriction pattern for CSI
	measurements defined in [7].
Note 7:	MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN
	subframe allocation.
Note 8:	The number of control OFDM symbols is not available for ABS and is 2 for the subframe
	indicated by "0" of ABS pattern.
Note 9:	The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel
N	transmission is in a subframe protected by MBSFN ABS in this test.
Note 10:	The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 11:	SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Table 8.4.1.2.4-4: Minimum performance PDCCH/PCFICH – MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	OCNG Pattern		Propagation Conditions (Note 1)		Correlation Matrix and	Refere	nce Value		
			Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell3	Antenna Configuration (Note 2)	Pm- dsg (%)	SNR (dB) (Note 3)
1	8 CCE	R.15-2 FDD	OP.1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	EVA5	2x2 Low	1	-2.0
Note 1:	The propagation	on conditions f	or Cell 1.	Cell 2 ar	nd Cell 3	are statis	stically ind	depender	nt.		

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.

Note 3: SNR corresponds to \hat{E}_{s}/N_{oc2} of cell 1.

8.4.2 TDD

The parameters specified in Table 8.4.2-1 are valid for all TDD tests unless otherwise stated.

Table 8.4.2-1: Test Parameters for PDCCH/PCFICH

Parame	Parameter		Single antenna port	Transmit diversity			
Uplink downlink (Note	•		0	0			
Special subframe (Note	•		4	4			
Number of PDC	CH symbols	symbols	2	2			
Number of PHICH	H groups (N _g)		1	1			
PHICH du	ration		Normal	Normal			
Unused RE-s a	and PRB-s		OCNG	OCNG			
Cell II)		0	0			
Downlink nower	PDCCH_RA PHICH_RA OCNG_RA	dB	0	-3			
Downlink power allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	0	-3			
$N_{\it oc}$ at anter	nna port	dBm/15kHz	-98	-98			
Cyclic pi	efix		Normal	Normal			
ACK/NACK feed	back mode		Multiplexing	Multiplexing			
Note 1: as specified in Table 4.2-2 in TS 36.211 [4]. Note 2: as specified in Table 4.2-1 in TS 36.211 [4].							

8.4.2.1 Single-antenna port performance

For the parameters specified in Table 8.4.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.2.1-1: Minimum performance PDCCH/PCFICH

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	8 CCE	R.15 TDD	OP.1 TDD	ETU70	1x2 Low	1	-1.6

8.4.2.2 Transmit diversity performance

8.4.2.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.4.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.2.2.1-1: Minimum performance PDCCH/PCFICH

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		level	Channel	Pattern	Condition	configuration	Pm-dsg (%)	SNR (dB)
						and		
						correlation		
						Matrix		
1	10 MHz	4 CCE	R.16 TDD	OP.1 TDD	EVA70	2 x 2 Low	1	0.1

8.4.2.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.4.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.4.2.2.2-1: Minimum performance PDCCH/PCFICH

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	value
number		level	Channel	Pattern	Condition	configuration and correlation	Pm-dsg (%)	SNR (dB)
						Matrix	(/0)	(ub)
1	5 MHz	2 CCE	R.17 TDD	OP.1	EPA5	4 x 2 Medium	1	6.5
				TDD				

8.4.2.2.3 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS)

For the parameters for non-MBSFN ABS specified in Table 8.4.2-1 and Table 8.4.2.3-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.3-2. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3.. In Table 8.4.2.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

For the parameters for MBSFN ABS specified in Table 8.4.2-1 and Table 8.4.2.3-3, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.3-4. The downlink physical channel setup for Cell 1 is according to Annex C3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Table 8.4.2.2.3-1: Test Parameters for PDCCH/PCFICH - Non-MBSFN ABS

Paramete	er	Unit	Cell 1	Cell 2
Uplink downlink co	nfiguration		1	1
Special subframe co	onfiguration		4	4
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3
	N_{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A
	N_{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A
\widehat{E}_s/N_{oc2}	:	dB	Reference Value in Table 8.4.2.2.3-2	1.5
BW _{Channe}	I	MHz	10	10
Subframe Config	guration		Non-MBSFN	Non-MBSFN
Time Offset between	een Cells	μS	2.5 (synchro	nous cells)
Cell Id			0	1
ABS pattern (N	lote 4)		N/A	0000010001 0000000001
RLM/RRM Measurement Pattern(Note			000000001 000000001	N/A
CSI Subframe	C _{CSI,0}		0000010001 000000001	N/A
Sets(Note 6)	C _{CSI,1}		1100101000 1100111000	N/A
Number of control OF	DM symbols		3	3
ACK/NACK feedba			Multiplexing	N/A
Number of PHICH groups (N _g)			1	N/A
PHICH dura		<u> </u>	extended	N/A
Unused RE-s and	d PRB-s		OCNG	OCNG
	ix		Normal	Normal

- Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 4: ABS pattern as defined in [9]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 8: SIB-1 will not be transmitted in Cell2 in the test.

Table 8.4.2.2.3-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS

Test Numbe r	Aggregatio n Level	Referenc e Channel	OCNG	Pattern	Propagation Conditions (Note 1)		Conditions Matrix an		Correlation Matrix and Antenna		rence alue
			Cell 1	Cell 2	Cell 1	Cell 2	Configuration	Pm- dsg (%)	SNR (dB) (Note 2)		
1	8 CCE	R15-1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	2x2 Low	1	-3.9		

The propagation conditions for Cell 1 and Cell 2 are statistically independent. Note 1:

Note 2:

SNR corresponds to \hat{E}_s/N_{oc2} of cell 1. The correlation matrix and antenna configuration apply for Cell 1 and Cell 2. Note 3:

Table 8.4.2.2.3-3: Test Parameters for PDCCH/PCFICH - MBSFN ABS

Paramete	er	Unit	Cell 1	Cell 2
Uplink downlink co	nfiguration		1	1
Special subframe co	onfiguration		4	4
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3
	N_{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A
	N_{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A
\hat{E}_s/N_{oc}		dB	Reference Value in Table 8.4.2.2.3-4	1.5
BW _{Channe}	I	MHz	10	10
Subframe Config	guration		Non-MBSFN	MBSFN
Time Offset between	een Cells	μS	2.5 (synchro	onous cells)
Cell Id			0	126
ABS pattern (N	lote 4)		N/A	000000001 000000001
RLM/RRM Measurem Pattern(Note			000000001 000000001	N/A
CSI Subframe	$C_{CSI,0}$		000000001 000000001	N/A
Sets(Note 6)	C _{CSI,1}		1100111000 1100111000	N/A
MBSFN Subframe Allocation (Note 9) Number of control OFDM symbols			N/A	000010
			3	3
ACK/NACK feedb			Multiplexing	N/A
Number of PHICH groups (Ng)			1	N/A
PHICH dura	tion		extended	N/A
Unused RE-s and PRB-s			OCNG	OCNG
Cyclic pret	fix		Normal	Normal

- Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
- Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 4: ABS pattern as defined in [9]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes.PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 8: SIB-1 will not be transmitted in Cell2 in this test.
- Note 9: MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation.

Table 8.4.2.2.3-4: Minimum performance PDCCH/PCFICH - MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	OCNG Pattern		Propagation Conditions(Note 1)		Correlation Matrix and	Referen	ce Value
			Cell 1	Cell 2	Cell 1	Cell 2	Antenna Configurati on	Pm-dsg (%)	SNR (dB) (Note 2)
1	8 CCE	R15-1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	2x2 Low	1	-4.1

Note 1: The propagation conditions for Cell 1 and Cell2 are statistically independent.

Note 2: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.

Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.

8.4.2.2.4 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

For the parameters for non-MBSFN ABS specified in Table 8.4.2-1 and Table 8.4.2.2.4-1, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.4-2.

For the parameters for MBSFN ABS specified in Table 8.4.2-1 and Table 8.4.2.2.4-3, the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.4-4.

In Tables 8.4.2.2.4-1 and 8.4.2.2.4-3, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Table 8.4.2.2.4-1: Test Parameters for PDCCH/PCFICH - Non-MBSFN ABS

Param	eter	Unit	Cell 1	Cell 2	Cell 3
Uplink downlink	configuration		1	1	1
Special subframe	configuration		4	4	4
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3	-3
	N_{oc1}	dBm/15kHz	-98(Note 1)	N/A	N/A
N_{oc} at antenna	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A	N/A
port	N_{oc3}	dBm/15kHz	-93 (Note 3)	N/A	N/A
\hat{E}_s/N		dB	Reference Value in Table 8.4.2.2.4-2	5	3
BW _{Cha}	annel	MHz	10	10	10
Subframe Co	nfiguration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset be	tween Cells	μs	N/A	3	-1
Frequency shift I	between Cells	Hz	N/A	300	-100
Cell	ld		0	126	1
ABS pattern	(Note 4)		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Me Subframe Patt			0000000001 0000000001	N/A	N/A
CSI Subframe	C _{CSI,0}		000000001 000000001	N/A	N/A
Sets (Note 6)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
Number of con symb			2	Note 7	Note 7
ACK/NACK feedback mode			Multiplexing	N/A	N/A
Number of PHICH groups ($N_{\rm g}$)			1	N/A	N/A
PHICH duration			Normal	N/A	N/A
Unused RE-s			OCNG	OCNG	OCNG
Cyclic p	orefix		Normal	Normal	Normal

- Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10, #12, #13 of a subframe overlapping with the aggressor ABS.
- Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 4: ABS pattern as defined in [9]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7];
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7];
- Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
- Note 8: The number of the CRS ports in Cell1, Cell2 and Cell 3is the same.
- Note 9: SIB-1 will not be transmitted in Cell2 and Cell 3 in the test.

Table 8.4.2.2.4-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	OCNG Pattern				ropagations (N		Correlation Matrix and	Referer	nce Value
			Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell3	Antenna Configuration (Note 2)	Pm- dsg (%)	SNR (dB) (Note 3)
1	8 CCE	R.15-2 TDD	OP.1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	EVA5	2x2 Low	1	-2.0

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.

Note 3: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.

Table 8.4.2.2.4-3: Test Parameters for PDCCH/PCFICH - MBSFN ABS

Param	eter	Unit	Cell 1	Cell 2	Cell 3
Uplink downlink			1	1	1
Special subframe	e configuration		4	4	4
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3	-3
	N_{oc1}	dBm/15kHz	-98 (Note 1)	N/A	N/A
N_{oc} at antenna	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A	N/A
port	N_{oc3}	dBm/15kHz	-93 (Note 3)	N/A	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 8.4.2.2.4-4	5	3
BW _{Ch}	annel	MHz	10	10	10
Subframe Configuration			Non-MBSFN	MBSFN	MBSFN
Time Offset be	etween Cells	μs	N/A	3	-1
Frequency shift	between Cells	Hz	N/A	300	-100
Cell	ld		0	126	1
ABS patterr	(Note 4)		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Me Subframe Patt			0000000001 0000000001	N/A	N/A
CSI Subframe	C _{CSI,0}		0000000001 0000000001	N/A	N/A
Sets (Note 6)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
MBSFN Subfrai (Note			N/A	000010	000010
Number of control			2	Note 8	Note 8
ACK/NACK feedback mode			Multiplexing	N/A	N/A
Number of PHICH groups (Ng)			1	N/A	N/A
PHICH d			Normal	N/A	N/A
Unused RE-s			OCNG	OCNG	OCNG
Cyclic p	orefix		Normal	Normal	Normal

- Note 1: This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of a subframe overlapping with the aggressor ABS.
- Note 2: This noise is applied in OFDM symbols #0 of a subframe overlapping with the aggressor ABS.
- Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 4: ABS pattern as defined in [9]. The 10th and 20th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 7: MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation.
- Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
- Note 9: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 10: SIB-1 will not be transmitted in Cell2 in this test.

Table 8.4.2.2.4-4: Minimum performance PDCCH/PCFICH - MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	OCNG Pattern				ropagations (N		Correlation Matrix and	Referer	nce Value
			Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell3	Antenna Configuration (Note 2)	Pm- dsg (%)	SNR (dB) (Note 3)
1	8 CCE	R.15-2 TDD	OP.1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	EVA5	2x2 Low	1	-1.8
Note 1:	The propagation	on conditions f	or Call 1	Call 2 or	74 CVII 3	ara atatic	tically in	donondor	\ +		

Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.

8.5 Demodulation of PHICH

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold delection).

8.5.1 FDD

The parameters specified in Table 8.5.1-1 are valid for all FDD tests unless otherwise stated.

Table 8.5.1-1: Test Parameters for PHICH

Parame	eter	Unit	Single antenna port	Transmit diversity
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	0	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	0	-3
PHICH du	uration		Normal	Normal
Number of PHICH	groups (Note 1)		Ng = 1	Ng = 1
PDCCH C	Content			be included with the aligned with A.3.6.
Unused RE-s	and PRB-s		OCNG	OCNG
Cell ID			0	0
N_{oc} at antenna port		dBm/15kHz	-98	-98
Cyclic p	refix		Normal	Normal
Note 1: according	g to Clause 6.9 in	TS 36.211 [4]		`

8.5.1.1 Single-antenna port performance

For the parameters specified in Table 8.5.1-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.1.1-1: Minimum performance PHICH

Test	Bandwidth	Reference	OCNG			Referen	ce value
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
1	10 MHz	R.18	OP.1 FDD	ETU70	1 x 2 Low	0.1	5.5
2	10 MHz	R.24	OP.1 FDD	ETU70	1 x 2 Low	0.1	0.6

Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.

Note 3: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.

8.5.1.2 Transmit diversity performance

8.5.1.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.5.1-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.1.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.1.2.1-1: Minimum performance PHICH

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Reference value	
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
1	10 MHz	R.19	OP.1 FDD	EVA70	2 x 2 Low	0.1	4.4
1A	5MHz (Note 1)	R.19-1	OP.1 FDD	EVA 70	2x2 Low	0.1	4
Note 1: Te	st case applicabil	itv is defined in	8.1.2.1.	•			

8.5.1.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.5.1-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.1.2.2-1: Minimum performance PHICH

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration	Pm-an (%)	SNR (dB)
					and		
					correlation		
					Matrix		
1	5 MHz	R.20	OP.1 FDD	EPA5	4 x 2 Medium	0.1	6.1

8.5.1.2.3 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS)

For the parameters specified in Table 8.5.1-1 and Table 8.5.1.2.3-1, the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.3-2. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3. In Table 8.5.1.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Table 8.5.1.2.3-1: Test Parameters for PHICH

Paramete	er	Unit	Cell 1	Cell 2	
Downlink power allocation	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3	
	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3	
N_{oc} at antenna port	N_{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A	
	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A	
	N_{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A	
\widehat{E}_s/N_{oc}	\hat{E}_s/N_{oc2}		Reference Value in Table 8.5.1.2.3-2	1.5	
BW _{Channe}	el	MHz	10	10	
Subframe Confi	guration		Non-MBSFN	Non-MBSFN	
Time Offset between	een Cells	μs	2.5 (synchror	nous cells)	
Cell Id			0	1	
ABS pattern (N	Note 4)		N/A	00000100 00000100 00000100 01000100 00000100	
RLM/RRM Measurem Pattern (Not			00000100 00000100 00000100 00000100 00000100	N/A	
CSI Subframe Sets (Note 6)			00000100 00000100 00000100 01000100 00000100	N/A	
	C _{CSI,1}		11111011 11111011 11111011 10111011 11111011	N/A	
Number of control OF			3	3	
Number of PHICH			1	N/A	
PHICH dura			extended	N/A	
Unused RE-s an			OCNG	OCNG	
Cyclic pre	tix		Normal	Normal	

- Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
- Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
- Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 4: ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in the 26th subframe indicated by the ABS pattern.
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
- Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 8: SIB-1 will not be transmitted in Cell2 in the test.

Table 8.5.1.2.3-2: Minimum performance PHICH

Test Number	Reference Channel	OCNG Pattern		Propagation Conditions (Note 1)		Antenna Configuration and	Refere	nce Value
		Cell 1	Cell 2	Cell 1	Cell 2	Correlation Matrix	Pm-an (%)	SNR (dB) (Note 2)
1	R.19	OP.1 FDD	OP.1 FDD	EPA5	EPA5	2x2 Low	0.1	4.6
Note 1:					ell 2 are s	tatistically indepen	dent.	
Note 2:	SNR correspor	nds to $\widehat{E}_s ig/ N_{oc2}$ of cell 1.						
Note 3:	The correlation	matrix ar	nd antenna	a configur	ation appl	y for Cell 1 and Ce	II 2.	

8.5.1.2.4 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

For the parameters specified in Table 8.5.1-1 and Table 8.5.1.2.4-1, the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.4-2. In Table 8.5.1.2.4-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Table 8.5.1.2.4-1: Test Parameters for PHICH

Param	neter	Unit	Cell 1	Cell 2	Cell 3	
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3	-3	
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3	-3	
	N_{oc1}	dBm/15kHz	-98 (Note 1)	N/A	N/A	
N_{oc} at antenna	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A	N/A	
port	N_{oc3}	dBm/15kHz	-93 (Note 3)	N/A	N/A	
\hat{E}_s/N	Į.	dB	Reference Value in Table 8.5.1.2.4-	5	3	
BW _{Ch}	annel	MHz	10	10	10	
Subframe Co	onfiguration		Non-MBSFN	Non-MBSFN	Non-MBSFN	
Time Offset be	etween Cells	μs	N/A	3	-1	
Frequency shift	Frequency shift between Cells		N/A	300	-100	
Cell Id			0	126	1	
PDCCH (PDCCH Content		UL Grant should be included with the proper information aligned with A.3.6.	N/A	N/A	
ABS pattern	n (Note 4)		N/A	00000100 00000100 00000100 00000100 00000100	00000100 00000100 00000100 00000100 00000100	
RLM/RRM Me Subframe Patt			00000100 00000100 00000100 00000100 00000100	N/A	N/A	
CSI Subframe	C _{CSI,0}		00000100 00000100 00000100 00000100 00000100	N/A	N/A	
Sets (Note 6)	C _{CSI,1}		11111011 11111011 11111011 11111011 11111011	N/A	N/A	
Number of control OFDM symbols			2	Note 7	Note 7	
Number of PHICH groups (Ng)			1	N/A	N/A	
PHICH d			Normal	N/A	N/A	
Unused RE-s			OCNG	OCNG	OCNG	
Cyclic	oretix		Normal	Normal	Normal	

Note 1:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
Note 2:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 3:	This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4:	ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in the 26 th subframe indicated by the ABS pattern.
Note 5:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 6:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
Note 7:	The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 8:	The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
Note 9:	SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test.

Table 8.5.1.2.4-2: Minimum performance PHICH

Test Number	Reference Channel	OC	NG Patt	ern	Propagation Conditions (Note 1)		Antenna Configuration	on		
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	and Correlation Matrix (Note 2)	Pm-an (%)	SNR (dB) (Note 3)
1	R.19	OP.1 FDD	OP.1 FDD	OP.1 FDD	EPA5	EVA5	EVA5	2x2 Low	0.1	5.0
Note 1: Note 2: Note 3:	The correlation	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. SNR corresponds to \hat{E}_{ν}/N_{max} of Cell 1.								

8.5.2 TDD

The parameters specified in Table 8.5.2-1 are valid for all TDD tests unless otherwise stated.

Table 8.5.2-1: Test Parameters for PHICH

Parame	eter	Unit	Single antenna port	Transmit diversity
Uplink downlink cor 1)	figuration (Note		1	1
Special subframe (Note	•		4	4
	PDCCH_RA PHICH_RA OCNG_RA	dB	0	-3
Downlink power allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	0	-3
PHICH du	ıration		Normal	Normal
Number of PHICH	groups (Note 3)		Ng = 1	Ng = 1
PDCCH C	Content			I be included with the on aligned with A.3.6.
Unused RE-s	and PRB-s		OCNG	OCNG
Cell I	D		0	0
N_{oc} at ante	nna port	dBm/15kHz	-98	-98
Cyclic p			Normal	Normal
ACK/NACK fee			Multiplexing	Multiplexing
Note 1: as specif	ied in Table 4.2-2	in TS 36.211 [4]	

Note 1: as specified in Table 4.2-2 in TS 36.211 [4]
Note 2: as specified in Table 4.2-1 in TS 36.211 [4]
Note 3: according to Clause 6.9 in TS 36.211 [4]

8.5.2.1 Single-antenna port performance

For the parameters specified in Table 8.5.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.2.1-1: Minimum performance PHICH

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Reference value	
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
1	10 MHz	R.18	OP.1 TDD	ETU70	1 x 2 Low	0.1	5.8
2	10 MHz	R.24	OP.1 TDD	ETU70	1 x 2 Low	0.1	1.3

8.5.2.2 Transmit diversity performance

8.5.2.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.5.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.2.2.1-1: Minimum performance PHICH

Test	Bandwidth	Reference		Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration	Pm-an (%)	SNR (dB)
					and		
					correlation		
					Matrix		
1	10 MHz	R.19	OP.1 TDD	EVA70	2 x 2 Low	0.1	4.2

8.5.2.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.5.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.5.2.2.2-1: Minimum performance PHICH

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration	Pm-an (%)	SNR (dB)
					and		
					correlation		
					Matrix		
1	5 MHz	R.20	OP.1 TDD	EPA5	4 x 2 Medium	0.1	6.2

8.5.2.2.3 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS)

For the parameters specified in Table 8.5.2-1 and Table 8.5.2.2.3-1, the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.3-2. The downlink physical setup is in accordance with Annex C.3.2 and Annex C.3.3, In Table 8.5.2.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Table 8.5.2.2.3-1: Test Parameters for PHICH

Paramete	r	Unit	Cell 1	Cell 2
Uplink downlink cor	nfiguration		1	1
Special subframe co	onfiguration		4	4
Downlink nower	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3
Downlink power allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3
	N_{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A
	N_{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.5.2.2.3-2	1.5
BW _{Channel}	I	MHz	10	10
Subframe Config	guration		Non-MBSFN	Non-MBSFN
Time Offset between	een Cells	μs	2.5 (synchronous cells)	
Cell Id			0	1
ABS pattern (N	lote 4)		N/A	0000010001 0000000001
RLM/RRM Measureme Pattern (Note			000000001 000000001	N/A
CSI Subframe Sets	C _{CSI,0}		0000010001 000000001	N/A
(Note 6)	C _{CSI,1}		1100101000 1100111000	N/A
Number of control OFDM symbols			3	3
ACK/NACK feedback mode			Multiplexing	N/A
Number of PHICH groups (Ng)			1	N/A
PHICH dura			extended	N/A
Unused RE-s and			OCNG	OCNG
Cyclic pref	ΪX		Normal	Normal

- Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
- Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
- Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 4: ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in subframe 5
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
- Note 7: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 8: SIB-1 will not be transmitted in Cell2 in the test.

Table 8.5.2.2.3-2: Minimum performance PHICH

Test Number	Reference Channel	OCNG	Pattern	Cond	gation itions te 1)	Antenna Configuration and	Refere	nce Value
		Cell 1	Cell 2	Cell 1	Cell 2	Correlation Matrix	Pm-an (%)	SNR (dB) (Note 2)
1	R.19	OP.1 TDD	OP.1 TDD	EPA5	EPA5	2x2 Low	0.1	4.6
Note 1:					ell 2 are s	tatistically independ	dent.	
Note 2:	SNR corresponds to \widehat{E}_s/N_{oc2} of cell 1.							
Note 3:	The correlation	matrix ar	d antenna	a configur	ation appl	y for Cell 1 and Ce	II 2.	

8.5.2.2.4 Minimum Requirement 2 Tx Antenna Port (demodulation subframe overlaps with aggressor cell ABS and CRS assistance information are configured)

For the parameters specified in Table 8.5.2-1 and Table 8.5.2.2.4-1, the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.2.4-2. In Table 8.5.2.2.4-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Table 8.5.2.2.4-1: Test Parameters for PHICH

Paran		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink			1	1	1
Special subfram			4	4	4
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3	-3
	N_{oc1}	dBm/15kHz	-98 (Note 1)	N/A	N/A
N _{oc} at antenna	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A	N/A
port	N_{oc3}	dBm/15kHz	-93 (Note 3)	N/A	N/A
\widehat{E}_s/N	V_{oc2}	dB	Reference Value in Table 8.5.2.2.4-2	5	3
BW _C	nannel	MHz	10	10	10
Subframe Co	onfiguration		Non-MBSFN Non-MBSF		Non- MBSFN
Time Offset b	etween Cells	μs	N/A	3	-1
Frequency shift	between Cells	Hz	N/A	300	-100
Cell	l ld		0	126	1
PDCCH	Content		UL Grant should be included with the proper information aligned with A.3.6.	N/A	N/A
ABS patter	n (Note 4)		N/A	0000000001 0000000001	0000000001
RLM/RRM Measur Pattern (000000001 000000001	N/A	N/A
CSI Subframe	C _{CSI,0}		000000001 000000001	N/A	N/A
Sets (Note 6)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
Number of control OFDM symbols			2	Note 7	Note 7
ACK/NACK fe	edback mode		Multiplexing	N/A	N/A
Number of PHIC			1	N/A	N/A
PHICH o			Normal	N/A	N/A
Unused RE-s			OCNG	OCNG	OCNG
Cyclic	prefix		Normal	Normal	Normal

- Note 1: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
- Note 2: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
- Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 4: ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell but not in subframe 5
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
- Note 7: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
- Note 8: The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
- Note 9: SIB-1 will not be transmitted in Cell 2 and Cell 3 in the test.

Table 8.5.2.2.4-2: Minimum performance PHICH

Test Number	Reference Channel	OC	NG Patt	ern	Propagation Conditions (Note 1)		Antenna Configuration	Reference Value		
		Cell 1	Cell 2	Cell 3	Cell 1	ell 1 Cell 2 Cell 3		and Correlation Matrix (Note 2)	Pm-an (%)	SNR (dB) (Note 3)
1	R.19	OP.1 TDD	OP.1 TDD	OP.1 TDD	EPA5	EVA5	EVA5	2x2 Low	0.1	5.7
Note 1: Note 2: Note 3:	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent. The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.									

8.6 Demodulation of PBCH

The receiver characteristics of the PBCH are determined by the probability of miss-detection of the PBCH (Pm-bch), which is defined as

$$Pm - bch = 1 - \frac{A}{B}$$

Where A is the number of correctly decoded MIB PDUs and B is the Number of transmitted MIB PDUs (Redundancy versions for the same MIB are not counted separately).

8.6.1 FDD

Table 8.6.1-1: Test Parameters for PBCH

Parame	ter	Unit	Single antenna port	Transmit diversity
Downlink power	PBCH_RA	dB	0	-3
allocation	PBCH_RB	dB	0	-3
$N_{\it oc}$ at anter	nna port	dBm/15kHz	-98	-98
Cyclic pr	efix		Normal	Normal
Cell II)		0	0
Note 1: as specif	fied in Table 4.2	<u>.</u>]		
Note 2: as specif	fied in Table 4.2	-1 in TS 36.211 [4	.]	

8.6.1.1 Single-antenna port performance

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detecting PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.1.1-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
number		Channel	Condition	configuration	Pm-bch (%)	SNR (dB)
				and		
				correlation		
				Matrix		
1	1.4 MHz	R.21	ETU70	1 x 2 Low	1	-6.1

8.6.1.2 Transmit diversity performance

8.6.1.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.1.2.1-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
number		Channel	Condition	configuration and correlation Matrix	Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.22	EPA5	2 x 2 Low	1	-4.8

8.6.1.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.1.2.2-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
number		Channel	Condition	configuration	Pm-bch (%)	SNR (dB)
				and		
				correlation		
				Matrix		
1	1.4 MHz	R.23	EVA5	4 x 2 Medium	1	-3.5

8.6.1.2.3 Minimum Requirement 2 Tx Antenna Port under Time Domain Measurement Resource Restriction with CRS Assistance Information

For the parameters specified in Table 8.6.1.2.3-1 and Table 8.6.1.2.3-2, the averaged probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.2.3-2. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, repectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Table 8.6.1.2.3-1: Test Parameters for PBCH

Param	eter	Unit	Cell 1	Cell 2	Cell 3
Downlink power	PBCH_RA OCNG_RA	dB	-3	-3	-3
allocation	PBCH_RB OCNG_RB	dB	-3	-3	-3
N_{oc} at ante	enna port	dBm/15kHz	-98	N/A	N/A
$\frac{\mathcal{E}_{\delta}}{N_{oc}}$		dB	Reference Value in Table 8.6.1.2.3-2	4	2
BW _{Ch}	$BW_Channel$		1.4	1.4	1.4
Time Offset be	etween Cells	μs	N/A	3	-1
Frequency shift	between Cells	Hz	N/A	300	-100
Cell	Id		0	126	1
ABS Pattern (Note 4)			N/A	01000000 01000000 01000000 01000000 01000000	01000000 01000000 01000000 01000000 01000000
Unused RE-s	and PRB-s		OCNG	OCNG	OCNG
Cyclic	orefix		Normal	Normal	Normal

Note 1: The number of the CRS ports in Cell1, Cell2 and Cell 3 is the same.

Note 2: SIB-1 will not be transmitted in Cell2 and Cell 3 in the test.

Note 3: The PBCH transmission from Cell 1, Cell 2 and Cell 3 overlap. The same PBCH transmission redundancy version is used for Cell 1, Cell 2 and Cell 3.

Note 4: ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Table 8.6.1.2.3-2: Minimum performance PBCH

Test	Reference	Propagation Conditions (Note 1)			Antenna Configuration	Refe	Reference Value		
Number	Channel	Cell 1	Cell 2	Cell 3	and Correlation Matrix (Note 2)	Pm-bch (%)	SNR (dB) (Note 3)		
1	R.22	ETU30	ETU30	ETU30	2x2 Low	1	-3.0		
Note 1:	The propagation	on conditions for	or Cell 1, C	Cell 2 and Cell	3 are statistically independent	t.			
Note 2:	The correlation	n matrix and ar	ntenna con	figuration appl	y for Cell 1, Cell 2 and Cell 3.				
Note 3:	SNR corresponds to \hat{E}_s/N_{oc} of cell 1.								

8.6.2 TDD

Table 8.6.2-1: Test Parameters for PBCH

Parame	ter	Unit	Single antenna port	Transmit diversity
Uplink downlink o	•		1	1
Special subframe (Note 2	•		4	4
Downlink power	PBCH_RA	dB	0	-3
allocation	PBCH_RB	dB	0	-3
$N_{\it oc}$ at anter	nna port	dBm/15kHz	-98	-98
Cyclic pr	efix		Normal	Normal
Cell II)		0	0
		-2 in TS 36.211 [4 -1 in TS 36.211 [4		

8.6.2.1 Single-antenna port performance

For the parameters specified in Table 8.6.2-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.2.1-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	e value	
number		Channel	Condition	configuration	Pm-bch (%)	SNR (dB)	
				and			
				correlation			
				Matrix			
1	1.4 MHz	R.21	ETU70	1 x 2 Low	1	-6.4	

8.6.2.2 Transmit diversity performance

8.6.2.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.6.2-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.2.2.1-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value	
number		Channel	Condition	configuration	Pm-bch (%)	SNR (dB)	
				and			
				correlation			
				Matrix			
1	1.4 MHz	R.22	EPA5	2 x 2 Low	1	-4.8	

8.6.2.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.6.2-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.2.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.2.2.2-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value	
number		Channel	Condition	configuration	Pm-bch (%)	SNR (dB)	
				and			
				correlation			
				Matrix			
1	1.4 MHz	R.23	EVA5	4 x 2 Medium	1	-4.1	

8.6.2.2.3 Minimum Requirement 2 Tx Antenna Port under Time Domain Measurement Resource Restriction with CRS Assistance Information

For the parameters specified in Table 8.6.2.2.3-1 and Table 8.6.2.2.3-2, the averaged probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.2.2.3-2. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggressor cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C3.3, respectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Table 8.6.2.2.3-1: Test Parameters for PBCH

Param	eter	Unit	Cell 1	Cell 2	Cell 3
Downlink power	PBCH_RA OCNG_RA	dB	-3	-3	-3
allocation	PBCH_RB OCNG_RB	dB	-3	-3	-3
N_{oc} at ante	enna port	dBm/15kHz	-98	N/A	N/A
$\frac{\widehat{E}_s}{N_{o\sigma}}$		dB	Reference Value in Table 8.6.2.2.3-2	Value in Table 4	
BW _{Ch}	annel	MHz	1.4	1.4	1.4
Time Offset be	etween Cells	μs	N/A	3	-1
Frequency shift	between Cells	Hz	N/A	300	-100
Cell	ld		0	126	1
ABS Pattern (Note 4)			N/A	0000000001 0000000001	0000000001 0000000001
Unused RE-s	and PRB-s		OCNG	OCNG	OCNG
Cyclic p	orefix		Normal	Normal	Normal

Note 1: The number of the CRS ports in Cell1, Cell2 and Cell 3is the same.

Note 2: SIB-1 will not be transmitted in Cell2 and Cell 3 in the test.

Note 3: The PBCH transmission from Cell 1, Cell 2 and Cell 3 overlap. The same PBCH transmission redundancy version is used for Cell 1, Cell 2 and Cell 3.

Note 4: ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.

Table 8.6.2.2.3-2: Minimum performance PBCH

Test	Reference Propagation Conditions (N		ons (Note 1)	Antenna Configuration	Reference Value				
Number	Channel	Cell 1	Cell 2	Cell 3	and Correlation Matrix	Pm-bch	SNR (dB) (Note		
					(Note 2)	(%)	3)		
1	R.22	ETU30	ETU30	ETU30	2x2 Low	1	-3.0		
Note 1:	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.								
Note 2:	The correlation	n matrix and ar	ntenna con	figuration appl	y for Cell 1, Cell 2 and Cell 3				

Note 3: SNR corresponds to \hat{E}_s/N_{oc} of cell 1.

8.7 Sustained downlink data rate provided by lower layers

The purpose of the test is to verify that the Layer 1 and Layer 2 correctly process in a sustained manner the received packets corresponding to the maximum number of DL-SCH transport block bits received within a TTI for the UE category indicated. The sustained downlink data rate shall be verified in terms of the success rate of delivered PDCP SDU(s) by Layer 2. The test case below specifies the RF conditions and the required success rate of delivered TB by Layer 1 to meet the sustained data rate requirement. The size of the TB per TTI corresponds to the largest possible DL-SCH transport block for each UE category using the maximum number of layers for spatial multiplexing. Transmission modes 1 and 3 are used with radio conditions resembling a scenario where sustained maximum data rates are available.

Test case is selected according to table 8.7-1 depending on UE capability for CA and EPDCCH.

Single carrier UE Single carrier UE CA UE not **CA UE supporting** not supporting supporting supporting **EPDCCH EPDCCH EPDCCH EPDCCH FDD** 8.7.1 8.7.1 8.7.3 8.7.1, 8.7.3 **TDD** 8.7.2 8.7.4 8.7.2, 8.7.4 8.7.2

Table 8.7-1: SDR test applicability

8.7.1 FDD (single carrier and CA)

The parameters specified in Table 8.7.1-1 are valid for all FDD tests unless otherwise stated.

Parameter	Unit	Value
Cyclic prefix		Normal
Cell ID		0
Inter-TTI Distance		1
Number of HARQ processes per component carrier	Processes	8
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,0,1,2} for 64QAM and 256QAM
Number of OFDM symbols for PDCCH per component carrier	OFDM symbols	1
Cross carrier scheduling		Not configured
Propagation condition		Static propagation condition No external noise sources are applied

Table 8.7.1-1: Common Test Parameters (FDD)

For UE not supporting 256QAM, the requirements are specified in Table 8.7.1-3, with the addition of the parameters in Table 8.7.1-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1-4. The TB success rate shall be sustained during at least 300 frames.

For UE supporting 256QAM, the requirements are specified in Table 8.7.1-6, with the addition of the parameters in Table 8.7.1-5 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.1-7, the TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.1-3 is not applicable.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.7.1-2: test parameters for sustained downlink data rate (FDD 64QAM)

Test	Bandwidth			Codebook subset		nlink p cation		$\hat{E}_{\scriptscriptstyle s}$ at	Symbols for
rest	(MHz)	mode	configuration	restriction	$ ho_{\scriptscriptstyle A}$	$ ho_{\scriptscriptstyle B}$	ь	antenna port (dBm/15kHz)	unused PRBs
1	10	1	1 x 2	N/A	0	0	0	-85	OP.6 FDD
2	10	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
3,4,6	20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
3A	10	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
3B, 4A	2x10	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
3C, 4B	15	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
6A	2x20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
6B	10+15	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
6C	10+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
6D	15+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
6E	2x15	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
6F	15+5	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
6G	20+5	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7	3x20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7A	15+20+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7B	10+20+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7C	15+15+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7D	10+15+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7E	10+10+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7F	10+15+15	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7G	5+10+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7H	5+15+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
8	4x20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
8A	20+20+20+10	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
8B	20+20+10+10	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
9	5x20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD

NOTE 1: For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK for Test 1-6E, and PUCCH format 3 is used to feedback ACK/NACK for Test 7-7G.

Table 8.7.1-3: Minimum requirement (FDD 64QAM)

Test	Number of bits of a DL-SCH transport	Measurement channel	Reference value		
	block received within a TTI		TB success rate [%]		
1	10296	R.31-1 FDD	95		
2	25456	R.31-2 FDD	95		
3	51024	R.31-3 FDD	95		
3A	36696 (Note 2)	R.31-3A FDD	85		
3B	25456	R.31-2 FDD	95		
3C	51024	R.31-3C FDD	85		
4	75376 (Note 3)	R.31-4 FDD	85		
4A	36696 (Note 2)	R.31-3A FDD	85		
4B	55056 (Note 5)	R.31-4B FDD	85		
6	75376 (Note 3)	R.31-4 FDD	85		
6A	75376 (Note 3)	R.31-4 FDD	85		
6B	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC	85		
	55056 for 15MHz CC	R.31-5 FDD for 15MHz CC			
6C	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC	85		
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
6D	55056 for 15MHz CC	R.31-5 FDD for 15MHz CC	85		
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
6E	55056 (Note 5) for two 15MHz CCs	R.31-4B FDD for two 15MHz CCs	85		
6F	55056 (Note 5) for 15MHz CC	R.31-5 FDD for 15MHz CC	85		
	18336 (Note 6) for 5MHz CC	R.31-6 FDD for 5MHz CC			
6G	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC	85		
	18336 (Note 6) for 5MHz CC	R.31-6 FDD for 5MHz CC			
7	75376 (Note 3)	R.31-4 FDD	85		
7A	55056 (Note 5) for 15MHz CC	R.31-5 FDD for 15MHz CC	85		
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
7B	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC	85		
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
7C	55056 (Note 5) for 15MHz CC	R.31-5 FDD for 15MHz CC	85		
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
7D	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC	85		
	55056 (Note 5) for 15MHz CC	R.31-5 FDD for 15MHz CC			
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
7E	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC	85		
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
7F	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC	85		
	55056 (Note 5) for 15MHz CC	R.31-5 FDD for 15MHz CC			
7G	18336 (Note 6) for 5MHz CC	R.31-6 FDD for 5MHz CC	85		
	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC			
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
7H	18336 (Note 6) for 5MHz CC	R.31-6 FDD for 5MHz CC	[85]		
	55056 (Note 5) for 15MHz CC	R.31-5 FDD for 15MHz CC			
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
8	75376 (Note 3)	R.31-4 FDD	85		
8A	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC	85		
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
8B	36696 (Note 2) for 10MHz CC	R.31-3A FDD for 10MHz CC	85		
	75376 (Note 3) for 20MHz CC	R.31-4 FDD for 20MHz CC			
9	75376 (Note 3)	R.31-4 FDD	[85]		
	For 2 layer transmissions, 2 transport blocks	are received within a TTI	• •		

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: 35160 bits for sub-frame 5.

Note 3: 71112 bits for sub-frame 5.

Note 4: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/(N_{DL_newtx} + N_{DL_retx})$, where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_retx} is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

Note 5: 52752bits for sub-frame 5.

Note 6: 15840bits for sub-frame 0 and 5.

Table 8.7.1-4: Test points for sustained data rate (FRC 64QAM)

CA config	Maximum supported Bandwidth/ Bandwidth combination (MHz)	Cat. 1	Cat. 2	Cat. 3	Cat. 4	Cat. 6,7	Cat. 9,10	Cat 11, 12 DL Cat. 11,12	DL Cat. 15
<u> </u>	10	1	2	3A	3A	-	-	-	-
Single	15	-	-	3C	4B	-	-	-	-
carrier	20	-	-	3	4	6	-	-	-
	10+10	-	-	3B	4A	4A	4A	-	-
	10+15	-	-	3B	4A	6B	6B	-	-
	10+20	-	-	3B	4A	6C	6C	-	-
CA	15+15	-	-	3B	4A	6E	6E	-	-
with	15+5			3B	4A	6F	6F	-	-
2CCs	20+5	-	-	3	4	6G	6G	-	-
	15+20	-	-	3B	4A	6D	6D	-	-
	20+20	-	-	3B or 3 (Note 4)	4A or 4 (Note 4)	6A	6A	-	-
	3x20	-	-	-	-	6A	7	7	-
	15+20+20	-	-	-	-	6A	7A	7A	-
	10+20+20	-	-	-	-	6A	7B	7B	-
CA	15+15+20					6D	7C	7C	-
with	10+15+20	-	-	-	-	6D	7D	7D	-
3CCs	10+10+20	-	-	-	-	7E	7E	7E	-
	10+15+15	-	-	-	-	7F	7F	7F	-
	5+10+20	-	-	-	-	7G	7G	7G	-
	5+15+20	-	-	-	-	7H	7H	7H	-
CA	4x20	-	-	-	-	-	7	8	8
with	20+20+20+10	-	-	-	-	-	7	8A	8A
4CCs	20+20+10+10	-	-	-	-	-	8B	8B	8B
CA with 5CCs	5x20	-	-	-	-	-	-	8	9

Note 1: Void.

Note 2: For non-CA UE, test is selected for maximum supported bandwidth.

Note 3: Void.

Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, the single carrier test is selecte, i.e., Test 3 for UE category 3 and Test 4 for UE category 4. Otherwise, Test 3B applies for category 3 UE and Test 4A applies for category 4 UE.

Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.

Note 6: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

Table 8.7.1-5: test parameters for sustained downlink data rate (FDD 256QAM)

Test	Bandwidth	Transmission	Antenna Codebook a			nlink p		$\hat{E}_{\scriptscriptstyle S}$ at	Symbols for
1621	(MHz)	mode	configuration	restriction	$ ho_{\scriptscriptstyle A}$	$ ho_{\scriptscriptstyle B}$	ь	antenna port (dBm/15kHz)	unused PRBs
1	20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
2	2x15	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
2A	15+5	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
3	10+15	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
3A	20+5	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
4	10+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
6	15+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
7	2x20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
8	3x20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
9	15+20+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
10	10+20+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
11	15+15+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
12	10+15+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
13	10+10+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
14	10+15+15	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
15	5+10+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
15A	5+15+20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
16	4x20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
17	20+20+20+10	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
18	20+20+10+10	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
19	5x20	3	2 x 2	10	-3	-3	0	-85	OP.1 FDD
Note 1	: For CA test of	ases, PUCCH forn	nat 3 is used to fe	edback ACK/I	NACK.			•	

Table 8.7.1-6: Minimum requirement (FDD 256QAM)

Test	Measurement channel	Reference value						
		TB success rate [%]						
1	R.68 FDD	85						
2	R.68-1 FDD	85						
2A	R.68-1 FDD for 15MHz CC	85						
ZA	R.68-3 FDD for 5MHz CC							
3	R.68-2 FDD for 10MHz CC	85						
3	R.68-1 FDD for 15MHz CC							
3A	R.68 FDD for 20MHz CC	85						
	R.68-3 FDD for 5MHz CC							
4	R.68-2 FDD for 10MHz CC	85						
•	R.68 FDD for 20MHz CC							
6	R.68-1 FDD for 15MHz CC	85						
	R.68 FDD for 20MHz CC							
7	R.68 FDD	85						
8	R.68 FDD	85						
9	R.68-1 FDD for 15MHz CC	85						
	R.68 FDD for 20MHz CC R.68-2 FDD for 10MHz CC	05						
10	R.68 FDD for 20MHz CC	85						
	R.68-1 FDD for 15MHz CC	85						
11	R.68 FDD for 20MHz CC	65						
	R.68-2 FDD for 10MHz CC	85						
12	R.68-1 FDD for 15MHz CC	03						
	R.68 FDD for 20MHz CC							
40	R.68-2 FDD for 10MHz CC	85						
13	R.68 FDD for 20MHz CC							
14	R.68-2 FDD for 10MHz CC	85						
14	R.68-1 FDD for 15MHz CC							
	R.68-3 FDD for 5MHz CC	85						
15	R.68-2 FDD for 10MHz CC							
	R.68 FDD for 20MHz CC							
	R.68-3 FDD for 5MHz CC	[85]						
15A	R.68-1 FDD for 15MHz CC							
	R.68 FDD for 20MHz CC							
16	R.68 FDD	85						
17	R.68-2 FDD for 10MHz CC	85						
	R.68 FDD for 20MHz CC	0.5						
18	R.68-2 FDD for 10MHz CC	85						
19	R.68 FDD for 20MHz CC R.68 FDD	[95]						
Note 1:	For 2 layer transmissions, 2 transport b	[85]						
NOLE I.	TTI.	iocks are received within a						
Note 2:	The TB success rate is defined as TB s	uccess rate =						
11010 2.	100%*N _{DL_correct_rx} / (N _{DL_newtx} + N _{DL_retx}),							
	umber of newly transmitted DL transport blocks, N _{DL retx} is the							

Note 2: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/\left(N_{DL_newtx} + N_{DL_retx}\right), \text{ where } N_{DL_newtx} \text{ is the number of newly transmitted DL transport blocks, } N_{DL_retx} \text{ is the number of retransmitted DL transport blocks, and } N_{DL_correct_rx} \text{ is the number of correctly received DL transport blocks.}$

Table 8.7.1-7: Test points for sustained data rate (FRC 256QAM)

CA	Maximum supported Bandwidth/	Cat. 11, 12	DL Cat.	DL Cat.	DL Cat.	
config	Bandwidth combination (MHz)	DL Cat. 11, 12	13	15	16	
Single carrier	20	-	1	-	-	
	2x15	2	2	-	-	
	15+5	2A	2A	-	-	
CA	10+15	3	3	-	-	
with	20+5	3A	3A	-	-	
2CCs	10+20	4	4	-	-	
	15+20	6	6	-	-	
	20+20	7	7	-	-	
	3x20	8	7	8	-	
	15+20+20	9	7	9	-	
	10+20+20	10	7	10	-	
CA	15+15+20	11	6	11	-	
with	10+15+20	12	6	12	-	
3CCs	10+10+20	13	13	13	-	
	10+15+15	14	14	14	-	
	5+10+20	15	15	15	-	
	5+15+20	15A	15A	15A	-	
CA	4x20	8	1	16	16	
with	20+20+20+10	8	-	17	17	
4CCs	20+20+10+10	18	-	18	18	
CA with 5CCs	5x20	-	-	16	19	

NOTE 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

8.7.2 TDD (single carrier and CA)

The parameters specified in Table 8.7.2-1 are valid for all TDD tests unless otherwise stated.

Table 8.7.2-1: Common Test Parameters (TDD)

Parameter	Unit	Value				
Special subframe configuration (Note 1)		4				
Cyclic prefix		Normal				
Cell ID		0				
Inter-TTI Distance		1				
Maximum number of HARQ transmission		4				
Redundancy version coding sequence		{0,0,1,2} for 64QAM and 256QAM				
Number of OFDM symbols for PDCCH per component carrier	OFDM symbols	1				
Cross carrier scheduling		Not configured				
Propagation condition		Static propagation condition No external noise sources are applied				
Note 1: as specified in Table 4.2-1 in TS 36.211 [4].						

For UE not supporting 256QAM, the requirements are specified in Table 8.7.2-3, with the addition of the parameters in Table 8.7.2-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2-4. The TB success rate shall be sustained during at least 300 frames.

For UE supporting 256QAM, the requirements are specified in Table 8.7.2-6, with the addition of the parameters in Table 8.7.2-5 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.2-7. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.2-3 is not applicable.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.7.2-2: test parameters for sustained downlink data rate (TDD 64QAM)

Test	Bandwidth	Transmission	Antenna	Codebook subset	Downlink power allocation (dB)		$\hat{E}_{\scriptscriptstyle S}$ at antenna	ACK/NACK feedback	Symbols for unused	
1001	(MHz)	mode	configuration	restriction	$ ho_{\scriptscriptstyle A}$	$ ho_{\scriptscriptstyle B}$	σ	port (dBm/15 kHz)	mode	PRBs
1	10	1	1 x 2	N/A	0	0	0	-85	Bundling	OP.6 TDD
2	10	3	2 x 2	10	-3	-3	0	-85	Bundling	OP.1 TDD
3	20	3	2 x 2	10	-3	-3	0	-85	Bundling	OP.1 TDD
3A	15	3	2 x 2	10	-3	-3	0	-85	Muliplexing	OP.2 TDD
4,6	20	3	2 x 2	10	-3	-3	0	-85	Multiplexing	OP.1 TDD
6A	2x20	3	2 x 2	10	-3	-3	0	-85	- (Note 1)	OP.1 TDD
6B	20+15	3	2 x 2	10	-3	-3	0	-85	(Note 1)	OP.1 TDD
7	3x20	3	2 x 2	10	-3	-3	0	-85	(Note 2)	OP.1 TDD
7A	15+20+20	3	2 x 2	10	-3	-3	0	-85	(Note 2)	OP.1 TDD

Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.

Note 2: PUCCH format 3 is used to feedback ACK/NACK.

Table 8.7.2-3: Minimum requirement (TDD 64QAM)

Test	Number of bits of a DL-SCH transport block received within	Measurement channel	Reference value TB success rate [%]
	a TTI for normal/special sub- frame		
1	10296/0	R31-1 TDD	95
2	25456/0	R31-2 TDD	95
3	51024/0	R31-3 TDD	95
3A	51024/0	R31-3A TDD	85
4	75376/0 (Note 2)	R31-4 TDD	85
6	75376/0 (Note 2)	R.31-4 TDD	85
6A	75376/0 (Note 2)	R.31-4 TDD	85
6B	55056/0 for 15MHz CC	R31-5 TDD for 15MHz CC	85
	75376/0 for 20MHz CC (Note 2)	R.31-4 TDD for 20MHz CC	
7	75376/0 (Note 2)	R.31-4 TDD	85
7A	55056/0 for 15MHz CC 75376/0 for 20MHz CC (Note 2)	R.31-5 TDD for 15MHz CC R.31-4 TDD for 20MHz CC	85

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: 71112 bits for sub-frame 5.

Note 3: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/(N_{DL_newtx} + N_{DL_retx})$, where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_retx} is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

Table 8.7.2-4: Test points for sustained data rate (FRC 64QAM)

CA config	Bandwidth/ Bandwidth combination (MHz)	Cat. 1	Cat. 2	Cat. 3	Cat. 4	Cat. 6,7	Cat. 9, 10	Cat. 11, 12 DL Cat. 11, 12	DL Cat. 15
Cinala	10	1	2	-	-	-	-	-	-
Single	15	-	-	3A	3A	-	-	-	-
carrier	20	-	-	3	4	6	-	-	-
CA with	20+20	-		3(Note 4)	4 (Note 4)	6A	6A	-	-
2CCs	15+20	-	-	3(Note 4)	4 (Note 4)	6B	6B	-	-
CA with 3	3x20	-	-		-	6A	7	7	-
CCs	15+20+20	-	-	-	-	6A	7A	7A	-

Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category.

Otherwise, select the test point according to the UE category signalled.

Note 2: For non-CA UE, test is selected for maximum supported bandwidth.

Note 3: Void.

Note 4: If the intra-band contiguous CA is the only CA configuration supported by category 3 or 4 UE, single carrier

test is selected.

Note 5: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in

8.1.2.3.

Table 8.7.2-5: test parameters for sustained downlink data rate (TDD 256QAM)

Test	Bandwidth	Transmission	Antenna	Codebook		Downlink power allocation (dB)		power		$\hat{E}_{\scriptscriptstyle s}$ at antenna	ACK/NACK feedback	Symbols for unused
1000	(MHz)	mode	configuration	restriction	$ ho_{\scriptscriptstyle A}$	$ ho_{\scriptscriptstyle B}$	σ	port (dBm/15 kHz)	mode	PRBs		
1	20	3	2 x 2	10	-3	-3	0	-85	Bundling	OP.1 TDD		
2	15+20	3	2 x 2	10	-3	-3	0	-85	(Note 1)	OP.1 TDD		
3	2x20	3	2 x 2	10	-3	-3	0	-85	(Note 1)	OP.1 TDD		
4	3x20	3	2 x 2	10	-3	-3	0	-85	(Note 1)	OP.1 TDD		
5	15+20+20	3	2 x 2	10	-3	-3	0	-85	(Note 1)	OP.1 TDD		
Note 1	Note 1: For CA test cases, PUCCH format 3 is used to feedback ACK/NACK.											

Table 8.7.2-6: Minimum requirement (TDD 256QAM)

Test	Measurement channel	Reference value				
		TB success rate [%]				
1	R.68 TDD	85				
2	R.68-1 TDD for 15MHz CC	85				
	R.68 TDD for 20MHz CC					
3	R.68 TDD	85				
4	R.68 TDD	85				
5	R.68-1 TDD for 15MHz CC	85				
5	R.68 TDD for 20MHz CC					

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/(N_{DL_newtx} + N_{DL_retx})$, where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_retx} is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

Table 8.7.2-7: Test points for sustained data rate (FRC 256QAM)

CA config	Bandwidth/ Bandwidth combination (MHz)	Cat. 11, 12 DL Cat. 11, 12	DL Cat. 13	DL Cat. 15	DL Cat. 16	
Single carrier	20	-	1	-	-	
CA with	15+20	2	2	-	-	
2CCs	2x20	3	3	-	ı	
CA with 3	3x20	4	3	4	ı	
CCs	15+20+20	5	3	5	ı	

8.7.3 FDD (EPDCCH scheduling)

The parameters specified in Table 8.7.3-1 are valid for all FDD tests unless otherwise stated.

Table 8.7.3-1: Common test parameters (FDD)

Parameter	Unit	Value						
Cyclic prefix		Normal						
Cell ID		0						
Inter-TTI Distance		1						
Number of HARQ								
processes per	Processes	8						
component carrier								
Maximum number of		4						
HARQ transmission		4						
Redundancy version		{0,0,1,2} for 64QAM						
coding sequence		{0,0,1,2} 101 04QAM						
Number of OFDM								
symbols for PDCCH per	OFDM symbols	1						
component carrier								
Cross carrier scheduling		Not configured						
Number of EPDCCH		1						
sets		ı						
EPDCCH transmission		Localized						
type								
Number of PRB per		2 PRB pairs						
EPDCCH set and		10MHz BW: Resource blocks n _{PRB} = 48, 49						
EPDCCH PRB pair		15MHz BW: Resource blocks n _{PRB} = 70, 71						
allocation		20MHz BW: Resource blocks n _{PRB} = 98, 99						
EPDCCH Starting		Derived from CFI (i.e. default behaviour)						
Symbol								
ECCE Aggregation		2 ECCEs						
Level								
Number of EREGs per		4						
ECCE								
EPDCCH scheduling		EPDCCH candidate is randomly assigned in each subframe						
EPDCCH precoder								
(Note 1)		Fixed PMI 0						
EPDCCH monitoring SF		111111111 000000000						
pattern		111111111 000000000						
Timing advance	μs	100						
	r.··	Static propagation condition						
Propagation condition		No external noise sources are applied						
Note 1: EPDCCH preco								
configuration								

The requirements are specified in Table 8.7.3-3, with the addition of the parameters in Table 8.7.3-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category, CA capability and

bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.3-4. The TB success rate shall be sustained during at least 300 frames.

Table 8.7.3-2: Test parameters for SDR test for PDSCH scheduled by EPDCCH (FDD)

Test	Bandwidth	Transmission	Antenna	Codebook subset		ownlin Ilocati			$\hat{E}_{\scriptscriptstyle S}$ at	Symbols for
Test	(MHz)	mode	configuration	restriction	$ ho_{\scriptscriptstyle A}$	$ ho_{\scriptscriptstyle B}$	σ	δ	antenna port (dBm/15kHz)	unused PRBs
1	10	1	1 x 2	N/A	0	0	0	0	-85	OP.6 FDD
2	10	3	2 x 2	10	-3	-3	0	3	-85	OP.1 FDD
3,4,6	20	3	2 x 2	10	-3	-3	0	3	-85	OP.1 FDD
ЗА	10	3	2 x 2	10	-3	-3	0	3	-85	OP.1 FDD
3C, 4B	15	3	2 x 2	10	-3	-3	0	3	-85	OP.1 FDD

Table 8.7.3-3: Minimum requirement (FDD)

Test	Number of bits of a DL-SCH transport	Measurement channel	Reference value
	block received within a TTI		TB success rate [%]
1	10296	R.31E-1 FDD	95
2	25456	R.31E-2 FDD	95
3	51024	R.31E-3 FDD	95
3A	36696 (Note 2)	R.31E-3A FDD	85
3C	51024	R.31E-3C FDD	85
4	75376 (Note 3)	R.31E-4 FDD	85
4B	55056 (Note 5)	R.31E-4B FDD	85
6	75376 (Note 3)	R.31E-4 FDD	85

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: 35160 bits for sub-frame 5.

Note 3: 71112 bits for sub-frame 5.

Note 4: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/(N_{DL_newtx} + N_{DL_retx})$, where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_retx} is the number of retransmitted DL transport

blocks, and N_{DL_correct_rx} is the number of correctly received DL transport blocks.

Note 5: 52752 bits for sub-frame 5.

Table 8.7.3-4: Test points for sustained data rate (FRC)

CA config	Bandwidth (MHz)	Category 1	Category 2	Category 3	Category 4	Category 6	Category 7
Single	10	10 1 2		3A	3A	-	-
Ų.	15	-	-	3C	4B	-	-
carrier	20	-	-	3	4	6	6
Note 1: T	he test is selected for	maximum su	ported bandw	/idth.			

8.7.4 TDD (EPDCCH scheduling)

The parameters specified in Table 8.7.4-1 are valid for all TDD tests unless otherwise stated.

Table 8.7.4-1: Common test parameters (TDD)

Parameter	Unit	Value
Special subframe		4
configuration (Note 1)		·
Cyclic prefix		Normal
Cell ID		0
Inter-TTI Distance		1
Maximum number of HARQ transmission		4
Redundancy version coding sequence		{0,0,1,2} for 64QAM
Number of OFDM symbols for PDCCH per component carrier	OFDM symbols	1
Cross carrier scheduling		Not configured
Number of EPDCCH sets		1
EPDCCH transmission type		Localized
Number of PRB per EPDCCH set and EPDCCH PRB pair allocation		2 PRB pairs 10MHz BW: Resource blocks n _{PRB} = 48, 49 15MHz BW: Resource blocks n _{PRB} = 70, 71 20MHz BW: Resource blocks n _{PRB} = 98,
EPDCCH Starting Symbol		99 Derived from CFI (i.e. default behaviour)
ECCE Aggregation Level		2 ECCEs
Number of EREGs per ECCE		4 for normal subframe and 8 for special subframe
EPDCCH scheduling		EPDCCH candidate is randomly assigned in each subframe
EPDCCH precoder (Note 2)		Fixed PMI 0
EPDCCH monitoring SF pattern		UL-DL configuration 1: 1101111111 000000000 UL-DL configuration 5: 1100111001 000000000
Timing advance	μs	100
Propagation condition		Static propagation condition No external noise sources are applied
Note 1: As specified in Note 2: EPDCCH preconfiguration	Table 4.2-1 in TS 36 oder parameters are	.211 [4]. defined for tests with 2 x 2 antenna

The requirements are specified in Table 8.7.4-3, with the addition of the parameters in Table 8.7.4-2 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category, CA capability and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.4-4. The TB success rate shall be sustained during at least 300 frames.

Table 8.7.4-2: Test parameters for SDR test for PDSCH scheduled by EPDCCH (TDD)

Test	Bandwidth (MHz)	th Transmission mode	Antenna configuration	Codebook subset	Downlink power allocation (dB)				$\hat{E}_{_{s}}$ at antenna port	Symbols for unused	ACK/NACK feedback
	(1411 12)	mode	comiguration	restriction	$ ho_{\scriptscriptstyle A}$	$ ho_{\scriptscriptstyle B}$	σ	δ	(dBm/15kHz)	PRBs	mode
1	10	1	1 x 2	N/A	0	0	0	0	-85	OP.6 TDD	Bundling
2	10	3	2 x 2	10	-3	-3	0	3	-85	OP.1 TDD	Bundling
3	20	3	2 x 2	10	-3	-3	0	3	-85	OP.1 TDD	Bundling
ЗА	15	3	2 x 2	10	-3	-3	0	3	-85	OP.2 TDD	Multiplexing
4,6	20	3	2 x 2	10	-3	-3	0	3	-85	OP.1 TDD	Multiplexing

Table 8.7.4-3: Minimum requirement (TDD)

Test	Number of bits of a DL-SCH	Measurement channel	Reference value
	transport block received within a TTI for normal/special sub-		TB success rate [%]
	frame		
1	10296/0	R.31E-1 TDD	95
2	25456/0	R.31E-2 TDD	95
3	51024/0	R.31E-3 TDD	95
3A	51024/0	R.31E-3A TDD	85
4	75376/0 (Note 2)	R.31E-4 TDD	85
6	75376/0 (Note 2)	R.31E-4 TDD	85

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: 71112 bits for sub-frame 5.

Note 3: The TB success rate is defined as TB success rate = $100\%*N_{DL_correct_rx}/(N_{DL_newtx} + N_{DL_retx})$, where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_retx} is the number of retransmitted DL transport blocks, and $N_{DL_correct_rx}$ is the number of correctly received DL transport blocks.

Table 8.7.4-4: Test points for sustained data rate (FRC)

CA config	Bandwidth/ Bandwidth combination (MHz)	Category 1	Category 2	Category 3	Category 4	Category 6	Category 7
Cinala	10	1	2	-	-	-	-
Single	15	-	-	3A	3A	-	-
carrier	20	-	-	3	4	6	6
Note 1: T	he test is selected for	maximum supp	oorted bandwid	lth.			

8.7.5 TDD FDD CA

The parameters specified in Table 8.7.5-1 are valid for all TDD FDD CA tests unless otherwise stated.

Table 8.7.5-1: Common Test Parameters (TDD FDD CA)

Parameter		Unit	Value
Uplink downlink configuration TDD CC			1
Special subframe configuration for TDD CC	ation (Note 2)		4
	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3
	σ	dB	0
Cyclic prefix			Normal
Cell ID			0
Inter-TTI Distan	се		1
Maximum number of HARQ processes per	FDD PCell	Processes	8 for FDD and TDD CCs
component carrier	TDD PCell	Processes	11 for FDD CC; 7 for TDD CC
Maximum number of HARO	transmission		4
Redundancy version codi	dancy version coding sequence		{0,0,1,2} for 64QAM, 256QAM
Number of OFDM symbol per component ca		OFDM symbols	1
Cross carrier schee	duling		Not configured
Propagation cond	lition		Static propagation condition No external noise sources are applied
Transmission mo	ode		ТМЗ
Codebook subset res	striction		10
Antenna configura	ation		2 x 2
$\hat{E}_{\scriptscriptstyle s}$ at antenna port (dB	m/15kHz)		-85
Symbols for unused	I PRBs		OP.1 FDD for FDD CC, OP.1 TDD for TDD CC
ACK/NACK feedbac	k mode		PUCCH format 3
Downlink HARQ-ACK	FDD PCell		As specified in Clause 7.3.3 in TS36.213 [6]
timing	TDD PCell		As specified in Clause 7.3.4 in TS36.213 [6]

8.7.5.1 Minimum Requirement FDD PCell

For UE not supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.1-2. The TB success rate shall be sustained during at least 300 frames.

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.1-3 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with the maximum aggregated bandwidth as specified in Table 8.7.5.1-4. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirement in Table 8.7.5.1-1 is not applicable.

The applicability of the requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.7.5.1-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)

Test num ber	Ban	dwidth (MH	lz)	SCH trans received w (for norm subframe	ransport block ed within a TTI formal/special rame for TDD, for subframe #5)		Reference value	
	Total	FDD CC	TDD CC	FDD CC	TDD CC	FDD CC	TDD CC	TB success rate [%]
1	2x20	20	20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	85
2	10+20	10	20	36696	75376/0	R.31-3A FDD R.31-4 TDD		85
2A	15+20	15	20	55056	75376/0	R.31-5 FDD	R.31-4 TDD	85
3	10+10	10	10	36696	36696/0	R.31-3A FDD	R.31-6 TDD	85
4	3x20	20	2x20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	85
5	15+20+20	15	2x20	55056	75376/0	R.31-5 FDD	R.31-4 TDD	85
6	10+20+20	10	2x20	36696	75376/0	R.31-3A FDD	R.31-4 TDD	85
7	3x20	2x20	20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	[85]
8	20+20+15	20+15	20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for		[85]
9	20+20+10	20+10	20	75376 for 20MHz CC 36696 for 10MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC	R.31-4 TDD	[85]
10	4x20	20	3x20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	85
11	4x20	2×20	2×20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	[85]
12	3x20+15	20+15	2×20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
13	2×15+2x20	2×15	2x20	55056	75376/0	R.31-5 FDD	R.31-4 TDD	[85]
14	3x20+15	2×20+15	20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
15	2×15+2x20	2x15+20	20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
16	4x20+15	2x20+15	2x20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
17	2x15+3x20	2x15+20	2x20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]

Table 8.7.5.1-2: Test points for sustained data rate (FRC 64QAM)

CA		Maximum supported Bandwidth/ Bandwidth combination (MHz)			Cat. 2	Cat. 3	Cat. 4	Cat. 6,	Cat. 9,10	Cat 11, 12	DL Cat.
config	Total	FDD CC	TDD CC	Cat. 1	Cat. 2	Cat. 3	Cal. 4	DL Cat. 6, 7	DL Cat. 9, 10	DL Cat. 11, 12	15
CA	2x20	20	20		-	3	3	1	1	-	-
with	10+20	10	20	•	-	3	3	2	2	-	-
2CCs	15+20	15	20	1	-	3	3	2A	2A	-	-
	3x20	20	2x20	1	-	-	-	1	4	4	-
CA	15+20+20	15	2x20	•	-	-	-	2A	5	5	-
CA	10+20+20	10	2x20	-	-	-	-	2	6	6	-
with 3CCs	3x20	2x20	20	•	-	-	-	1	7	7	-
3008	20+20+15	20+15	20	-	-	-	-	1	8	8	-
	20+20+10	20+10	20	-	-	-	-	1	9	9	-
	4x20	20	3x20	-	-	-	-	-	4	10	10
CA	4x20	2×20	2×20	-	-	-	-	-	4 or 7	11	11
CA with	3x20+15	20+15	2×20	-	-	-	-	-	4	12	12
4CCs	2×15+2x20	2×15	2x20		-	-	-	-	5	13	13
4008	3x20+15	2×20+15	20	-	-	-	-	-	7	14	14
	2×15+2x20	2x15+20	20	-	-	-	-	-	8	15	15
CA	4x20+15	2x20+15	2x20	-	-	-	-	-	-	11	16
with 5 CCs	2x15+3x20	2x15+20	2x20	-	-	-	-	-	-	12	17

Note 1: Void. Note 2: Void.

Note 3: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

Table 8.7.5.1-3: Minimum requirement (TDD FDD CA 256QAM)

Test	Bar	ndwidth (MF	lz)	Measurem	ent channel	Reference value
number	Total	FDD CC	TDD CC	FDD CC	TDD CC	TB success rate [%]
1	2x20	20	20	R.68 FDD	R.68 TDD	85
2	10+20	10	20	R.68-2 FDD	R.68 TDD	85
3	15+20	15	20	R.68-1 FDD	R.68 TDD	[85]
4	3x20	20	2x20	R.68 FDD	R.68 TDD	85
5	15+20+20	15	2x20	R.68-1 FDD	R.68 TDD	85
6	10+20+20	10	2x20	R.68-2 FDD	R.68TDD	85
7	3x20	2x20	20	R.68 FDD	R.68 TDD	[85]
8	20+20+15	20+15	20	R.68 FDD for 20MHz CC, R.68-1 FDD fo 15MHz CC	r R.68 TDD	[85]
9	20+20+10	20+10	20	R.68 FDD for 20MHz CC, R.68-2 FDD fo 10MHz CC	r R.68 TDD	[85]
10	4x20	20	3x20	R.68-2 FDD	R.68TDD	85
11	4x20	2×20	2×20	R.68 FDD	R.68 TDD	[85]
12	3x20+15	20+15	2×20	R.68 FDD for 20MHz CC, R.68-1 FDD fo 15MHz CC	r R.68 TDD	[85]
13	2x15+2x2 0	2×15	2x20	R.68-1 FDD	R.68 TDD	[85]
14	3x20+15	2×20+15	20	R.68 FDD for 20MHz CC, R.68-1 FDD fo 15MHz CC	r R.68 TDD	[85]
15	2×15+2×2 0	2x15+20	20	R.68 FDD for 20MHz CC, R.68-1 FDD fo 15MHz CC	r R.68 TDD	[85]
16	4x20+15	2x20+15	2x20	R.68 FDD for 20MHz CC, R.68-1 FDD fo 15MHz CC	r R.68 TDD	[85]
17	2x15+3x20	2x15+20	2x20	R.68 FDD for 20MHz CC, R.68-1 FDD fo 15MHz CC	r R.68 TDD	[85]

Table 8.7.5.1-4: Test points for sustained data rate (FRC 256QAM)

CA	Maximum su Bandwidth	ipported Ba combinatio		Cat. 11, 12	DL Cat.	DL Cat.	DL Cat.	
config	Total	FDD CC	TDD CC	DL Cat. 11, 12	13	15	16	
CA	2x20	20	20	1	1	-	ı	
with	10+20	10	20	2	2			
2CCs	15+20	15	20	3	3	-		
	3x20	20	2x20	4	1	4	-	
	15+20+20	15	2x20	5	3	5	-	
CA with	10+20+20	10	2x20	6	2	6	-	
3CCs	3x20	2x20	20	7	1	7	-	
3005	20+20+15	20+15	20	8	1	8	-	
	20+20+10	20+10	20	9	1	9	-	
	4x20	20	3x20	4	-	10	10	
	4x20	2×20	2×20	4 or 7	-	11	11	
CA with	3x20+15	20+15	2×20	8	-	12	12	
4CCs	2×15+2x20	2×15	2x20	5	-	13	13	
4005	3x20+15	2×20+15	20	7	-	14	14	
	2×15+2×20	2x15+20	20	8	-	15	15	
CA	4x20+15	2x20+15	2x20	-	-	14 or 12	16	
with 5CCs	2x15+3x20	2x15+20	2x20	-	-	15 or 12	17	

Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

8.7.5.2 Minimum Requirement TDD PCell

For UE not supporting 256QAM, the requirements for TDD FDD CA with TDD PCell are specified in Table 8.7.5.2-1 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2-2. The TB success rate shall be sustained during at least 300 frames.

For UE supporting 256QAM, the requirements for TDD FDD CA with FDD PCell are specified in Table 8.7.5.2-3 with the additional parameters specified in Table 8.7.5-1, and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category or UE DL category, and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.5.2-4. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirements in Table 8.7.5.2-1 is not applicable.

The applicability of ther requirements are specified in Clause 8.1.2.3B. The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.7.5.2-1: test parameters for sustained downlink data rate (TDD FDD CA 64QAM)

Test num ber	Bar	ndwidth (MH	lz)	Number of bits of a DL- SCH transport block received within a TTI (for normal/special subframe for TDD, except for subframe #5)		Measureme	nt channel	Referenc e value
	Total	FDD CC	TDD CC	FDD CC	TDD CC	FDD CC	TDD CC	TB success rate [%]
1	2x20	20	20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	85
2	10+20	10	20	36696	75376/0	R.31-3A FDD	R.31-4 TDD	85
2A	15+20	15	20	55056	75376/0	R.31-5 FDD	R.31-4 TDD	85
3	10+10	10	10	36696	36696/0	R.31-3A FDD	R.31-6 TDD	85
4	3x20	20	2x20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	85
5	15+20+20	15	2x20	55056	75376/0	R.31-5 FDD	R.31-4 TDD	85
6	10+20+20	10	2x20	36696	75376/0	R.31-3A FDD	R.31-4 TDD	85
7	3x20	2x20	20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	[85]
8	20+20+15	20+15	20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
9	20+20+10	20+10	20	75376 for 20MHz CC 36696 for 10MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-3A FDD for 10MHz CC	R.31-4 TDD	[85]
10	4x20	20	3x20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	85
11	4x20	2×20	2×20	75376	75376/0	R.31-4 FDD	R.31-4 TDD	[85]
12	3x20+15	20+15	2×20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
13	2×15+2x20	2×15	2x20	55056	75376/0	R.31-5 FDD	R.31-4 TDD	[85]
14	3x20+15	2×20+15	20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
15	2×15+2x20	2x15+20	20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
16	4x20+15	2x20+15	2x20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]
17	2x15+3x20	2x15+20	2x20	75376 for 20MHz CC 55056 for 15MHz CC	75376/0	R.31-4 FDD for 20MHz CC, R.31-5 FDD for 15MHz CC	R.31-4 TDD	[85]

Table 8.7.5.2-2: Test points for sustained data rate (FRC 64QAM)

CA	Maximum su Bandwidth	ipported Ba		Cat. 1	Cat. 1 Cat. 2		Cat. 4	Cat. 6,	Cat. 9,10	Cat 11, 12	DL Cat.
config	Total	FDD CC	TDD CC	Cat. 1	Cat. 2	Cat. 3	Cal. 4	DL Cat. 6, 7	DL Cat. 9, 10	DL Cat. 11, 12	15
CA	2x20	20	20		-	3	3	1	1	-	-
with	10+20	10	20	•	-	3	3	2	2	-	-
2CCs	15+20	15	20	1	-	3	3	2A	2A	-	-
	3x20	20	2x20	1	-	-	-	1	4	4	-
CA	15+20+20	15	2x20	•	-	-	-	2A	5	5	-
CA	10+20+20	10	2x20	-	-	-	-	2	6	6	-
with 3CCs	3x20	2x20	20	•	-	-	-	1	7	7	-
3008	20+20+15	20+15	20	-	-	-	-	1	8	8	-
	20+20+10	20+10	20	-	-	-	-	1	9	9	-
	4x20	20	3x20	-	-	-	-	-	4	10	10
CA	4x20	2×20	2×20	-	-	-	-	-	4 or 7	11	11
CA with	3x20+15	20+15	2×20	-	-	-	-	-	4	12	12
4CCs	2×15+2x20	2×15	2x20	•	-	-	-	-	5	13	13
4008	3x20+15	2×20+15	20	-	-	-	-	-	7	14	14
	2×15+2x20	2x15+20	20	-	-	-	-	-	8	15	15
CA	4x20+15	2x20+15	2x20	-	-	-	-	-	-	11	16
with 5 CCs	2x15+3x20	2x15+20	2x20	-	-	-	-	-	-	12	17

Note 1: Void. Note 2: Void.

Note 3: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

Table 8.7.5.2-3: Minimum requirement (TDD FDD CA 256QAM)

Test	Ban	dwidth (MH	z)	Measureme	nt channel	Reference value
number	Total	FDD CC	TDD CC	FDD CC	TDD CC	TB success rate [%]
1	2x20	20	20	R.68 FDD	R.68 TDD	85
2	10+20	10	20	R.68-2 FDD	R.68 TDD	85
3	15+20	15	20	R.68-1 FDD	R.68 TDD	[85]
4	3x20	20	2x20	R.68 FDD	R.68 TDD	85
5	15+20+20	15	2x20	R.68-1 FDD	R.68 TDD	85
6	10+20+20	10	2x20	R.68-2 FDD	R.68TDD	85
7	3x20	2x20	20	R.68 FDD	R.68 TDD	[85]
8	20+20+15	20+15	20	R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC	R.68 TDD	[85]
9	20+20+10	20+10	20	R.68 FDD for 20MHz CC, R.68-2 FDD for 10MHz CC	R.68 TDD	[85]
10	4x20	20	3x20	R.68-2 FDD	R.68TDD	85
11	4x20	2×20	2×20	R.68 FDD	R.68 TDD	[85]
12	3x20+15	20+15	2×20	R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC	R.68 TDD	[85]
13	2×15+2x20	2×15	2x20	R.68-1 FDD	R.68 TDD	[85]
14	3x20+15	2×20+15	20	R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC	R.68 TDD	[85]
15	2×15+2x20	2x15+20	20	R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC	R.68 TDD	[85]
16	4x20+15	2x20+15	2x20	R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC	R.68 TDD	[85]
17	2x15+3x20	2x15+20	2x20	R.68 FDD for 20MHz CC, R.68-1 FDD for 15MHz CC	R.68 TDD	[85]

Table 8.7.5.2-4: Test points for sustained data rate (FRC 256QAM)

CA		upported Ba		Cat. 11, 12	DL Cat.	DL Cat.	DL Cat.	
config	Total	FDD CC	TDD CC	DL Cat. 11, 12	13	15	16	
CA	2x20	20	20	1	1	-	-	
with	10+20	10	20	2	2			
2CCs	15+20	15	20	3	3	-	-	
	3x20	20	2x20	4	1	4	-	
	15+20+20	15	2x20	5	3	5	-	
CA	10+20+20	10	2x20	6	2	6	-	
with 3CCs	3x20	2x20	20	7	1	7	-	
3008	20+20+15	20+15	20	8	1	8	-	
	20+20+10	20+10	20	9	1	9	-	
	4x20	20	3x20	4	-	10	10	
0.4	4x20	2×20	2×20	4 or 7	-	11	11	
CA	3x20+15	20+15	2×20	8	-	12	12	
with 4CCs	2×15+2x20	2×15	2x20	5	-	13	13	
400S	3x20+15	2×20+15	20	7	-	14	14	
	2×15+2x20	2x15+20	20	8	-	15	15	
CA	4x20+15	2x20+15	2x20	-	-	14 or 12	16	
with 5CCs	2x15+3x20	2x15+20	2x20	-	-	15 or 12	17	

Note 1: If DL category is signalled by the UE under test, then select the test point according to UE DL Category. Otherwise, select the test point according to the UE category signalled.

8.7.6 FDD (DC)

The parameters specified in Table 8.7.6-1 are valid for all FDD DC tests unless otherwise stated.

Table 8.7.6-1: Common Test Parameters (FDD)

Parai	neter	Unit	Value
Cyclic	prefix		Normal
Cel	I ID		0
Inter-TTI	Distance		1
compone	Q processes per ent carrier	Processes	8
	nber of HARQ nission		4
Redundancy version	n coding sequence		{0,0,1,2} for 64QAM and 256QAM
	symbols for PDCCH nent carrier	OFDM symbols	1
Cross carrie	r scheduling		Not configured
Propagatio	n condition		Static propagation condition No external noise sources are applied
Transmission mode			TM3
Codebook subset restriction			10
Antenna co	onfiguration		2x2
$\hat{E}_{\scriptscriptstyle s}$ at antenna p	ort (dBm/15kHz)		-85
Symbols for t	unused PRBs		OP.1 FDD
ACK/NACK fe	edback mode		Separate ACK/NACK feedbacks with PUCCH format 3 on the MCG and SCG
Time offset between MCG CC and SCG CC		μs	O for UE under test supporting synchronous dual connectivity; 500 for UE under test supporting both asynchronous and synchrounous dual connectivity (Note 1)
Downlink nower	$\rho_{\scriptscriptstyle A}$		-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB dB	-3
	σ		0 ity are defined in TS36.300 [11].

If the UE supports both SCG bearer and Split bearer, the Split bearer is configured.

For UE not supporting 256QAM, the requirements are specified in Table 8.7.6-2, with the addition of the parameters in Table 8.7.6-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.6-3. The TB success rate across CGs shall be sustained during at least 300 frames.

For UE supporting 256QAM, the requirements are specified in Table 8.7.6-4, with the addition of the parameters in Table 8.7.6-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.6-5. The TB success rate across CGs shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirements in Table 8.7.6-2 are not applicable.

The applicability of ther requirements are specified in Clause 8.1.2.3A.

Table 8.7.6-2: Minimum requirement (DC 64QAM)

Test number	Bandwidth combination (MHz) Number of bits of a DL-SCH transport channel			Reference value TB success rate(%)			
		within a TTI		DRB type of Split bearer	DRB type bearer (
				(Note 2)	MCG	SCG	
1	2x10	25456	R.31-2 FDD	95	95	95	
2	2x10	36696 (Note 4)	R.31-3A FDD	85	85	85	
3	10+20	36696 (Note 4) for 10MHz CC 75376 (Note 5) for 20MHz CC	R.31-3A FDD for 10MHz CC R.31-4 FDD for 20MHz CC	85	85	85	
4	2x15	55056 (Note 6)	R.31-4B FDD	85	85	85	
5	15+20	55056 for 15MHz CC 75376 (Note 5) for 20MHz CC	R.31-5 FDD for 15MHz CC R.31-4 FDD for 20MHz CC	85	85	85	
6	2x20	75376 (Note 5)	R.31-4 FDD	85	85	85	

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx}), where N_{DL_newtx} is the number of newly transmitted DL transport blocks , N_{DL_retx} is the number of retransmitted DL transport blocks, and N_{DL_correct_rx} is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blockes across all the CGs used for DC transmission or reception.

Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx}), where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_retx} is the number of retransmitted DL transport blocks, and N_{DL_correct_rx} is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blockes per CG used for DC transmission or reception, separately.

Note 4: 35160 bits for sub-frame 5. Note 5: 71112 bits for sub-frame 5. Note 6: 52752 bits for sub-frame 5.

Table 8.7.6-3: Test points for sustained data rate (FRC DC 64QAM)

DC config	Maximum supported Bandwidth combination (MHz)	Cat. 3	Cat. 4	Cat. 6, 7	Cat. 9, 10	Cat. 11, 12	
	2x10	1	2	2	2	-	
DC with	10+20	1	2	3	3	-	
2CCs	2x15	1	2	4	4	-	
2008	15+20	1	2	5	5	-	
	2x20	1	2	6	6	-	

Table 8.7.6-4: Minimum requirement (DC 256QAM)

Test number	Bandwidth combination (MHz)	Measurement channel	Reference value TB success rate (%)		6)
			DRB type of Split bearer		e of SCG (Note 3)
			(Note 2)	MCG	SCG
1	2x10	R.68-2 FDD	85	85	85
2	10+20	R.68-2 FDD for 10MHz CC R.68 FDD for 20MHz CC	85	85	85
3	2x15	R.68-1 FDD	85	85	85
4	15+20	R.68-1 FDD for 15MHz CC R.68 FDD for 20MHz CC	85	85	85
5	2x20	R.68 FDD	85	85	85

Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI.

Note 2: For the configuration of DRB type of Split bearer, the TB success rate across CGs is defined as TB success rate = 100%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx}), where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_retx} is the number of retransmitted DL transport blocks, and N_{DL_correct_rx} is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blockes across all the CGs used for DC transmission or reception.

Note 3: For the configuration of DRB type of SCG bearer, the TB success rate across CGs is defined as TB success rate = 100%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx}), where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_correct_rx} is the number of retransmitted DL transport blocks, and N_{DL_correct_rx} is the number of correctly received DL transport blocks. All the above numbers of transmitted, retransmitted or correctly received DL transport blocks are calculated as the sum of the numbers of DL transport blockes per CG used for DC transmission or reception, separately.

Table 8.7.6-5: Test points for sustained data rate (FRC DC 256QAM)

DC config	Maximum supported Bandwidth combination (MHz)	Cat. 11, 12	DL Cat. 13		
	2x10	1	1		
DC with	10+20	2	2		
DC with 2CCs	2x15	3	3		
2008	15+20	4	4		
	2x20	5	5		

8.7.7 TDD (DC)

The parameters specified in Table 8.7.7-1 are valid for all TDD DC tests unless otherwise stated.

Table 8.7.7-1: Common Test Parameters (TDD)

Para	meter	Unit	Value
Uplink downlii	nk configuration		2 (Note 2)
Special subfra	me configuration		4
Cycli	c prefix		Normal
Ce	ell ID		0
Inter-TT	I Distance		1
	RQ processes per ent carrier	Processes	7
Maximum number o	of HARQ transmission		4
Redundancy versi	on coding sequence		{0,0,1,2} for 64QAM and 256QAM
	symbols for PDCCH onent carrier	OFDM symbols	1
Cross carrie	er scheduling		Not configured
Propagation	on condition		Static propagation condition No external noise sources are applied
Transmis	sion mode		TM3
Codebook su	bset restriction		10
Antenna c	onfiguration		2x2
$\hat{E}_{\scriptscriptstyle s}$ at antenna $_{\scriptscriptstyle m I}$	oort (dBm/15kHz)		-85
Symbols for	unused PRBs		OP.1 TDD
ACK/NACK f	eedback mode		Separate ACK/NACK feedbacks with PUCCH format 3 on the MCG and SCG
	n MCG CC and SCG CC	μs	O for UE under test supporting synchronous dual connectivity; 500 for UE under test supporting both asynchronous and synchrounous dual connectivity (Note 1)
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	-3
allocation			-3
Note 1: Asynchro	σ	dB	0 y are defined in TS36.300 [11].

If the UE supports both SCG bearer and Split bearer, the Split bearer is configured. Note 2:

For UE not supporting 256QAM, the requirements are specified in Table 8.7.7-2, with the addition of the parameters in Table 8.7.7-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.7-3. The TB success rate shall be sustained during at least 300 frames.

For UE supporting 256QAM, the requirements are specified in Table 8.7.7-4, with the addition of the parameters in Table 8.7.7-1 and the downlink physical channel setup according to Annex C.3.2. The test points are applied to UE category and bandwidth combination with maximum aggregated bandwidth as specified in Table 8.7.7-5. The TB success rate shall be sustained during at least 300 frames. For UE supporting 256QAM, the requirements in Table 8.7.7-2 are not applicable.

The applicability of ther requirements are specified in Clause 8.1.2.3A.

Table 8.7.7-2: Minimum requirement (DC 64QAM)

Test number	Bandwidth combinatio n (MHz)	Number of bits of a DL-SCH transport block received within	Measurement channel	Reference value TB success rate across CGs(%) DRB type of Split bearer Reference value DRB type of SCC Split bearer (Note 3)		CGs(%)
		a TTI				
				(Note 2)	MCG	SCG
1	2x20	75376/0 (Note 4)	R.31-4A TDD	85	85	85
Note 2:	For the configurate = 100%*N blocks, N _{DL_reb} received DL tr transport block	nsmissions, 2 transport blow uration of DRB type of Splus $N_{DL_correct_rx}$ ($N_{DL_newtx} + N_{Dlot}$) is the number of retranshansport blocks. All the aboves are calculated as the support of reception.	it bearer,the TB success r retx), where N _{DL_newtx} is th nitted DL transport blocks ove numbers of transmitte	rate across CGs is one number of newly and N _{DL_correct_rx} is done or retransmitted or ret	transmitted D the number o correctly rece	L transport f correctly ived DL
Note 3:	rate = 100%*N blocks, N _{DL_reb} received DL tr transport block	uration of DRB type of SC DL_correct_rx / (NDL_newtx + NDI is the number of retransn ansport blocks. All the abo ks are calculated as the su or reception, separately.	_retx), where N _{DL_newtx} is th nitted DL transport blocks ove numbers of transmitte	ne number of newly , and N _{DL_correct_rx} is d, retransmitted or	transmitted D the number o correctly rece	L transport f correctly ived DL
Note 4:	71112 bits for					

Table 8.7.7-3: Test points for sustained data rate (FRC DC 64QAM)

DC config	Maximum supported Bandwidth combination (MHz)	Cat. 3	Cat. 4	Cat. 6, 7	Cat. 9, 10	Cat. 11, 12	
DC with 2CCs	2x20	-	-	1	1	-	

Table 8.7.7-4: Minimum requirement (DC 256QAM)

Test number	Bandwidth combination (MHz)	Measurement channel	Reference value TB success rate (%)			
			DRB type of Split bearer	Split bearer bearer (Note 3)		
			(Note 2)	MCG	SCG	
1	2x20	R.68-3 TDD	85	85	85	
Note 1: Note 2:	For the configured defined as TB s is the number of retransmitted DL transport blackers.	Ismissions, 2 transport blocks a ration of DRB type of Split bear success rate = 100%*N _{DL_correct_} of newly transmitted DL transport blocks, and N _{DL_correct_} ocks. All the above numbers of insport blocks are calculated as	er, the TB success rs/ (NDL_newtx + NDL, rt blocks, NDL_retx is sec_rx is the number transmitted, retrar the sum of the nu	s rate across _retx), where I s the number of correctly asmitted or combers of DL	N _{DL_newtx} r of received orrectly	
Note 3:	For the configured defined as TB s is the number of retransmitted DL transport blackers.	es across all the CGs used for I ration of DRB type of SCG bear success rate = 100%*N _{DL_correct_} of newly transmitted DL transport transport blocks, and N _{DL_correct_} ocks. All the above numbers of ansport blocks are calculated as es per CG used for DC transmisses.	rer, the TB succes rs/ (N _{DL_newtx} + N _{DL} , rt blocks, N _{DL_retx} is ect_rx is the number transmitted, retrar the sum of the nu	s rate across _retx), where I s the number of correctly asmitted or combers of DL	N _{DL_newtx} r of received orrectly	

Table 8.7.7-5: Test points for sustained data rate (FRC DC 256QAM)

	DC config	Maximum supported Bandwidth combination (MHz)	Cat. 11, 12	DL Cat. 13		
ı	DC with 2CCs	2x20	1	1		

8.8 Demodulation of EPDCCH

The receiver characteristics of the EPDCCH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). For the distributed transmission tests in 8.8.1, EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH. For other tests, EPDCCH and PCFICH are not tested jointly.

8.8.1 Distributed Transmission

8.8.1.1 FDD

The parameters specified in Table 8.8.1.1-1 are valid for all FDD distributed EPDCCH tests unless otherwise stated.

Table 8.8.1.1-1: Test Parameters for Distributed EPDCCH

	Parame	eter	Unit	Value
Number of	of PDCCH syr	mbols	symbols	2 (Note 1)
PHICH de	uration			Normal
Unused F	RE-s and PRE	3-s		OCNG
Cell ID				0
		$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink	•	$ ho_{\scriptscriptstyle B}$	dB	-3
allocation	1	σ	dB	0
		δ	dB	3
N_{oc} at ar	ntenna port		dBm/15 kHz	-98
Cyclic pre	efix			Normal
Subframe	Configuratio		Non-MBSFN	
Precoder Update Granularity			PRB	1
			ms	1
	ning Pre-Cod			Annex B. 4.4
	ific Reference			Port 0 and 1
Number of	of EPDCCH S	ets Configured		2 (Note 2)
Number	of PRB per EF	PDCCH Set		4 (1 st Set) 8 (2 nd Set)
EPDCCH	Subframe M	onitoring		NA
PDSCH 7	ГМ			TM3
DCI Form				2A
Note 1:	PCFICH. RF configured.	symbol for EPDCC RC signalling <i>epdccl</i>	h-StartSymb	ool-r11 is not
Note 2:		s are distributed EP		
		with PRB = $\{3, 17, 3\}$		
		, 14, 21, 28, 35, 42,		
		scheduled in the first		
	set for Test	respectively. Both	n sets are al	ways configured.

For the parameters specified in Table 8.8.1.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.1.1-2. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.8.1.1-2: Minimum performance Distributed EPDCCH

ſ	Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
	number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
Ī	1	10 MHz	4 ECCE	R.55 FDD	OP.7 FDD	EVA5	2 x 2 Low	1	2.60
ſ	2	10 MHZ	16 ECCE	R.56 FDD	OP.7 FDD	EVA70	2 x 2 Low	1	-3.20

8.8.1.1.1 Void

Table 8.8.1.1.1-1: Void

8.8.1.2 TDD

The parameters specified in Table 8.8.1.2-1 are valid for all TDD distributed EPDCCH tests unless otherwise stated.

Table 8.8.1.2-1: Test Parameters for Distributed EPDCCH

Parame	eter	Unit	Value		
Number of PDCCH syr	mbols	symbols	2 (Note 1)		
PHICH duration			Normal		
Unused RE-s and PRE	3-s		OCNG		
Cell ID			0		
	$ ho_{\scriptscriptstyle A}$	dB	-3		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3		
allocation	σ	dB	0		
	δ	dB	3		
$N_{\it oc}$ at antenna port		dBm/15 kHz	-98		
Cyclic prefix		Normal			
Subframe Configuratio		Non-MBSFN			
Precoder Update Gran	ularity	PRB	1		
Trecoder Opdate Gran	lularity	ms	1		
Beamforming Pre-Cod		Annex B. 4.4			
Cell Specific Reference		Port 0 and 1			
Number of EPDCCH S		2 (Note 2)			
Number of PRB per ER	PDCCH Set		4 (1 st Set) 8 (2 nd Set)		
EPDCCH Subframe M	onitoring		NA		
PDSCH TM			TM3		
DCI Format			2A		
TDD UL/DL Configurat	ion		0		
TDD Special Subframe	9		1 (Note 3)		
	symbol for EPDCCI RC signalling <i>epdccl</i>				
Note 2: The two sets are distributed EPDCCH sets and non- overlapping with PRB = {3, 17, 31, 45} for the first set and PRB = {0, 7, 14, 21, 28, 35, 42, 49} for the second set. EPDCCH is scheduled in the first set for Test 1 and second set for Test 2, respectively. Both sets are always configured.					
Note 3: Demodulati special subf	on performance is a rame.	veragea ove	er normal and		

For the parameters specified in Table 8.8.1.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.1.2-2. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.8.1.2-2: Minimum performance Distributed EPDCCH

Γ	Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
	number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
	1	10 MHz	4 ECCE	R.55 TDD	OP.7 TDD	EVA5	2 x 2 Low	1	2.80
Γ	2	10 MHZ	16 ECCE	R.56 TDD	OP.7 TDD	EVA70	2 x 2 Low	1	-3.10

8.8.1.2.1 Void

Table 8.8.1.2.1-1: Void

8.8.2 Localized Transmission with TM9

8.8.2.1 FDD

The parameters specified in Table 8.8.2.1-1 are valid for all FDD TM9 localized ePDCCH tests unless otherwise stated.

Table 8.8.2.1-1: Test Parameters for Localized EPDCCH with TM9

Parame	eter	Unit	Value
Number of PDCCH syr	nbols	symbols	1 (Note 1)
EPDCCH starting syml	ool	symbols	2 (Note 1)
PHICH duration			Normal
Unused RE-s and PRE	Jnused RE-s and PRB-s		OCNG
Cell ID	Cell ID		0
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	σ	dB	-3
	δ	dB	0
$N_{\it oc}$ at antenna port	N_{oc} at antenna port		-98
Cyclic prefix			Normal
Subframe Configuratio	n		Non-MBSFN
Precoder Undate Gran	Precoder Update Granularity		1
		ms	1
Beamforming Pre-Code			Annex B.4.5
Cell Specific Reference			Port 0 and 1
CSI-RS Reference Sig			Port 15 and 16
CSI-RS reference sign	al resource		0
configuration			0
CSI reference signal su	ubframe		2
configuration I _{CSI-RS}			
ZP-CSI-RS configuration			000001000000000
ZP-CSI-RS subframe of	configuration I _{ZP-}		2
CSI-RS			_
Number of EPDCCH S			2 (Note 2)
EPDCCH Subframe M			1111111110 1111111101 1111111011
subframePatternConfig	g-r11		1111110111 (Note 3)
PDSCH TM			TM9

Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. However, CFI is set to 1.

Note 2: The first set is distributed transmission with PRB = {0, 49} and the second set is localized transmission with PRB = {0, 7, 14, 21, 28, 35, 42, 49}. ePDCCH is scheduled in the second set for all tests

Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by *subframePatternConfig-r11*. Legacy PDCCH is not scheduled.

For the parameters specified in Table 8.8.2.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.2.1-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%.

The downlink physical setup is in accordance with Annex C.3.2.

Table 8.8.2.1-2: Minimum performance Localized EPDCCH with TM9

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Referenc	e value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	2 ECCE	R.57 FDD	OP.7 FDD	EVA5	2 x 2 Low	1	12.2
2	10 MHZ	8 ECCE	R.58 FDD	OP.7 FDD	EVA5	2 x 2 Low	1	2.5

8.8.2.1.1 Void

Table 8.8.2.1.1-1: Void

8.8.2.1.2 Void

Table 8.8.2.1.2-1: Void

Table 8.8.2.1.2-2: Void

Table 8.8.2.1.2-3: Void

8.8.2.2 TDD

The parameters specified in Table 8.8.2.2-1 are valid for all TDD TM9 localized ePDCCH tests unless otherwise stated.

Table 8.8.2.2-1: Test Parameters for Localized EPDCCH with TM9

Parame	eter	Unit	Value
Number of PDCCH syr	mbols	symbols	1 (Note 1)
EPDCCH starting sym	bol	symbols	2 (Note 1)
PHICH duration			Normal
Unused RE-s and PRE	3-s		OCNG
Cell ID			0
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	σ	dB	-3
	δ	dB	0
$N_{\it oc}$ at antenna port	N_{oc} at antenna port		-98
Cyclic prefix	Cyclic prefix		Normal
Subframe Configuratio	Subframe Configuration		Non-MBSFN
Precoder I Indate Gran	recoder Update Granularity		1
·		ms	1
Beamforming Pre-Cod			Annex B.4.5
Cell Specific Reference			Port 0 and 1
CSI-RS Reference Sig			Port 15 and 16
CSI-RS reference sign configuration	al resource		0
CSI reference signal su configuration $I_{\text{CSI-RS}}$	ubframe		0
ZP-CSI-RS configuration	on bitmap		000001000000000
ZP-CSI-RS subframe o			0
Number of EPDCCH S	ets		2 (Note 2)
EPDCCH Subframe Monitoring pattern subframePatternConfig-r11			1100011000 1100010000 1100011000 1100001000 1100011000 1000011000 1100011000 (Note 3)
PDSCH TM			TM9
TDD UL/DL Configurat	ion		0
TDD Special Subframe			1 (Note 4)
	====		

- Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. However, CFI is set to 1.
- Note 2: The first set is distributed transmission with PRB = {0, 49} and the second set is localized transmission with PRB = {0, 7, 14, 21, 28, 35, 42, 49}. ePDCCH is scheduled in the second set for all tests.
- Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by *subframePatternConfig-r11*. Legacy PDCCH is not scheduled.

 Note 4: Demodulation performance is averaged over normal and special subframe.

For the parameters specified in Table 8.8.2.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.2.2.2-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%.

The downlink physical setup is in accordance with Annex C.3.2.

Table 8.8.2.2-2: Minimum performance Localized EPDCCH with TM9

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	2 ECCE	R.57 TDD	OP.7 TDD	EVA5	2 x 2 Low	1	12.8
2	10 MHZ	8 ECCE	R.58 TDD	OP.7 TDD	EVA5	2 x 2 Low	1	2.0

8.8.2.2.1 Void

Table 8.8.2.2.1-1: Void

8.8.2.2.2 Void

Table 8.8.2.2.2-1: Void

Table 8.8.2.2.2: Void

Table 8.8.2.2.2-3: Void

8.8.3 Localized transmission with TM10 Type B quasi co-location type

8.8.3.1 FDD

For the parameters specified in Table 8.8.3.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified values in Table 8.8.3.1-2. In Table 8.8.3.1-1, transmission point 1 (TP 1) is the serving cell. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.8.3.1-1: Test Parameters for Localized Transmission TM10 Type B quasi co-location type

_			Te	est 1	Tes	st 2
	rameter	Unit	TP 1	TP 2	TP 1	TP 2
PHICH durati					ormal	
Downlink	$\rho_{\scriptscriptstyle A}$	dB			0	
power	$\rho_{\scriptscriptstyle B}$	dB			0	
allocation	σ	dB			-3	
	δ	dB	OdD power		0	
\hat{E}_s/N_{oc}		dB	0dB power imbalance is considered between TP 1 and TP 2,	Reference value in Table 8.8.3.1-	Reference value in Table 8.8.3.1-	Reference value in Table 8.8.3.1-
$N_{\it oc}$ at anten	na port	dBm/ 15kH z		-	98	
Bandwidth		MHz	10	10	10	10
Number of co	ts		2 (N	lote 1)	2 (N	ote1)
EPDCCH-PR (setConfigld)			0	1	0	1
PRB-set	type of EPDCCH-		Localized	Localized	Localized	Localized
Number of PI EPDCCH-PR	B-set	PRB	8	8	8	8
	amforming model		Annex B.4.5	Annex B.4.5	Annex B.4.5	Annex B.4.5
PDSCH trans	smission mode		TM10	TM10	TM10 Probability of	TM10 Probability of
PDSCH trans scheduling	PDSCH transmission scheduling		Blanked in all the subframes	Transmit in all the subframes	occurrence of PDSCH transmission is 30% (Note 3)	occurrence of PDSCH transmission is 70% (Note 3)
Non-zero power CSI	CSI reference signal configuration		N/A	0	N/A	0
reference signal (NZPId=1)	CSI reference signal subframe configuration I _{CSI-RS}		N/A	2	N/A	2
Non-zero power CSI	CSI reference signal configuration		N/A	N/A	10	N/A
reference signal (NZPId=2)	CSI reference signal subframe configuration I _{CSI-RS}		N/A	N/A	2	N/A
Zero power CSI reference	CSI-RS Configuration list (ZeroPowerCSI- RS bitmap)	Bitma p	N/A	0000010000000	N/A	1000010000000
signal (ZPId=1)	CSI-RS subframe configuration I _{CSI-RS}		N/A	2	N/A	2
Zero power CSI reference	CSI-RS Configuration list (ZeroPowerCSI- RS bitmap)	Bitma p	N/A	N/A	1000010000000	N/A
reference signal (ZPId=2)	CSI-RS subframe configuration I _{CSI-RS}		N/A	N/A	2	N/A
PQI set 0 (Note 4)	Non-Zero power CSI RS Identity (NZPId)		N/A	1	N/A	1

	Zero power CSI RS Identity (ZPId)		N/A	1	N/A	1	
PQI set 1 (Note 4)	Non-Zero power CSI RS Identity (NZPId)		N/A	N/A	2	N/A	
	Zero power CSI RS Identity (ZPId)		N/A	N/A	2	N/A	
Number of P	DCCH symbols	Symb ols	1 (Note 2)				
EPDCCH sta	EPDCCH starting position		pdsch-Start- r11=2 (Note 2)	pdsch-Start- r11=2 (Note 2)	pdsch-Start- r11=2 (Note 2)	pdsch-Start- r11=2 (Note 2)	
Subframe co	Subframe configuration		Non-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN	
Time offset between TPs		μs	N/A	2	N/A	2	
Frequency shift between TPs		Hz	N/A 200		N/A	200	
Cell ID			0	126	0	126	

- Note 1: Resource blocks n_{PRB} =0, 7, 14, 21, 28, 35, 42, 49 are allocated for both the first set and the second set.
- Note 2: The starting OFDM symbol for EPDCCH is determined from the higher layer signalling pdsch-Start-r11. And CFI is set to 1.
- Note 3: The TP from which PDSCH is transmitted shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TP 1 and TP 2 are specified.
- Note 4: For PQI set 0, PDSCH and EPDCCH are transmitted from TP 2. For PQI set 1, PDSCH and EPDCCH are transmitted from TP1. EPDCCH and PDSCH are transmitted from same TP.

Table 8.8.3.1-2: Minimum Performance

ſ	Test	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
	number	level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
	1	2 ECCE	R.59 FDD	OP.7 FDD	EVA5	2 x 2 Low	1	13.4
	2	2 ECCE	R.59 FDD	OP.7 FDD	EVA5	2 x 2 Low	1	13.4

8.8.3.2 TDD

For the parameters specified in Table 8.8.3.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified values in Table 8.8.3.2-2. In Table 8.8.3.2-1, transmission point 1 (TP1) is the serving cell. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.8.3.2-1: Test Parameters for Localized Transmission TM10 Type B quasi co-location type

Do	romotor	Unit	Te	est 1	Test 2	
	rameter	Unit	TP 1	TP 2	TP 1	TP 2
PHICH durati					rmal	
Downlink	$ ho_{\scriptscriptstyle A}$	dB			0	
power	$ ho_{\scriptscriptstyle B}$	dB			0	
allocation	σ	dB			-3	
	δ	dB			0	
\hat{E}_s/N_{oc}		dB	0dB power imbalance is considered between TP 1 and TP 2,	Reference value in Table 8.8.3.2-	Reference value in Table 8.8.3.2-	Reference value in Table 8.8.3.2-
$N_{\it oc}$ at anten	na port	dBm/ 15kH z		-	98	
Bandwidth		MHz	10	10	10	10
Number of El				lote 1)	2 (No	ote1)
EPDCCH-PR (setConfigld)			0	1	0	1
PRB-set	type of EPDCCH-		Localized	Localized	Localized	Localized
Number of PI EPDCCH-PR	B-set	PRB	8	8	8	8
	amforming model		Annex B.4.5	Annex B.4.5	Annex B.4.5	Annex B.4.5
PDSCH trans	smission mode		TM10	TM10	TM10	TM10
scheduling	PDSCH transmission scheduling		Blanked in all the subframes	Transmit in all the subframes	Probability of occurrence of PDSCH transmission is 30% (Note 3)	Probability of occurrence of PDSCH transmission is 70% (Note 3)
CSI reference configuration	s		Antenna ports 15,16	Antenna ports 15,16	Antenna ports 15,16	Antenna ports 15,16
Non-zero power CSI	CSI reference signal configuration		N/A	0	N/A	0
reference signal (NZPId=1)	CSI reference signal subframe configuration $I_{\text{CSI-RS}}$		N/A	0	N/A	0
Non-zero power CSI	CSI reference signal configuration		N/A	N/A	10	N/A
reference signal (NZPId=2)	CSI reference signal subframe configuration I _{CSI-RS}		N/A	N/A	0	N/A
Zero power CSI reference	CSI-RS Configuration list (ZeroPowerCSI- RS bitmap)	Bitma p	N/A	0000010000000	N/A	1000010000000
signal (ZPId=1)	CSI-RS subframe configuration $I_{\text{CSI-RS}}$		N/A	0	N/A	0
Zero power CSI reference	CSI-RS Configuration list (ZeroPowerCSI- RS bitmap)	Bitma p	N/A	N/A	1000010000000 000	N/A
signal (ZPId=2)	CSI-RS subframe configuration $I_{\text{CSI-RS}}$		N/A	N/A	0	N/A

PQI set 0	Non-Zero power CSI RS Identity (NZPId)		N/A	1	N/A	1			
(Note 4)	Zero power CSI RS Identity (ZPId)		N/A	1	N/A	1			
PQI set 1 (Note 4)	Non-Zero power CSI RS Identity (NZPId)		N/A	N/A	2	N/A			
	Zero power CSI RS Identity (ZPId)		N/A	N/A	2	N/A			
Number of P	DCCH symbols	Symb ols	1 (Note 2)						
EPDCCH sta	arting position		pdsch-Start- r11=2 (Note 2)	pdsch-Start- r11=2 (Note 2)	pdsch-Start- r11=2 (Note 2)	pdsch-Start- r11=2 (Note 2)			
Subframe co	nfiguration		Non-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN			
Time offset b	etween TPs	μs	N/A	2	N/A	2			
Frequency shift between TPs		Hz	N/A	200	N/A	200			
Cell ID			0	126	0	126			
TDD UL/DL configuration			0						
TDD special			1						
Note 1. D	Note 1: Poscurso blocks need = 0.7.14, 21, 29, 25, 42, 40 are allocated for both the first set and the second set								

- Note 1: Resource blocks $n_{PRB} = 0, 7, 14, 21, 28, 35, 42, 49$ are allocated for both the first set and the second set.
- Note 2: The starting OFDM symbol for EPDCCH is determined from the higher layer signalling pdsch-Start-r11. And CFI is set to 1.
- Note 3: The TP from which PDSCH is transmitted shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TP 1 and TP 2 are specified.
- Note 4: For PQI set 0, PDSCH and EPDCCH are transmitted from TP 2. For PQI set 1, PDSCH and EPDCCH are transmitted from TP1. EPDCCH and PDSCH are transmitted from same TP.

Table 8.8.3.2-2: Minimum Performance

Test	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
number	level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	2 ECCE	R.59 TDD	OP.7 TDD	EVA5	2 x 2 Low	1	13.6
2	2 ECCE	R.59 TDD	OP.7 TDD	EVA5	2 x 2 Low	1	13.6

8.9 Demodulation (single receiver antenna)

The SNR deifintion is given in Clause 8.1.1 where the number of receiver antennas N_{RX} assumed for the minimum performance requirement in this clause is 1.

8.9.1 PDSCH

8.9.1.1 FDD and half-duplex FDD (Fixed Reference Channel)

The parameters specified in Table 8.9.1.1-1 are valid for FDD and half-duplex FDD tests unless otherwise stated.

Parameter Unit Value Inter-TTI Distance 1 Number of HARQ processes per **Processes** 8 component carrier Maximum number of 4 HARQ transmission {0,1,2,3} for QPSK and 16QAM Redundancy version coding sequence {0,0,1,2} for 64QAM 4 for 1.4 MHz bandwidth, 3 for 3 MHz and Number of OFDM 5 MHz bandwidths, symbols for PDCCH per OFDM symbols 2 for 10 MHz, 15 MHz and 20 MHz component carrier bandwidths Cyclic Prefix Normal Frequency domain: 1 PRG Precoder update Time domain: 1 ms for Transmission granularity mode 9

Table 8.9.1.1-1: Common Test Parameters (FDD and half-duplex FDD)

8.9.1.1.1 Transmit diversity performance (Cell-Specific Reference Symbols)

8.9.1.1.1.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.9.1.1.1.1-2, with the addition of the parameters in Table 8.9.1.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.9.1.1.1.1-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1			
	$ ho_{\scriptscriptstyle A}$	dB	-3			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)			
	σ	dB	0			
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98			
PDSCH transmission	on mode		2			
Note 1: $P_B = 1$.						

Table 8.9.1.1.1.1-2: Minimum performance Transmit Diversity (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference value		UE DL
number	width and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughp ut (%)	SNR (dB)	category
1	10 MHz 16QAM 1/2	R. 62 FDD	OP.1 FDD	EPA5	2x1 Low	70	9.0	0

8.9.1.1.2 Closed-loop spatial multiplexing performance (Cell-Specific Reference Symbols)

8.9.1.1.2.1 Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.9.1.1.2.1-2, with the addition of the parameters in Table 8.9.1.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with frequency selective precoding.

Table 8.9.1.1.2.1-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
Precoding granularity		PRB	6
PMI delay (Note	2)	ms	8
Reporting inter	val	ms	8
Reporting mod	de		PUSCH 1-2
CodeBookSubsetR	estricti		001111
on bitmap			
PDSCH transmis	sion		4
mode			
1			

Note 1: $P_{R} = 1$.

Note 2: If the UE reports in an available uplink reporting instance at

subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the

eNB downlink before SF#(n+4).

Table 8.9.1.1.2.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE DL
number	width and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	categor y
1	10 MHz 64QAM 1/2	R. 63 FDD	OP.1 FDD	EPA5	2x1Low	70	13.2	0

8.9.1.1.3 Closed-loop spatial multiplexing performance (User-Specific Reference Symbols)

8.9.1.1.3.1 Single-layer Spatial Multiplexing

For single-layer transmission on antenna ports 7 or 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.9.1.1.3.1-2 with the addition of the parameters in Table 8.9.1.1.3.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify rank-1 performance on one of the antenna ports 7 or 8, and to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power.

Table 8.9.1.1.3.1-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple **CSI-RS** configurations

parameter		Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
	σ	dB	-3
Beamforming mo	del		Annex B.4.1
Cell-specific refere	ence		Antenna ports 0,1
CSI reference sign	nals		Antenna ports 15,,18
CSI-RS periodicity subframe offse $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	t	Subframes	5/2
CSI reference sig configuration	nal		0
Zero-power CSI- configuration I _{CSI-RS} / ZeroPowerCSI-F bitmap		Subframes / bitmap	3 / 0001000000000000
$N_{\it oc}$ at antenna p	ort	dBm/15kHz	-98
Symbols for unus PRBs	ed		OCNG (Note 4)
Number of allocated resource blocks (Note 2)		PRB	6
PDSCH transmission mode			9
Note 1: $P_B = 1$.			

Note 2: The modulation symbols of the signal under test are mapped

onto antenna port 7 or 8.

These physical resource blocks are assigned to an arbitrary Note 3: number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated

pseudo random data, which is QPSK modulated.

Table 8.9.1.1.3.1-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	UE DL	
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughpu t (%)	SNR (dB)	category
1	10 MHz QPSK 1/3	R. 64 FDD	OP.1 FDD	EPA5	2x1 Low	70	4.7	0

8.9.1.2 TDD (Fixed Reference Channel)

The parameters specified in Table 8.9.1.2-1 are valid for all TDD tests unless otherwise stated.

Table 8.9.1.2-1: Common Test Parameters (TDD)

Parameter	Unit	Value				
Uplink downlink configuration (Note 1)		1				
Special subframe configuration (Note 2)		4				
Cyclic prefix		Normal				
Cell ID		0				
Inter-TTI Distance		1				
Number of HARQ processes per component carrier	Processes	7				
Maximum number of HARQ transmission		4				
Redundancy version coding sequence		{0,1,2,3} for QPSK and 16QAM {0,0,1,2} for 64QAM				
Number of OFDM symbols for PDCCH per component carrier	OFDM symbols	4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths				
Precoder update granularity		Frequency domain: 1 PRG Time domain: 1 ms for Transmission mode 9				
ACK/NACK feedback mode		Multiplexing				
Note 1: as specified in Table 4.2-2 in TS 36.211 [4]. Note 2: as specified in Table 4.2-1 in TS 36.211 [4].						

8.9.1.2.1 Transmit diversity performance (Cell-Specific Reference Symbols)

8.9.1.2.1.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.9.1.2.1.1-2, with the addition of the parameters in Table 8.9.1.2.1.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.9.1.2.1.1-1: Test Parameters for Transmit diversity Performance (FRC)

Parameter		Unit	Test 1-2
	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{_{oc}}$ at antenna	port	dBm/15kHz	-98
ACK/NACK feedba	ck mode		Multiplexing
PDSCH transmission	on mode		2
Note 1: $P_B = 1$			

Table 8.9.1.2.1.1-2: Minimum performance Transmit Diversity (FRC)

Test	Bandw	Reference	OCNG	Propagation	Correlation	Reference	value	UE DL
number	idth	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	category
1	10 MHz 16QAM 1/2	R. 62 TDD	OP.1 TDD	EPA5	2x1 Low	70	8.8	0

8.9.1.2.2 Closed-loop spatial multiplexing performance (Cell-Specific Reference Symbols)

8.9.1.2.2.1 Minimum Requirement Single-Layer Spatial Multiplexing 2 Tx Antenna Port

The requirements are specified in Table 8.9.1.2.2.1-2, with the addition of the parameters in Table 8.9.1.2.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with frequency selective precoding.

Table 8.9.1.2.2.1-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Parameter		Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna p	ort	dBm/15kHz	-98
Precoding granula	arity	PRB	6
PMI delay (Note	2)	ms	10 or 11
Reporting interv	al	ms	1 or 4 (Note 3)
Reporting mode	Э		PUSCH 1-2
CodeBookSubsetRes	triction		001111
bitmap			
ACK/NACK feedback	mode		Multiplexing
PDSCH transmission	mode		4
Note 1: D = 1	•		

Note 1: $P_B = 1$.

Note 2: If the UE reports in an available uplink reporting instance at

subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the

eNB downlink before SF#(n+4).

Note 3: For Uplink - downlink configuration 1 the reporting interval will

alternate between 1ms and 4ms.

Table 8.9.1.2.2.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	value	UE DL
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	category
1	10 MHz 64QAM 1/2	R. 63 TDD	OP.1 TDD	EPA5	2x1 Low	70	13.1	0

8.9.1.2.3 Closed-loop spatial multiplexing performance (User-Specific Reference Symbols)

8.9.1.2.3.1 Single-layer Spatial Multiplexing

For single-layer transmission on antenna ports 7 or 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.9.1.2.3.1-2 with the addition of the parameters in Table 8.9.1.2.3.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify rank-1 performance on one of the

antenna ports 7 or 8, and to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power.

Table 8.9.1.2.3.1-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations

Parameter		Unit	Test 1		
D 11.1	$ ho_{\scriptscriptstyle A}$	dB	0		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)		
	σ	dB	-3		
Cell-specific refere	ence		Antenna ports 0,1		
CSI reference sign	nals		Antenna ports 15,,18		
Beamforming mo	del		Annex B.4.1		
CSI-RS periodicity subframe offse $T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$	t	Subframes	5/4		
CSI reference sig configuration	nal		1		
Zero-power CSI- configuration I _{CSI-RS} / ZeroPowerCSI-F bitmap		Subframes / bitmap	4 / 0010000100000000		
$N_{\it oc}$ at antenna p	ort	dBm/15kHz	-98		
Symbols for unus PRBs	ed		OCNG (Note 4)		
Number of allocar resource blocks (No		PRB	6		
Simultaneous transmission			No		
PDSCH transmiss mode	sion		9		
Note 1: $P_{B} = 1$.					
Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8. Note 3: These physical resource blocks are assigned to an					

Table 8.9.1.2.3.1-2: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC) with multiple CSI-RS configurations

which is QPSK modulated.

arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data,

Test	Bandwidth	Reference	OCNG	Propagation Correlation		Reference	value	UE DL
number	and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughpu t (%)	SNR (dB)	category
1	10 MHz QPSK 1/3	R. 64 TDD	OP.1 TDD	EPA5	2x1 Low	70	4.5	0

8.9.2 PHICH

8.9.2.1 FDD and half-duplex FDD

8.9.2.1.1 Transmit diversity performance

For the parameters specified in Table 8.5.1-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.9.2.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.9.2.1.1-1: Minimum performance PHICH

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
1	10 MHz	R.19	OP.1 FDD	EPA5	2 x 1 Low	0.1	8.6

8.9.2.2 TDD

8.9.2.2.1 Transmit diversity performance

For the parameters specified in Table 8.5.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.9.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.9.2.2.1-1: Minimum performance PHICH

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration	Pm-an (%)	SNR (dB)
					and		
					correlation		
					Matrix		
1	10 MHz	R.19	OP.1 TDD	EPA5	2 x 1 Low	0.1	8.6

8.9.3 PBCH

8.9.3.1 FDD and half-duplex FDD

8.9.3.1.1 Transmit diversity performance

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.9.3.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.9.3.1.1-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
number		Channel	Condition	configuration	Pm-bch (%)	SNR (dB)
				and		
				correlation		
				Matrix		
1	1.4 MHz	R.22	EPA5	2 x 1 Low	1	-1.3

8.9.3.2 TDD

8.9.3.2.1 Transmit diversity performance

For the parameters specified in Table 8.6.2-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.9.3.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.9.3.2.1-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
number		Channel	Condition	configuration and correlation Matrix	Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.22	EPA5	2 x 1 Low	1	-1.7

8.10 Demodulation (4 receiver antenna ports)

The performance requirements specified in this clause are valid for 4Rx capable UEs.

8.10.1 PDSCH

8.10.1.1 FDD (Fixed Reference Channel)

8.10.1.1.1 Transmit diversity performance with 2Tx Antenna Ports (Cell-Specific Reference Symbols)

The requirements are specified in Table 8.10.1.1.1-2, with the addition of the parameters in Table 8.10.1.1.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.10.1.1.1-1: Test Parameters for Transmit diversity Performance (FRC) with 4 RX Antenna Ports

Paramete	r	Unit	Test 1-2
	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)
	σ	dB	0
N_{oc} at antenna port		dBm/15kHz	-98
PDSCH transmission	mode		2
NOTE 1: $P_B = 1$.			

Table 8.10.1.1.1-2: Minimum performance Transmit Diversity (FRC) with 4 RX Antenna Ports

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference value		UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughp ut (%)	SNR (dB)	Category
1	10 MHz	R.11 FDD	OP.1 FDD	EVA5	2x4 Medium correlation A, ULA	70	[3.9]	≥2

8.10.1.1.2 Open-loop spatial multiplexing performance with 2Tx Antenna Ports (Cell-Specific Reference Symbols)

The requirements are specified in Table 8.10.1.1.2-2, with the addition of the parameters in Table 8.10.1.1.2-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.10.1.1.2-1: Test Parameters for Large Delay CDD (FRC) with 4 RX Antenna Ports

Paramete	er	Unit	Test 1-4			
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-3			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (NOTE 1)			
	σ	dB	0			
$N_{\it oc}$ at antenna por	t	dBm/15kHz	-98			
PDSCH transmission	n mode		3			
NOTE 1: $P_B = 1$.						

Table 8.10.1.1.2-2: Minimum performance Large Delay CDD (FRC) with 4 RX Antenna Ports

				Propa-	Correlation	Reference		
Test num	Bandwidt h	Referenc e channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)	UE cate gory
1	10 MHz	R.11 FDD	OP.1 FDD	EVA70	2x4 Low	70	[8.0]	≥2

8.10.1.1.3 Closed-loop spatial multiplexing Enhanced Performance Requirements Type A - Single-Layer Spatial Multiplexing 2 Tx Antenna Port with TM4 interference model (Cell-Specific Reference Symbols)

The requirements are specified in Table 8.10.1.1.3-2, with the addition of the parameters in Table 8.10.1.1.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model defined in clause B.5.3. In Table 8.10.1.1.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

Table 8.10.1.1.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4 RX Antenna Ports

Parameter		Unit	Cell 1	Cell 2
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3
	σ	dB	0	0
Cell-specific reference sign	gnals		Antenna ports 0,1	Antenna ports 0,1
N_{oc} at antenna port		dBm/15kHz	-98	N/A
DIP (Note 2)		dB	N/A	-1.73
BW _{Channel}		MHz	10	10
Cyclic Prefix			Normal	Normal
Cell Id			0	1
Number of control OFDM	symbols		2	2
PDSCH transmission mo	de		6	N/A
Interference model			N/A	As specified in clause B.5.3
Probability of	Rank 1	%	N/A	80
occurrence of transmission rank in interfering cells	Rank 2	%	N/A	20
Precoding granularity		PRB	50	6
PMI delay (Note 4)		ms	8	N/A
Reporting interval		ms	5	N/A
Reporting mode			PUCCH 1-1	N/A
CodeBookSubsetRestric	tion bitmap		001111	N/A

Note 1: $P_R = 1$

Note 2: The respective received power spectral density of each interfering cell relative to $N_{\rm ac}$ is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2 is the interfering cell.

Note 4: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Table 8.10.1.1.3-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4 RX Antenna Ports

Test Number	Reference Channel	OCNG Pattern			gation itions	Correlation Matrix and	Reference Value		UE Cate
		Cell 1	Cell 2	Cell 1	Cell 2	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	gory
1	R.47 FDD	OP.1 FDD	N/A	EVA5	EVA5	2x4 Low	70	TBD	≥1

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

8.10.1.1.4 Closed-loop spatial multiplexing performance, Multi-Layer Spatial Multiplexing 4 Tx Antenna Port (Cell-Specific Reference Symbols)

For single carrier, the requirements are specified in Table 8.10.1.1.4-2, with the addition of the parameters in Table 8.10.1.1.4-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.10.1.1.4-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) with 4 RX Antenna
Ports

Parameter	•	Unit	Test 1
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
N_{oc} at antenna port		dBm/15kHz	-98
Precoding granularity	Precoding granularity		6
PMI delay (Note 2)		ms	8
Reporting interval		ms	1
Reporting mode			PUSCH 1-2
CodeBookSubsetRes	striction		000000000000000000000000000000000000000
bitmap			00001111111111111111100000000
			0000000
PDSCH transmission	n mode		4

Note 1: $P_{R} = 1$

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n

based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Table 8.10.1.1.4-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC) with 4 RX Antenna Ports

Ī				Propa-	Correlation	Reference			
	Test num.	Band- width	Reference channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	UE cate- gory
	1	10 MHz	R.36 FDD	OP.1 FDD	EPA5	4x4 Low	70	[10.1]	≥2

8.10.1.1.5 Enhanced Performance Requirement Type A – Single-layer Spatial Multiplexing with TM9 interference model (User-Specific Reference Symbols)

The requirements are specified in Table 8.10.1.1.5-2, with the addition of the parameters in Table 8.10.1.1.5-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4. In 8.10.1.1.5-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

Table 8.10.1.1.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model and 4 RX Antenna Ports

paramete	r	Unit	Cell 1	Cell 2
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referen	ce signals		Antenna ports 0,1	Antenna ports 0,1
CSI reference signa			Antenna ports 15,16	N/A
CSI-RS periodicity a subframe offset T_{CS}		Subframes	5/2	N/A
CSI reference signa configuration	I		0	N/A
N_{oc} at antenna port	t	dBm/15kH z	-98	N/A
DIP (Note 2)		dB	N/A	-1.73
BW _{Channel}		MHz	10	10
Cyclic Prefix			Normal	Normal
Cell Id			0	126
Number of control C symbols	FDM		2	2
PDSCH transmissio	n mode		9	N/A
Beamforming mode	I		As specified in clause B.4.3 (Note 4, 5)	N/A
Interference model			N/A	As specified in clause B.5.4
Probability of occurrence of	Rank 1		N/A	70
transmission rank in interfering cells	Rank 2		N/A	30
Precoder update gra	anularity	PRB	50	6
PMI delay (Note 5)		Ms	8	N/A
Reporting interval		Ms	5	N/A
Reporting mode			PUCCH 1-1	N/A
CodeBookSubsetRe bitmap	estriction		0000000000000000 00000000000000000 00000	N/A
Symbols for unused	PRBs		OCNG (Note 6)	N/A
Simultaneous transi Note 1: $P_0 = 1$	mission		No simultaneous transmission on the other antenna port in (7 or 8) used for the input signal under test	N/A

Note 1: $P_R = 1$

Note 2: The respective received power spectral density of each interfering cell relative to N_{oc} ' is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI

cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 7: All cells are time-synchronous.

Table 8.10.1.1.5-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model and 4 RX Antenna Ports

Test Number	Referenc e			OCNG Propagation Pattern Conditions		Correlatio n Matrix	Reference V	UE Categor	
	Channel	Cell 1	Cell 2	Cell 1	Cell 2	and Antenna Configurat ion (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	y
1	R.48 FDD	OP.1 FDD	N/A	EVA5	EVA5	2x4 Low	70	TBD	≥1

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{ac} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

8.10.1.1.6 Dual-Layer Spatial Multiplexing (User-Specific Reference Symbols)

For dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.10.1.1.6-2, with the addition of the parameters in Table 8.10.1.1.6-1 where Cell 1 is the serving cell and Cell 2 is the interfering cell. The downlink physical channel setup is set according to Annex C.3.2. The purpose of these tests is to verify the rank-2 performance for full RB allocation, to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

Table 8.10.1.1.6-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple CSI-RS configurations with 4 RX Antenna Ports

Parameter		Unit	Tes	
Parameter		Onit	Cell 1	Cell 2
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	4	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	4 (Note 1)	0
	σ	dB	-3	-3
Cell-specific reference signals	nce		Antenna ports 0 and 1	Antenna ports 0 and 1
Cell ID			0	126
CSI reference signa	als		Antenna ports 15,16	NA
Beamforming mode	el		Annex B.4.2	NA
CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$		Subframes	5/2	NA
CSI reference signal configuration			8	NA
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap		Subframes / bitmap	3 / 00100000000000000	NA
$N_{\it oc}$ at antenna po	rt	dBm/15kHz	-98	-98
\hat{E}_s/N_{oc}			Reference Value in Table 8.10.1.1.6-2	7.25dB
Symbols for unused PRBs			OCNG (Note 2)	NA
Number of allocated resource blocks (Note 2)		PRB	50	NA
Simultaneous transmission			No	NA
PDSCH transmission mode	on		9	Blanked

Note 1: $P_B = 1$

Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK

modulated.

Table 8.10.1.1.6-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations and 4 RX Antenna Ports

Test number	Bandwidth and MCS	Reference Channel		OCNG Propagation Correlation Pattern Condition Matrix and		Reference	UE Categ			
			Cell1	Cell 2	Cell 1	Cell 2	Antenna Configurati on	Fraction of Maximum Throughput (%)	SNR (dB)	ory
1	10 MHz 16QAM 1/2	R.51 FDD	OP.1 FDD	N/A	ETU5	ETU5	2x4 Low	70	[9.2]	≥2

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

Note 3: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1.

8.10.1.2 TDD (Fixed Reference Channel)

8.10.1.2.1 Transmit diversity performance with 2Tx Antenna Ports (Cell-Specific Reference Symbols)

The requirements are specified in Table 8. 10.1.2.1-2, with the addition of the parameters in Table 8. 10.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.10.1.2.1-1: Test Parameters for Transmit diversity Performance (FRC) with 4Rx Antenna Ports

Paramet	er	Unit	Test 1-2			
	$ ho_{\scriptscriptstyle A}$	dB	-3			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)			
	σ	dB	0			
$N_{\it oc}$ at antenna port		dBm/15kHz	-98			
ACK/NACK feedbac	k mode		Multiplexing			
PDSCH transmissio	n mode		2			
Note 1: $P_B = 1$						

Table 8.10.1.2.1-2: Minimum performance Transmit Diversity (FRC) with 4Rx Antenna Ports

Test	Bandw	Reference	OCNG	Propagation	Correlation	Reference	value	UE
number	idth	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.11 TDD	OP.1 TDD	EVA5	2x4 Medium correlation A, ULA	70	[3.9]	≥2

8.10.1.2.2 Open-loop spatial multiplexing performance with 2Tx Antenna Ports (Cell-Specific Reference Symbols)

The requirements are specified in Table 8.10.1.2.2-2, with the addition of the parameters in Table 8.10.1.2.2-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.10.1.2.2-1: Test Parameters for Large Delay CDD (FRC) with 4Rx Antenna Ports

Paramete	r	Unit	Test 1-3				
Daniel alamana	$ ho_{\scriptscriptstyle A}$	dB	-3				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)				
	σ	dB	0				
$N_{\it oc}$ at antenna port		dBm/15kHz	-98				
ACK/NACK feedbac	k mode		Bundling				
PDSCH transmission	n mode		3				
Note 1: $P_B = 1$							

Table 8.10.1.2.2-2: Minimum performance Large Delay CDD (FRC) with 4Rx Antenna Ports

Test	Bandwidth	Reference OCNG		Propagation	Correlation	Reference	/alue	UE
num ber		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Cate gory
1	10 MHz	R.11-1 TDD	OP.1 TDD	EVA70	2x4 Low	70	[7.7]	≥2

8.10.1.2.3 Closed-loop spatial multiplexing Enhanced Performance Requirements Type A - Single-Layer Spatial Multiplexing 2 Tx Antenna Port with TM4 interference model (Cell-Specific Reference Symbols)

The requirements are specified in Table 8.10.1.2.3-2, with the addition of the parameters in Table 8.10.1.2.3-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify the closed loop rank-one performance with wideband precoding with two transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 4 interference model defined in clause B.5.3. In Table 8.10.1.2.3-1, Cell 1 is the serving cell, and Cell 2 is the interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

Table 8.10.1.2.3-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4Rx Antenna Ports

Parameter		Unit	Cell 1	Cell 2
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3
	σ	dB	0	0
Cell-specific reference signal	Cell-specific reference signals			Antenna ports 0,1
N_{oc} at antenna port	dBm/15kHz	-98	N/A	
DIP (Note 2)	dB	N/A	-1.73	
BW _{Channel}	MHz	10	10	
Cyclic Prefix		Normal	Normal	
Cell Id			0	1
Number of control OFDM syr	nbols		2	2
PDSCH transmission mode			6	N/A
Interference model			N/A	As specified in clause B.5.3
Probability of occurrence of	Rank 1	%	N/A	80
transmission rank in interfering cells	Rank 2	%	N/A	20
Precoding granularity		PRB	50	6
PMI delay (Note 4)		ms	10 or 11	N/A
Reporting interval		ms	5	N/A
Reporting mode			PUCCH 1-1	N/A
CodeBookSubsetRestriction	bitmap		001111	N/A
ACK/NACK feedback mode			Multiplexing	N/A

Note 1: $P_{R} = 1$

Note 2: The respective received power spectral density of each interfering cell relative to N_{oc} is defined by its associated DIP value as specified in clause B.5.1.

Note 3: Cell 1 is the serving cell. Cell 2, 3 are the interfering cells.

Note 4: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 5: All cells are time-synchronous.

Table 8.10.1.2.3-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model and 4Rx Antenna Ports

Test Number	Reference Channel	OCNG	Pattern	ern Propagation Conditions		Correlation Reference Value Matrix and			UE Cate	
		Cell 1	Cell 2	Cell 1	Cell 2	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	gory	
1	R.47 TDD	OP.1 TDD	N/A	EVA5	EVA5	2x4 Low	70	TBD	≥1	
Note 1:						stically independ	ent.			
Note 2:	SINR correspo	SINR corresponds to \widehat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.								
Note 3:	Correlation ma	trix and an	tenna conf	iguration p	arameters	apply for each o	of Cell 1 and Cell	2.		

Closed-loop spatial multiplexing performance, Multi-Layer Spatial Multiplexing 4 8.10.1.2.4 Tx Antenna Ports (Cell-Specific Reference Symbols)

The requirements are specified in Table 8.10.1.2.4-2, with the addition of the parameters in Table 8.10.1.2.4-1 and the downlink physical channel setup according to Annex C.3.2.

Table 8.10.1.2.4-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) with 4Rx Antenna Ports

Parameter	•	Unit	Test 1					
Describelances	$ ho_{\scriptscriptstyle A}$	dB	-6					
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)					
anocation	σ	dB	3					
$N_{\it oc}$ at antenna port		dBm/15kHz	-98					
Precoding granularity	/	PRB	6					
PMI delay (Note 2)		ms	10 or 11					
Reporting interval		ms	1 or 4 (Note 3)					
Reporting mode			PUSCH 1-2					
ACK/NACK feedback	k mode		Bundling					
CodeBookSubsetRe	striction		000000000000000000000000000000000000000					
bitmap			00001111111111111111100000000					
			00000000					
PDSCH transmission	mode		4					
Note 1: $P_{\rm B} = 1$.								
Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n								

based on PMI estimation at a downlink SF not later than SF#(n-4), this

reported PMI cannot be applied at the eNB downlink before SF#(n+4) Note 3: For Uplink - downlink configuration 1 the reporting interval will alternate between 1ms and 4ms.

Table 8.10.1.2.4-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC) with 4Rx Antenna Ports

Test			Propagatio	Correlation	Reference v	/alue	UE	
number	width	Channel	Pattern	n	Matrix and	Fraction of	SNR	Category
				Condition	Antenna Configuration	Maximum Throughput	(dB)	
					Comiguration	(%)		
1	10 MHz	R.36 TDD	OP.1 TDD	EPA5	4x4 Low	70	[10.4]	≥2

8.10.1.2.5 Enhanced Performance Requirement Type A – Single-layer Spatial Multiplexing with TM9 interference model (User-Specific Reference Symbols)

The requirements are specified in Table 8.10.1.2.5-2, with the addition of the parameters in Table 8.10.1.2.5-1 and the downlink physical channel setup according to Annex C.3.2. The purpose of these tests is to verify closed-loop rank one performance on one of the antenna ports 7 or 8 without a simultaneous transmission on the other antenna port in the serving cell when the PDSCH transmission in the serving cell is interfered by PDSCH of one dominant interfering cell applying transmission mode 9 interference model defined in clause B.5.4. In 8.10.1.2.5-1, Cell 1 is the serving cell, and Cell 2 is the interfering cell. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1 and Cell 2, respectively.

Table 8.10.1.2.5-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model and 4Rx Antenna Ports

paramete	r	Unit	Cell 1	Cell 2
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referen	ce signals		Antenna ports 0,1	Antenna ports 0,1
CSI reference signa	ls		Antenna ports 15,,18	N/A
CSI-RS periodicity a subframe offset $T_{\rm CS}$	$_{ extsf{I-RS}}$ / $\Delta_{ extsf{CSI-RS}}$	Subframes	5 / 4	N/A
CSI reference signa configuration	l		0	N/A
$N_{\it oc}$ at antenna por	t	dBm/15kH z	-98	N/A
DIP (Note 2)		dB	N/A	-1.73
BW _{Channel}		MHz	10	10
Cyclic Prefix			Normal	Normal
Cell Id			0	126
Number of control C symbols	FDM		2	2
PDSCH transmission	n mode		9	N/A
Beamforming model			As specified in clause B.4.3 (Note 4, 5)	N/A
Interference model			N/A	As specified in clause B.5.4
Probability of occurrence of	Rank 1		N/A	70
transmission rank in interfering cells	Rank 2		N/A	30
Precoder update gra	anularity	PRB	50	6
PMI delay (Note 5)		ms	10 or 11	N/A
Reporting interval		ms	5	N/A
Reporting mode			PUCCH 1-1	N/A
CodeBookSubsetRebitmap	estriction		0000000000000000 00000000000000000 00000	N/A
Symbols for unused	PRBs		OCNG (Note 6)	N/A
Simultaneous transi	mission		No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test	N/A

Note 1: $P_{p} = 1$

Note 2: The respective received power spectral density of each interfering cell relative to N_{oc} ' is defined by its associated DIP value as specified in clause B.5.1.

Note 3: The modulation symbols of the signal under test in Cell 1 are mapped onto antenna port 7 or 8.

Note 4: The precoder in clause B.4.3 follows UE recommended PMI.

Note 5: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI

cannot be applied at the eNB downlink before SF#(n+4).

Note 6: These physical resource blocks are assigned to an arbitrary number of virtual UEs

with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

Note 7: All cells are time-synchronous.

Table 8.10.1.2.5-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model and 4Rx Antenna Ports

Test Number	Referenc e		NG tern	Propagation Conditions		Correlatio n Matrix	Reference V	UE Categor	
	Channel	Cell 1	Cell 2	Cell 1	Cell 2	and Antenna Configurat ion (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	у
1	R.48 TDD	OP.1 TDD	N/A	EVA5	EVA5	4x4 Low	70	TBD	≥1

Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent.

Note 2: SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Note 3: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.

8.10.1.2.6 Dual-Layer Spatial Multiplexing (User-Specific Reference Symbols)

For dual-layer transmission on antenna ports 7 and 8 upon detection of a PDCCH with DCI format 2C, the requirements are specified in Table 8.10.1.2.6-2, with the addition of the parameters in Table 8.10.1.2.6-1 where Cell 1 is the serving cell and Cell 2 is the interfering cell. The downlink physical channel setup is set according to Annex C.3.2. The purpose of these tests is to verify the rank-2 performance for full RB allocation, to verify rate matching with multiple CSI reference symbol configurations with non-zero and zero transmission power, and to verify that the UE correctly estimate SNR.

Table 8.10.1.2.6-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer) with multiple **CSI-RS** configurations and 4Rx Antenna Ports

Parameter	Unit	Test 1			
Farameter		Onit	Cell 1	Cell 2	
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	4	0	
Downlink power allocation	$\rho_{\scriptscriptstyle B}$	dB	4 (Note 1)	0	
	σ	dB	-3	-3	
Cell-specific refere signals	nce		Antenna ports 0 and 1	Antenna ports 0 and 1	
Cell ID			0	126	
CSI reference signals			Antenna ports 15,16	NA	
Beamforming model			Annex B.4.2	NA	
CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$		Subframes	5/4	NA	
CSI reference signal configuration			8	NA	
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap		Subframes / bitmap	4 / 001000000000000000	NA	
$N_{\it oc}$ at antenna po	rt	dBm/15kHz	-98	-98	
\hat{E}_s/N_{oc}			Reference Value in Table 8.10.1.2.6-2	7.25dB	
Symbols for unuse PRBs			OCNG (Note 2)	NA	
Number of allocate resource blocks (N		PRB	50	NA	
Simultaneous transmission			No	NA	
PDSCH transmissi mode	on		9	Blanked	

Note 1: $P_{\rm B} = 1$

These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK

modulated.

Table 8.10.1.2.6-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations

Test number	Bandwidth	Reference Channel				gation dition	Correlation Matrix and	Reference value		UE Cate
			Cell 1	Cell 2	Cell 1	Cell 2	Antenna Configurati on	Fraction of Maximum Throughput (%)	SNR (dB)	gory
1	10 MHz	R.51 TDD	OP.1 TDD	N/A	ETU5	ETU5	2x4 Low	70	[9.5]	≥2

The propagation conditions for Cell 1 and Cell 2 are statistically independent. Note 1:

Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. Note 2:

SNR corresponds to \hat{E}_s/N_{oc} of Cell 1. Note 3:

8.10.2 PDCCH/PCFICH

8.10.2.1 FDD

The parameters specified in Table 8.10.2.1-1 are valid for all FDD tests unless otherwise stated.

Table 8.10.2.1-1: Test Parameters for PDCCH/PCFICH with 4 Rx Antenna Ports

Parame	eter	Unit	Single antenna port	Transmit diversity
Number of PDCCH		symbols	2	2
Number of PHICH	groups (N _g)		1	1
PHICH duration			Normal	Normal
PDSCH Reference	channel		R.2	R.2
Unused RE-s and	PRB-s		OCNG	OCNG
Cell ID			0	0
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0	-3 (Note 1)
	σ	dB	0	0
$N_{\it oc}$ at antenna po	rt	dBm/15kHz	-98	-98
Cyclic prefix			Normal	Normal
Note 1: according	g to Clause 6.9	in TS 36.211 [4]		

8.10.2.1.1 Single-antenna port performance for 4Rx UEs

For the parameters specified in Table 8. 10.2.1.-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.2.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8. 10.2.1.1-1: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	OCNG Pattern	Propagatio n Condition	Antenna configuration	Refer val	
						and correlation Matrix	Pm- dsg (%)	SNR (dB)
1	10 MHz	TBD CCE	R.15 FDD	OP.1 FDD	ETU70	1x4 Low	1	TBD

8.10.2.1.2 Minimum Requirement 2 Tx Antenna Port and 4 Rx Antennas

For the parameters specified in Table 8.10.2.1-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8. 10.2.1.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8. 10.2.1.2-1: Minimum performance PDCCH/PCFICH with 4 Rx Antenna Ports

Test	Bandwidt	Aggregatio	Referenc	OCNG	Propagatio	Antenna	Referenc	e value
numbe	h	n level	е	Pattern	n	configuration	Pm-dsg	SNR
r			Channel		Condition	and	(%)	(dB)
						correlation		
						Matrix		
1	10 MHz	4 CCE	R.16 FDD	OP.1 FDD	EVA70	2 x 4 Low	1	TBD

8.10.2.1.3 Minimum Requirement 4 Tx Antenna Ports and 4 Rx Antennas

For the parameters specified in Table 8.10.2.1-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.2.1.3-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.2.1.3-1: Minimum performance PDCCH/PCFICH

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	5 MHz	2 CCE	R.17 FDD	OP.1 FDD	EPA5	4 x 4 Medium A Xpol	1	TBD

8.10.2.2 TDD

Table 8.10.2.2-1: Test Parameters for PDCCH/PCFICH

Param	eter	Unit	Single antenna port	Transmit diversity
Uplink downlink co (Note 1)	onfiguration		0	0
Special subframe (Note 2)	configuration		4	4
Number of PDCCH	l symbols	symbols	2	2
Number of PHICH	groups (N _g)		1	1
PHICH duration			Normal	Normal
Unused RE-s and	PRB-s		OCNG	OCNG
Cell ID			0	0
Davinlink navian	$ ho_{\scriptscriptstyle A}$	dB	0	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0	-3 (Note 3)
	σ	dB	0	0
N_{oc} at antenna port		dBm/15kHz	-98	-98
Cyclic prefix			Normal	Normal
ACK/NACK feedba	ack mode		Multiplexing	Multiplexing
Note 1: as spec	ified in Table 4	2-2 in TS 36 211 [4	11	

Note 1: as specified in Table 4.2-2 in TS 36.211 [4].

Note 2: as specified in Table 4.2-1 in TS 36.211 [4].

Note 3: according to Clause 6.9 in TS 36.211 [4]

8.10.2.2.1 Single-antenna port performance for 4Rx UEs

For the parameters specified in Table 8.10.2.2-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.2.2.1-1: Minimum performance PDCCH/PCFICH

Test	Bandwidt	Aggregation	Referenc	OCNG	Propagati	Antenna	Referen	ce value
numbe r	h	level	e Channel	Pattern	on Condition	configuratio n and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	TBD CCE	R.15 TDD	OP.1 TDD	ETU70	1x4 Low	1	TBD

8.10.2.2.2 Minimum Requirement 2 Tx Antenna Port for 4 Rx UEs

For the parameters specified in Table 8.10.2.2-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.2.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.2.2.2-1: Minimum performance PDCCH/PCFICH

Test	Bandwidt	Aggregation	Referenc	OCNG	Propagati	Antenna	Referen	ce value
numbe r	h	level	e Channel	Pattern	on Condition	configuratio n and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	4 CCE	R.16 TDD	OP.1 TDD	EVA70	2 x 4 Low	1	TBD

8.10.2.2.3 Minimum Requirement 4 Tx Antenna Port and 4 Rx Antennas

For the parameters specified in Table 8.10.2.2-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.2.2.3-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.2.2.3-1: Minimum performance PDCCH/PCFICH

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	5 MHz	2 CCE	R.17 TDD	OP.1 TDD	EPA5	4 x 4 Medium A Xpol	1	TBD

8.10.3 PHICH

The receiver characteristics of the PHICH are determined by the probability of miss-detecting an ACK for a NACK (Pm-an). It is assumed that there is no bias applied to the detection of ACK and NACK (zero-threshold delection).

8.10.3.1 FDD

The parameters specified in Table 8.10.3.1-1 are valid for all FDD tests with 4Rx unless otherwise stated.

Table 8.10.3.1-1: Test Parameters for PHICH with 4 Rx Antenna Ports

Para	meter	Unit	Single antenna port	Transmit diversity	
Deventing a success	$ ho_{\scriptscriptstyle A}$	dB	0	-3	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0	-3 (Note 1)	
	σ	dB	0	0	
PHICH duration			Normal	Normal	
Number of PHICH	groups (Note 1)		Ng = 1	Ng = 1	
PDCCH Content			UL Grant should be included with the proper information aligned with A.3.6		
PDSCH Reference	e channel		R.2	R.2	
Unused RE-s and	PRB-s		OCNG	OCNG	
Cell ID			0	0	
$N_{\it oc}$ at antenna p	ort	dBm/15kHz	-98	-98	
Cyclic prefix			Normal	Normal	
Note 1: accord	ing to Clause 6.9 in	TS 36.211 [4]			

8.10.3.1.1 Single Tx Antenna Port performance and 4 Rx Antenna Ports

For the parameters specified in Table 8.10.3.1-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.3.1.1-1: Minimum performance PHICH with 4 Rx Antenna Ports

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
1	10 MHz	R.18	OP.1 FDD	ETU70	1 x 4 Low	0.1	TBD

8.10.3.1.2 Minimum Requirement 2 Tx Antenna Port and 4 Rx Antenna Ports

For the parameters specified in Table 8.10.3.1-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.1.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.3.1.2-1: Minimum performance PHICH with 4 Rx Antenna Ports

Ī	Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
	number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
	1	10 MHz	R.19	OP.1 FDD	EVA70	2 x 4 Low	0.1	TBD

8.10.3.1.3 Minimum Requirement 4 Tx Antenna Port and 4 Rx Antenna Ports

For the parameters specified in Table 8.10.3.1-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8 .10.3.1.3-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.3.1.3-1: Minimum performance PHICH with 4 Rx Antenna Ports

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
1	5 MHz	R.20	OP.1 FDD	EPA5	4 x 4 Medium correlation A, Cross polarized	0.1	TBD

8.10.3.2 TDD

The parameters specified in Table 8.10.3.2-1 are valid for all TDD tests with 4 Rx unless otherwise stated.

Table 8.10.3.2-1: Test Parameters for PHICH with 4 Rx Antenna Ports

Para	meter	Unit	Single antenna port	Transmit diversity	
Uplink downlink c	onfiguration (Note		1	1	
Special subframe (Note 2)	configuration		4	4	
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0	-3	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0	-3 (Note 3)	
	σ	dB	0	0	
PHICH duration			Normal	Normal	
Number of PHICH	d groups (Note 1)		Ng = 1	Ng = 1	
PDCCH Content			UL Grant should be included with the proper information aligned with A.3.6		
PDSCH Reference	e channel		R.2	R.2	
Unused RE-s and	I PRB-s		OCNG	OCNG	
Cell ID			0	0	
$N_{\it oc}$ at antenna p	ort	dBm/15kHz	-98	-98	
Cyclic prefix			Normal	Normal	
ACK/NACK feedb	ack mode		Multiplexing	Multiplexing	
Note 1: as spec	cified in Table 4.2-2	in TS 36.211 [4	.]		
Note 2: as spec	.]				
Note 3: accord	ing to Clause 6.9 in	TS 36.211 [4]			

8.10.3.2.1 Single Tx Antenna Port performance and 4 Rx Antenna Ports

For the parameters specified in Table 8.10.3.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.3.2.1-1: Minimum performance PHICH with 4 Rx Antenna Ports

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration	Pm-an (%)	SNR (dB)
					and		
					correlation		
					Matrix		
1	10 MHz	R.18	OP.1 TDD	ETU70	1 x 4 Low	0.1	TBD

8.10.3.2.2 Minimum Requirement 2 Tx Antenna Port and 4 Rx Antenna Ports

For the parameters specified in Table 8.10.3.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.3.2.2-1: Minimum performance PHICH with 4 Rx Antenna Ports

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration	Pm-an (%)	SNR (dB)
					and		
					correlation		
					Matrix		
1	10 MHz	R.19	OP.1 TDD	EVA70	2 x 4 Low	0.1	TBD

8.10.3.2.3 Minimum Requirement 4 Tx Antenna Port and 4 Rx Antenna Ports

For the parameters specified in Table 8.10.3.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.10.3.2.3-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.3.2.3-1: Minimum performance PHICH with 4 Rx Antenna Ports

Test	Bandwidth	Reference	OCNG	Propagation	Antenna	Referen	ce value
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
1	5 MHz	R.20	OP.1 TDD	EPA5	4 x 4 Medium cotrrelation A, Cross polarized	0.1	TBD

8.10.4 ePDCCH

The receiver characteristics of the EPDCCH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). For the distributed transmission tests in 8.10.4.1, EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH. For other tests, EPDCCH and PCFICH are not tested jointly.

8.10.4.1 Distributed Transmission with 4Rx

8.10.4.1.1 FDD

The parameters specified in Table 8.10.4.1.1-1 are valid for all FDD distributed EPDCCH test with 4Rx unless otherwise stated.

Table 8.10.4.1.1-1: Test Parameters for Distributed EPDCCH with 4Rx

P	arame	Unit	Value	
Number of PDC	CH syr	symbols	2 (Note 1)	
PHICH duration				Normal
Unused RE-s an	d PRE	3-s		OCNG
Cell ID				0
		$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power		$ ho_{\scriptscriptstyle B}$	dB	-3
allocation		σ	dB	0
		Δ	dB	3
$N_{\it oc}$ at antenna	port		dBm/15 kHz	-98
Cyclic prefix				Normal
Subframe Config	guratio	n		Non-MBSFN
Precoder Update	Gran	ularity	PRB	1
1 recoder opuate	Gian	dianty	ms	1
Beamforming Pr				Annex B.4.4
Cell Specific Ref				Port 0 and 1
Number of EPD0	CCH S	ets Configured		2 (Note 2)
Number of PRB	per EF	PDCCH Set		4 (1 st Set) 8 (2 nd Set)
EPDCCH Subfra	me M	onitoring		NA
PDSCH TM				TM3
DCI Format				2A
Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling <i>epdcch-StartSymbol-r11</i> is not configured. Note 2: The two sets are distributed EPDCCH sets and non-				
overlapping with PRB = {3, 17, 31, 45} for the first set and PRB = {0, 7, 14, 21, 28, 35, 42, 49} for the second set. EPDCCH is scheduled in the first set for Test 1 and secon set for Test 2, respectively. Both sets are always configure				

For the parameters specified in Table 8.10.4.1.1-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.4.1.1-2. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.4.1.1-2: Minimum performance Distributed EPDCCH with 4Rx

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	4 ECCE	R.55 FDD	OP.7 FDD	EVA5	2 x 4 Low	1	TBD
2	10 MHZ	TBD ECCE	R.56 FDD	OP.7 FDD	EVA70	2 x 4 Low	1	TBD

8.10.4.1.2 TDD

The parameters specified in Table 8.10.4.1.2-1 are valid for all TDD distributed EPDCCH tests with 4Rx unless otherwise stated.

Table 8.10.4.1.2-1: Test Parameters for Distributed EPDCCH with 4Rx

Param	Parameter				
Number of PDCCH sy	Number of PDCCH symbols				
PHICH duration		Normal			
Unused RE-s and PRE	Unused RE-s and PRB-s				
Cell ID			0		
	$ ho_{\scriptscriptstyle A}$	dB	-3		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3		
allocation	σ	dB	0		
	δ	dB	3		
$N_{\it oc}$ at antenna port		dBm/15 kHz	-98		
Cyclic prefix			Normal		
Subframe Configuration	n		Non-MBSFN		
Precoder Update Gran	ularity	PRB	1		
•		ms	1		
Beamforming Pre-Cod		Annex B.4.4			
Cell Specific Reference			Port 0 and 1		
Number of EPDCCH S	Sets Configured		2 (Note 2)		
Number of PRB per El	PDCCH Set		4 (1 st Set)		
·			8 (2 nd Set)		
EPDCCH Subframe M	onitoring		NA		
PDSCH TM			TM3		
DCI Format			2A		
TDD UL/DL Configura			0		
TDD Special Subframe			1 (Note 3)		
	Note 1: The starting symbol for EPDCC PCFICH. RRC signalling epdcc.				
Note 2: The two set overlapping PRB = {0, 7	31, 45} for th 49} for the s	ne first set and			
set for Test	sets are al	ways configured. er normal and			

For the parameters specified in Table 8.10.4.1.2-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.4.1.2-2. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.4.1.2-2: Minimum performance Distributed EPDCCH with 4Rx

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Referenc	e value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	4 ECCE	R.55 TDD	OP.7 TDD	EVA5	2 x 4 Low	1	TBD
2	10 MHZ	TBD ECCE	R.56 TDD	OP.7 TDD	EVA70	2 x 4 Low	1	TBD

8.10.4.2 Localized Transmission with TM9 with 4Rx

8.10.4.2.1 FDD

The parameters specified in Table 8.10.4.2.1-1 are valid for all FDD TM9 localized ePDCCH tests with 4Rx unless otherwise stated.

Table 8.10.4.2.1-1: Test Parameters for Localized EPDCCH with TM9 and 4Rx

Param		Unit	Value
Number of PDCCH sy	mbols	symbols	1 (Note 1)
EPDCCH starting sym	nbol	symbols	2 (Note 1)
PHICH duration			Normal
Unused RE-s and PR	B-s		OCNG
Cell ID			0
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	σ	dB	-3
	δ	dB	0
$N_{\it oc}$ at antenna port		dBm/15 kHz	-98
Cyclic prefix			Normal
Subframe Configuration	on		Non-MBSFN
Precoder Update Gra	oularity	PRB	1
Frecoder Opdate Gra	lulanty	ms	1
Beamforming Pre-Cod	der		Annex B.4.5
Cell Specific Reference	e Signal		Port 0 and 1
CSI-RS Reference Sign			Port 15 and 16
CSI-RS reference sign configuration	nal resource		0
CSI reference signal s configuration I _{CSI-RS}	subframe		2
ZP-CSI-RS configurat	ion bitmap		000001000000000
ZP-CSI-RS subframe configuration I_{ZP} .			2
CSI-RS			
Number of EPDCCH Sets			2 (Note 2)
EPDCCH Subframe Monitoring pattern			111111110 1111111101 1111111011
subframePatternConf	ıg-r11		1111110111 (Note 3)
PDSCH TM			TM9

Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. However, CFI is set to 1.

Note 2: The first set is distributed transmission with PRB = {0, 49} and the second set is localized transmission with PRB = {0, 7, 14, 21, 28, 35, 42, 49}. ePDCCH is scheduled in the second set for all tests.

Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by *subframePatternConfig-r11*. Legacy PDCCH is not scheduled.

For the parameters specified in Table 8.10.4.2.1-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.4.2.1-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%.

The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.4.2.1-2: Minimum performance Localized EPDCCH with TM9 and 4Rx

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	2 ECCE	R.57 FDD	OP.7 FDD	EVA5	2 x 4 Low	1	TBD
2	10 MHZ	8 ECCE	R.58 FDD	OP.7 FDD	EVA5	2 x 4 Low	1	TBD

8.10.4.2.2 TDD

The parameters specified in Table 8.10.4.2.2-1 are valid for all TDD TM9 localized ePDCCH tests unless otherwise stated.

Table 8.10.4.2.2-1: Test Parameters for Localized EPDCCH with TM9 and 4Rx

Parar	neter	Unit	Value		
Number of PDCCH s	ymbols	symbols	1 (Note 1)		
EPDCCH starting sy	mbol	symbols	2 (Note 1)		
PHICH duration			Normal		
Unused RE-s and PF	RB-s		OCNG		
Cell ID			0		
	$ ho_{\scriptscriptstyle A}$	dB	0		
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0		
allocation	σ	dB	-3		
	δ	dB	0		
$N_{\it oc}$ at antenna port	·	dBm/15 kHz	-98		
Cyclic prefix			Normal		
Subframe Configurat	Subframe Configuration		Non-MBSFN		
Precoder Update Granularity		PRB	1		
•		ms	1		
Beamforming Pre-Co			Annex B.4.5		
Cell Specific Referen			Port 0 and 1		
CSI-RS Reference S			Port 15 and 16		
CSI-RS reference sig configuration			0		
CSI reference signal configuration I _{CSI-RS}	subframe		0		
ZP-CSI-RS configura	ation bitmap		000001000000000		
ZP-CSI-RS subframe			0		
Number of EPDCCH Sets			2 (Note 2)		
EPDCCH Subframe Monitoring pattern subframePatternConfig-r11			1100011000 1100010000 1100011000 1100001000 1100011000 1000011000 1100011000 (Note 3)		
PDSCH TM			TM9		
TDD UL/DL Configur	ation		0		
TDD Special Subfrar			1 (Note 4)		
		"H is signalled with and och Start Symbol r11 Howavar CEL is			

Note 1: The starting symbol for EPDCCH is signalled with *epdcch-StartSymbol-r11*. However, CFI is set to 1.

Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by *subframePatternConfig-r11*. Legacy PDCCH is not scheduled.

Note 4: Demodulation performance is averaged over normal and special subframe.

For the parameters specified in Table 8.10.4.2.2-1 the average probability of a missed downlink scheduling grant (Pmdsg) shall be below the specified value in Table 8.10.4.2.2-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%.

Note 2: The first set is distributed transmission with PRB = {0, 49} and the second set is localized transmission with PRB = {0, 7, 14, 21, 28, 35, 42, 49}. ePDCCH is scheduled in the second set for all tests.

The downlink physical setup is in accordance with Annex C.3.2.

Table 8.10.4.2.2-2: Minimum performance Localized EPDCCH with TM9 and 4Rx

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	2 ECCE	R.57 TDD	OP.7 TDD	EVA5	2 x 4 Low	1	TBD
2	10 MHZ	8 ECCE	R.58 TDD	OP.7 TDD	EVA5	2 x 4 Low	1	TBD

9 Reporting of Channel State Information

9.1 General

This section includes requirements for the reporting of channel state information (CSI). For all test cases in this section, the definition of SNR and SINR are in accordance with the one given in clause 8.1.1.

For the performance requirements specified in this clause, it is assumed that N_{RX} =2 unless otherwise stated.

Unless otherwise stated, 4-bit CQI Table in Table 7.2.3-1 in TS 36.213 [6], and Modulation and TBS index table in Table 7.1.7.1-1 for PDSCH in TS 36.213 [6] are applied in all the CSI requirements.

9.1.1 Applicability of requirements

9.1.1.1 Applicability of requirements for different channel bandwidths

In Clause 9 the test cases may be defined with different channel bandwidth to verify the same CSI requirement.

Test cases defined for 5MHz channel bandwidth that reference this clause are applicable to UEs that support only Band 31.

9.1.1.2 Applicability and test rules for different CA configurations and bandwidth combination sets

The performance requirement for CA CQI tests in Clause 9 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.6A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL CCs in Table 9.1.1.2-1 and 3 or more DL CCs in Table 9.1.1.2-2. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

Table 9.1.1.2-1: Applicability and test rules for CA UE CQI tests with 2 DL CCs

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order
CA tests with 2CCs in Clause 9.6.1.1	Any of one of the supported CA capabilities	Any one of the supported FDD CA configurations	10+10 MHz, 20+20 MHz, 5+5 MHz, 10MHz+5MHz, 15MHz+5MHz
CA tests with 2CCs in Clause 9.6.1.2	Any of one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination

The applicability and test rules are specified in this table, unless otherwise stated.

Note 2: Number of the supported bandwidth combinations to be tested from each selected

CA configuration is 1.

Note 3: A single Uplink CC is configured for all tests

Table 9.1.1.2-2: Applicability and test rules for CA UE CQI tests with 3 or more DL CCs

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order					
CA tests with 3 ore more CCs in Clause 9.6.1.1	Any of one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported FDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination					
CA tests with 3 or more CCs in Clause 9.6.1.2 Any of one of the supported CA capabilities with largest aggregated CA bandwidth combination		Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination					
Note 1: The applicability and test rules are specified in this table, unless otherwise stated.								
Note 2: Number of the supported bandwidth combinations to be tested from each selected								
	CA configuration is 1. Note 3: A single Uplink CC is configured for all tests							

9.1.1.2A Applicability and test rules for different TDD-FDD CA configurations and bandwidth combination sets

The performance requirement for TDD-FDD CA CQI tests in Clause 9 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.6A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL TDD-FDD CA in Table 9.1.1.2A-1 and for 3 or more DL TDD-FDD CA in Table 9.1.1.2A-2. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

Note 3:

Table 9.1.1.2A-1: Applicability and test rules for CA UE CQI tests for TDD-FDD CA with 2 DL CCs

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order				
CA tests with 2CCs in Clause 9.6.1.3	Any of one of the supported CA capabilities	Any one of the supported TDD- FDD CA configurations with FDD PCell with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination				
CA tests with 2CCs in Clause 9.6.1.4	Any of one of the supported CA capabilities	Any one of the supported TDD- FDD CA configurations with TDD PCell with largest aggregated CA bandwidth combination Largest aggregated CA bandwidth combination					
Note 1: The applicability and test rules are specified in this table, unless otherwise stated. Note 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.							

Table 9.1.1.2A-2: Applicability and test rules for CA UE CQI tests for TDD-FDD CA with 3 or more DL CCs

Tests	CA capability where the tests	CA configuration from the selected CA capbility where the	CA Bandwidth combination to be					
	apply	tests apply	tested in priority order					
CA tests with 3CCs in Clause 9.6.1.3	Any of one of the supported TDD-FDD CA configurations with FDD PCell with largest aggregated CA bandwidth combination		Largest aggregated CA bandwidth combination					
CA tests with 3CCs in Clause 9.6.1.4	Any of one of the supported CA capabilities	Any one of the supported TDD- FDD CA configurations with TDD PCell with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination					
Note 1: The applicability and test rules are specified in this table, unless otherwise stated. Note 2: Number of the supported bandwidth combinations to be tested from each selected CA configuration is 1.								
Note 3: A single	Uplink CC is configure	d for all tests						

9.1.1.3 Test coverage for different number of component carriers

A single Uplink CC is configured for all tests

For FDD CA tests specified in 9.6.1.1, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD CA tests specified in 9.6.1.2, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the CA tests with less than the largest number of CCs supported by the UE.

For TDD FDD CA tests specified in 9.6.1.3 and 9.6.1.4, among all supported CA capabilities, if corresponding CA tests with the largest number of CCs supported by the UE are tested, the test coverage can be considered fulfilled without executing the TDD FDD CA tests with less than the largest number of CCs supported by the UE.

9.2 CQI reporting definition under AWGN conditions

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective conditions is determined by the reporting variance and the BLER performance using the transport format indicated by the reported CQI median. The purpose is to verify that the reported CQI values are in accordance with the CQI definition given in TS 36.213 [6]. To account for sensitivity of the input SNR the reporting definition is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.2.1 Minimum requirement PUCCH 1-0 (Cell-Specific Reference Symbols)

9.2.1.1 FDD

The following requirements apply to UE Category ≥ 1 . For the parameters specified in Table 9.2.1.1-1 and Table 9.2.1.1-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1 FDD / RC.14 FDD in Table A.4-1 shall be in the range of ± 1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI - 1) shall be less than or equal to 0.1.

The applicability of the requirement with 5MHz bandwidth as specificed in Table 9.2.1.1-2 is defined in 9.1.1.1.

Parameter Unit Test 1 Test 2 Bandwidth MHz 10 PDSCH transmission mode 1 dΒ 0 $\rho_{\scriptscriptstyle A}$ Downlink power dB 0 $\rho_{\scriptscriptstyle B}$ allocation dΒ 0 σ Propagation condition and AWGN (1 x 2) antenna configuration SNR (Note 2) dΒ 0 $\hat{I}_{or}^{(j)}$ dB[mW/15kHz] -98 -97 -92 -91 $N^{\overline{(j)}}$ dB[mW/15kHz] -98 -98 Max number of HARQ transmissions Physical channel for CQI **PUCCH Format 2** reporting PUCCH Report Type 4 Reporting periodicity ms $N_{pd} = 5$ cqi-pmi-ConfigurationIndex

Table 9.2.1.1-1: PUCCH 1-0 static test (FDD)

Note 1: Reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, except for category 1 UE use RC.4 FDD with two sided dynamic OCNG Pattern OP.2 FDD as described in Annex A.5.1.2.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Table 9.2.1.1-2: PUCCH 1-0 static test (FDD 5MHz)

Parameter		Unit	Test 1		Te	Test 2	
Bandwidth		MHz	5				
PDSCH transmission	mode			1			
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB			0		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0				
	σ	dB			0		
Propagation condition antenna configuration			AWGN (1 x 2)				
SNR (Note 2)		dB	[0]	[1]	[6]	[7]	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	[-98]	[-97]	[-92]	[-91]	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98		-98		
Max number of HARO transmissions	2		1				
Physical channel for (CQI		PUCCH Format 2				
PUCCH Report Type			4				
Reporting periodicity		ms	$N_{\rm pd} = 5$				
cqi-pmi-Configuration	Index	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	6				

Note 1: Reference measurement channel RC.14 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, except for category 1 UE use RC.4 FDD with two sided dynamic OCNG Pattern OP.2 FDD as described in Annex A.5.1.2.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

9.2.1.2 TDD

The following requirements apply to UE Category ≥ 1 . For the parameters specified in Table 9.2.1.2-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1 TDD in Table A.4-1 shall be in the range of ± 1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

Table 9.2.1.2-1: PUCCH 1-0 static test (TDD)

Parameter		Unit	Test 1 Test :		st 2	
Bandwidth		MHz			10	
PDSCH transmission	on mode				1	
Uplink downlink configuration			2			
Special subframe configuration			4			
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB			0	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB			0	
	σ	dB	0			
Propagation condition and antenna configuration			AWGN (1 x 2)			
SNR (Note 2	2)	dB	0	1	6	7
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-97	-92	-91
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-9	98
Max number of H transmission			1			
Physical channel for CQI reporting			PUSCH (Note 3)			
PUCCH Report Type					4	
Reporting periodicity		ms	·	N _p	_d = 5	
cqi-pmi-ConfigurationIndex			3			
ACK/NACK feedback	ck mode			Multi	plexing	

- Note 1: Reference measurement channel RC.1 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1, except for category 1 UE use RC.4 TDD with two sided dynamic OCNG Pattern OP.2 TDD as described in Annex A.5.2.2.
- Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

9.2.1.3 FDD (CSI measurements in case two CSI subframe sets are configured)

The following requirements apply to UE Category ≥ 1 . For the parameters specified in Table 9.2.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C.3.3-1 for Cell 2 and C.3.2-2, the reported CQI value according to RC.2 FDD / RC.6 FDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ± 1 of the reported median more than 90% of the time. If the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by (median CQI - 1) shall be less than or equal to 0.1. The value of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 2 and less than or equal to 5 in Test 1 and shall be larger than or equal to 0 and less than or equal to 1 in Test 2.

Table 9.2.1.3-1: PUCCH 1-0 static test (FDD)

Devemeter		l lmi4	Те	st 1	Test 2		
Parameter		Unit	Cell 1	Cell 2	Cell 1	Cell 2	
Bandwidth		MHz		0		0	
PDSCH transmissi	on mode		2	Note 10	2	Note 10	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		-3	-	.3	
allocation	$ ho_{\scriptscriptstyle B}$	dB		-3	-	-3	
	σ	dB		0		0	
Propagation condi antenna configu			Clause	B.1 (2x2)	Clause	B.1 (2x2)	
\widehat{E}_s/N_{oc2} (Note 1)		dB	4 5	6	4 5	-12	
(;)	$N_{oc1}^{(j)}$	dBm/15kHz	-102 (Note 7)	N/A	-98(Note 7)	N/A	
$N_{oc}^{(j)}$ at antenna $$	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (Note 8)	N/A	-98(Note 8)	N/A	
	$N_{oc3}^{(j)}$	dBm/15kHz	-94.8 (Note 9)	N/A	-98(Note 9)	N/A	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94 -93	-92	-94 -93	-110	
Subframe Config	uration		Non-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN	
Cell Id			0	1	0	1	
Time Offset betwe	en Cells	μs	2.5 (synchi	onous cells)	2.5 (synchr	onous cells)	
ABS pattern (Note 2)			01010101 01010101 N/A 01010101 01010101 01010101		N/A 0101010° 0101010° 0101010° 0101010° 0101010°		
RLM/RRM Measurement Subframe Pattern (Note 4)			00000100 00000100 00000100 00000100 00000100	00 00 0000100 00000100 00000100 00000100		N/A	
C _{CSI,0}			01010101 01010101 01010101 01010101 01010101	N/A	01010101 01010101 01010101 01010101 01010101	N/A	
(Note 3)	C _{CSI,1}		10101010 10101010 10101010 10101010 10101010	N/A	10101010 10101010 10101010 10101010 10101010	N/A	
Number of control symbols	OFDM			3		3	
Max number of HARQ transmissions				1		1	
Physical channel for C _{CSI,0} CQI reporting			PUCCH	Format 2	PUCCH	Format 2	
Physical channel for C _{CSI,1} CQI reporting			PUSCH	(Note 12)	PUSCH (Note 12)		
PUCCH Report Type				4		4	
Reporting perio		Ms	N _{po}	1 = 5	N _{po}	1 = 5	
cqi-pmi-Configurat C _{CSI,0} (Note 1	3)		6	N/A	6	N/A	
cqi-pmi-Configuration C _{CSI,1} (Note 1			5	N/A	5	N/A	

- Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 2: ABS pattern as defined in [9].
- Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
- Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 10: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.1.5
- Note 11: Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 for UE Cateogry 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, and RC.6 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP. 1/2 FDD as described in Annex A.5.1.1 and A.5.1.2.
- Note 12: To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
- Note 13: cgi-pmi-ConfigurationIndex is applied for C_{CSL0}.
- Note 14: cqi-pmi-ConfigurationIndex2 is applied for CCSI,1.

9.2.1.4 TDD (CSI measurements in case two CSI subframe sets are configured)

The following requirements apply to UE Category ≥ 1 . For the parameters specified in Table 9.2.1.4-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C3.3-1 for Cell 2 and C.3.2-2, the reported CQI value according to RC.2 TDD / RC.6 TDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ± 1 of the reported median more than 90% of the time. If the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1. The value of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 2 and less than or equal to 5 in Test 1 and shall be larger than or equal to 0 and less than or equal to 1 in Test 2.

Table 9.2.1.4-1: PUCCH 1-0 static test (TDD)

Parameter		Unit	Test 1			Test 2		
Parameter		Unit	Ce	II 1	Cell 2	Ce	II 1	Cell 2
Bandwidth		MHz			0			0
PDSCH transmission			2		Note 10	2		Note 10
Uplink downlink con					1	1		1
Special subfra configuration				4	4		4	4
Davimlink	$ ho_{\scriptscriptstyle A}$	dB		-:	3		-	3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB		-;	3		-	3
	σ	dB	0			()	
Propagation condit antenna configur				Clause E	3.1 (2x2)		Clause I	3.1 (2x2)
\widehat{E}_s/N_{oc2} (Not	te 1)	dB	4	5	6	4	5	-12
(:)	$N_{oc1}^{(j)}$	dBm/15kHz	-102 (1	Note 7)	N/A	-98 (N	ote 7)	N/A
$N_{oc}^{(j)}$ at antenna	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (N	ote 8)	N/A	-98 (N	lote 8)	N/A
port	$N_{oc3}^{(j)}$	dBm/15kHz	-94.8 (I	Note 9)	N/A	-98 (Note 9)		N/A
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-93	-92	-94	-93	-110
Subframe Configuration			Non-M	BSFN	Non-MBSFN	Non-MBSFN		Non-MBSFN
Cell Id			()	1	0		1
Time Offset between	en Cells	μs	2.5 (synchronous cells		onous cells)	2.5 (synchronous cells)		onous cells)
ABS pattern (No	ote 2)		N/A		0100010001 0100010001	N/A		0100010001 0100010001
RLM/RRM Measu	rement		000000001		N/A	0000000001		N/A
Subframe Pattern	(Note 4)		000000001		IN/A	000000001		IN/A
CSI Subframe Sets	$C_{\text{CSI},0}$		01000 01000		N/A	0100010001 0100010001		N.A
(Note 3)	C _{CSI,1}			01000 01000	N/A	1000101000 1000101000		N/A
Number of control	OFDM		10001)	3		
symbols			3		3			
Max number of H					1	1		1
	transmissions Physical channel for C _{CSI,0} CQI							
reporting				PUCCH	Format 2	PUCCH Format 2		Format 2
Physical channel for C _{CSI,1} CQI					(Note 12)	PUSCH		201
reporting			'	03011	(14016-12)		1 00	3011
PUCCH Report Type					4			4
Reporting periodicity cqi-pmi-ConfigurationIndex		ms		<i>N</i> _{pd}	= 5		N _{pd}	= 5
C _{CSI,0} (Note 1	3)		3	3	N/A	3	3	N/A
cqi-pmi-Configuration			4	1	N/A	4	1	N/A
ACK/NACK feedba				Multip	lexing		Multip	lexing

- Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 2: ABS pattern as defined in [9].
- Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
- Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
- Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 10: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.2.5
- Note 11: Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 for UE Category ≥2 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1, and RC.6 TDD according to Table A.4-1 for Category 1 with one/two sided dynami OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1 and Annex A.5.2.2.
- Note 12: To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
- Note 13: cqi-pmi-ConfigurationIndex is applied for C_{CSI,0}.
- Note 14: cqi-pmi-ConfigurationIndex2 is applied for C_{CSI.1}.

9.2.1.5 FDD (CSI measurements in case two CSI subframe sets are configured and with CRS assistance information)

The following requirements apply to UE Category ≥ 2 . For the parameters specified in Table 9.2.1.5-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C.3.3-2 for Cell 2 and Cell 3, and C.3.2-2, the reported CQI value according to RC.2 FDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ± 1 of the reported median more than 90% of the time.

For test 1 and test 2, if the PDSCH BLER in ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{\text{CSI},0}$ is less than or equal to 0.1, the BLER in ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

For test 2, if the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{\text{CSI},1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the (median CQI + 2) shall be greater than 0.1. If the PDSCH BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

Table 9.2.1.5-1: PUCCH 1-0 static test (FDD)

Bananatan		Heit	Te	est 1	Test 2		
Parameter		Unit	Cell 1	Cell 2 and 3	Cell 1 Cell 2 and 3		
Bandwidth		MHz		10 Note 10		0 Note 40	
PDSCH transmissi		4D	2 Note 10		2	Note 10	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		-3		3	
allocation	$ ho_{\scriptscriptstyle B}$	dB		-3		3	
Doortiti	σ	dB		0	1	0	
Propagation condi antenna configu			Clause	B.1 (2x2)	Clause	B.1 (2x2)	
\widehat{E}_s/N_{oc2} (Note 1)		dB	4 5	Cell 2: 12 Cell 3: 10	13 14	Cell 2: 12 Cell 3: 10	
\ \(\(\) \	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (Note 7)	N/A	-98 (Note 7)	N/A	
$N_{oc}^{(j)}$ at antenna port	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (Note 8)	N/A	-98 (Note 8)	N/A	
	$N_{oc3}^{(j)}$	dBm/15kHz	-93 (Note 9)	N/A	-93 (Note 9)	N/A	
Subframe Config	uration		Non-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN	
Cell Id			0	Cell 2: 6 Cell 3: 1	0	Cell 2: 6 Cell 3: 1	
T' 0" 11 1	0 "		Cell 2	: 3 usec	Cell 2:	3 usec	
Time Offset betwe	en Cells	μs	Cell 3	: -1usec	Cell 3:	-1usec	
Frequency Shift bety	veen Cells	Hz		: 300Hz		300Hz	
ABS pattern (Note 2)			N/A	: -100Hz 01010101 01010101 01010101 01010101 01010101	N/A	-100Hz 01010101 01010101 01010101 01010101 01010101	
RLM/RRM Measurement Subframe Pattern (Note 4)			00000100 00000100 00000100 00000100 00000100	N/A	00000100 00000100 00000100 00000100 00000100	N/A	
CSI Subframe Sets	C _{CSI,0}		01010101 01010101 01010101 01010101 01010101	N/A	01010101 01010101 01010101 01010101 01010101	N/A	
(Note 3)	C _{CSI,1}		10101010 10101010 10101010 10101010 10101010	N/A	10101010 10101010 10101010 10101010 10101010	N/A	
Number of control symbols	OFDM			3		3	
symbols Max number of HARQ transmissions				1		1	
Physical channel for C _{CSI,0} CQI reporting			PUCCH	l Format 2	PUCCH	Format 2	
Physical channel for C _{CSI,1} CQI reporting			PUSCH	(Note 12)	PUSCH	(Note 12)	
PUCCH Report Type				4		4	
Reporting perio		Ms	N _p	_d = 5	N _{pd}	= 5	
cqi-pmi-Configurat C _{CSI,0} (Note 1	3)		6	N/A	6	N/A	
cqi-pmi-Configuration C _{CSI,1} (Note 1			5	N/A	5	N/A	

- Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 2: ABS pattern as defined in [9].
- Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell1, Cell2, and Cell3 are the same.
- Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
- Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 10: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.1.5
- Note 11: Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
- Note 12: To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
- Note 13: cqi-pmi-ConfigurationIndex is applied for C_{CSI,0}.
- Note 14: cqi-pmi-ConfigurationIndex2 is applied for CCSI,1.

9.2.1.6 TDD (CSI measurements in case two CSI subframe sets are configured and with CRS assistance information)

The following requirements apply to UE Category ≥ 2 . For the parameters specified in Table 9.2.1.6-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C3.3-2 for Cell 2 and Cell 3, and C.3.2-2, the reported CQI value according to RC.2 TDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ± 1 of the reported median more than 90% of the time.

For test 1 and test 2, if the PDSCH BLER in ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{\text{CSI},0}$ is less than or equal to 0.1, the BLER in ABS subframes using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER in ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

For test 2, if the PDSCH BLER in non-ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{\text{CSI},1}$ is less than or equal to 0.1, the BLER in non-ABS subframes using the transport format indicated by the (median CQI + 2) shall be greater than 0.1. If the PDSCH BLER in non-ABS subframes using the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

Table 9.2.1.6-1: PUCCH 1-0 static test (TDD)

Davamatar		1124		Tes	st 1	Test 2			
Parameter		Unit	Ce	II 1	Cell 2 and 3	Ce	II 1	Cell 2 and 3	
Bandwidth		MHz			0		-	0	
PDSCH transmission			2	<u> </u>	Note 10	:	2	Note 10	
Uplink downlink con					1			1	
Special subfra configuratio				2	4		•	4	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		-;	3		-	3	
allocation	$ ho_{\scriptscriptstyle B}$	dB		-;	3		-	3	
	σ	dB		()			0	
Propagation condi- antenna configu				Clause E	3.1 (2x2)		Clause I	B.1 (2x2)	
\widehat{E}_s/N_{oc2} (No	te 1)	dB	4	5	Cell 2: 12 Cell 3: 10	13	14	Cell 2: 12 Cell 3: 10	
(-)	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (N	ote 7)	N/A	-98 (N	lote 7)	N/A	
$N_{oc}^{(j)}$ at antenna	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (N	ote 8)	N/A	-98 (N	lote 8)	N/A	
port	$N_{oc3}^{(j)}$	dBm/15kHz	-93 (N	ote 9)	N/A	-93 (N	lote 9)	N/A	
Subframe Config	uration		Non-MBSFN		Non-MBSFN	Non-N	/IBSFN	Non-MBSFN	
Cell Id			0		Cell 2: 6 Cell 3: 1	0		Cell 2: 6 Cell 3: 1	
Time Offset between	en Cells	μs	Cell 2: 3 usec Cell 3: -1usec		Cell 2: 3 usec Cell 3: -1usec				
Frequency shift betw	een Cells	Hz	Cell 2: 300Hz Cell 3: -100Hz		Cell 2: 300Hz Cell 3: -100Hz		300Hz		
ABS pattern (No	ote 2)		N,	/A	0100010001 0100010001	N	/A	0100010001 0100010001	
RLM/RRM Measu Subframe Pattern			00000		N/A		00001 00001	N/A	
CSI Subframe Sets	C _{CSI,0}		01000 01000		N/A)10001)10001	N.A	
(Note 3)	C _{CSI,1}		10001 10001		N/A		01000 01000	N/A	
Number of control symbols	OFDM			3	3	3			
Max number of h transmission				,	1			1	
Physical channel for reporting				PUCCH	Format 2		PUCCH	Format 2	
Physical channel for C _{CSI,1} CQI reporting			ı	PUSCH ((Note 12)		PUSCH	(Note 12)	
PUCCH Report Type					1			4	
Reporting periodicity		ms		N _{pd}	= 5		N _{pd}	= 5	
cqi-pmi-Configurati C _{CSI,0} (Note 1			3	3	N/A	;	3	N/A	
cqi-pmi-Configuration	onIndex2		4	ļ	N/A	4	4	N/A	
ACK/NACK feedba				Multip	lexing		Multip	lexing	

- Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 2: ABS pattern as defined in [9].
- Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell1, Cell2, and Cell3 is the same.
- Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
- Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 10: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.2.5
- Note 11: Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 12: To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
- Note 13: cgi-pmi-ConfigurationIndex is applied for C_{CSI.0}.
- Note 14: cqi-pmi-ConfigurationIndex2 is applied for C_{CSI,1}.

9.2.1.7 FDD (Modulation and TBS index Table 2 and 4-bit CQI Table 2 are used)

The following requirements apply to UE Category 11-12 and DL Category \geq 11. For the parameters specified in Table 9.2.1.7-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1A FDD in Table A.4-1 shall be in the range of \pm 1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

In this test, 4-bit CQI Table 2 in Table 7.2.3-2 in TS 36.213 [6], and Modulation and TBS index table 2 in Table 7.1.7.1-1A for PDSCH in TS 36.213 [6] are applied.

Table 9.2.1.7-1: PUCCH 1-0 static test (FDD)

Parameter		Unit	Test 1		Te	Test 2	
Bandwidth	Bandwidth		10				
PDSCH transmission	PDSCH transmission mode		1				
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB			0		
	σ	dB			0		
Propagation condition and antenna configuration			AWGN (1 x 2)				
SNR (Note 2)		dB	-1	0	20	21	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-99	-98	-78	-77	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-(-98	
Max number of HARQ transmissions			1				
Physical channel for CQI reporting			PUCCH Format 2				
PUCCH Report Type			4				
Reporting periodicity		ms	$N_{\rm pd} = 5$				
cqi-pmi-Configurati	onIndex		6				

Note 1: Reference measurement channel RC.1A FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

9.2.1.8 TDD (Modulation and TBS index Table 2 and 4-bit CQI Table 2 are used)

The following requirements apply to UE Category 11-12 and UE DL Category \geq 11. For the parameters specified in Table 9.2.1.8-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.1A TDD in Table A.4-1 shall be in the range of \pm 1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI - 1) shall be less than or equal to 0.1.

In this test, 4-bit CQI Table 2 in Table 7.2.3-2 in TS 36.213 [6], and Modulation and TBS index table 2 in Table 7.1.7.1-1A for PDSCH in TS 36.213 [6] are applied.

Parameter		Unit	Tes	st 1	Te	st 2	
Bandwidth		MHz	20				
PDSCH transmission	PDSCH transmission mode		1				
Uplink downlink conf	iguration				2		
	Special subframe configuration		4				
Dannelinkananna	$ ho_{\scriptscriptstyle A}$	dB			0		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0				
	σ	dB			0		
	Propagation condition and antenna configuration		AWGN (1 x 2)				
SNR (Note 2		dB	-1	0	20	21	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-99	-98	-78	-77	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98		98		
Max number of H transmission			1				
Physical channel for CQI reporting			PUSCH (Note 3)				
PUCCH Report Type			4				
Reporting periodicity		ms	·	N _p	_d = 5		
cqi-pmi-ConfigurationIndex					3		
ACK/NACK feedbac	ck mode			Multi	plexing		
Note 1: Reference	measurem	ent channel RC.1A	TDD accordii	ng to Table A.	4-1 with one s	sided	

Table 9.2.1.8-1: PUCCH 1-0 static test (TDD)

- Note 1: Reference measurement channel RC.1A TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

9.2.2 Minimum requirement PUCCH 1-1 (Cell-Specific Reference Symbols)

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

9.2.2.1 FDD

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.2.1-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial

differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband CQI_1 = wideband CQI_0 – Codeword 1 offset level

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 , median CQI_1+1 } for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0-1 and median CQI_1-1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0+1 and median CQI_1+1 shall be greater than or equal to 0.1.

Parameter		Unit	Test 1 Test 2			
Bandwidth		MHz		,	10	
PDSCH transmission	on mode		4			
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	-3			
allocation	$ ho_{\scriptscriptstyle B}$	dB	-3			
	σ	dB			0	
Propagation condit antenna configur	ration			Clause I	B.1 (2 x 2)	
CodeBookSubsetRe bitmap	estriction		010000			
SNR (Note 2	2)	dB	10	11	16	17
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-87	-82	-81
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98			98
Max number of F transmission			1			
Physical channel for reporting	CQI/PMI		PUCCH Format 2			
PUCCH Report Ty CQI/PMI		2				
PUCCH Report Type for RI			3			
Reporting periodicity		ms		N _p	_d = 5	
cqi-pmi-ConfigurationIndex					6	
ri-ConfigInde	X			1 (N	lote 3)	

Table 9.2.2.1-1: PUCCH 1-1 static test (FDD)

- Note 1: Reference measurement channel RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
- Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 3: It is intended to have UL collisions between RI reports and HARQ-ACK, since the RI reports shall not be used by the eNB in this test.

9.2.2.2 TDD

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.2.2-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband CQI_1 = wideband CQI_0 - Codeword 1 offset level

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 , median CQI_1+1 } for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0-1 and median CQI_1-1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0+1 and median CQI_1+1 shall be greater than or equal to 0.1.

ri-ConfigIndex

ACK/NACK feedback mode

Parameter Unit Test 1 Test 2 Bandwidth MHz 10 PDSCH transmission mode 4 Uplink downlink configuration Special subframe 4 configuration -3 dB $\rho_{\scriptscriptstyle A}$ Downlink power $\rho_{\scriptscriptstyle B}$ dΒ -3 allocation dB 0 σ Propagation condition and Clause B.1 (2 x 2) antenna configuration CodeBookSubsetRestriction 010000 bitmap SNR (Note 2) dB 10 11 16 17 dB[mW/15kHz] -88 -87 -82 -81 dB[mW/15kHz] -98 -98 Max number of HARQ transmissions Physical channel for CQI/PMI PUSCH (Note 3) reporting PUCCH Report Type 2 Reporting periodicity ms $N_{pd} = 5$ cqi-pmi-ConfigurationIndex 3

Table 9.2.2.2-1: PUCCH 1-1 static test (TDD)

Note 1: Reference measurement channel RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

805 (Note 4)

Multiplexing

- Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.
- Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

9.2.3 Minimum requirement PUCCH 1-1 (CSI Reference Symbols)

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

9.2.3.1 FDD

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.3.1-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband CQI_1 = wideband CQI_0 – Codeword 1 offset level

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 , median CQI_1+1 } for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0-1 and median CQI_1-1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER

using the transport format indicated by the respective median $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

Table 9.2.3.1-1: PUCCH 1-1 static test (FI	OD)
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Parameter		Unit	Unit Test 1 Test 2			t 2	
Bandwidth		MHz	10				
PDSCH transmission	on mode		9				
	$ ho_{\scriptscriptstyle A}$				0		
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0		
allocation	P_c	dB			-3		
	σ	dB			-3		
Cell-specific reference	e signals			Antenna	a ports 0, 1		
CSI reference si	gnals			Antenna p	orts 15,,18		
CSI-RS periodicity and	d subframe						
offset				:	5/1		
$T_{ extsf{CSI-RS}}$ / $\Delta_{ extsf{CSI-I}}$							
CSI reference signal co			0				
Propagation condition and antenna configuration			Clause B.1 (4 x 2)				
Beamforming M			As specified in Section B.4.3				
CodeBookSubsetRestri				0x0000 0000 0100 0000			
SNR (Note 2		dB	7	8	13	14	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-91	-90	-85	-84	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-6	98	-98	8	
Max number of HARQ tr	ansmissions				1		
Physical channel for	CQI/PMI			DUCC	L (Note 2)		
reporting				PUSCI	H (Note3)		
PUCCH Report Type f	or CQI/PMI		2				
Physical channel for R			PUCCH Format 2				
PUCCH Report Typ			3				
Reporting period	dicity	ms	$N_{\rm pd} = 5$				
CQI delay		ms			8		
cqi-pmi-Configurati	onIndex				2		
ri-ConfigInde	ΣX				1		
Note 1: Reference measurement channel RC 7 FDD according to Table A 4-1 with one sided dynamic OCNG							

Note 1: Reference measurement channel RC.7 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

9.2.3.2 TDD

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.3.2-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband CQI₁ = wideband CQI₀ - Codeword 1 offset level

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 , median CQI_1+1 } for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0-1 and median CQI_1-1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0+1 and median CQI_1+1 shall be greater than or equal to 0.1.

Table 9.2.3.2-1: PUCCH 1-1 submode 1 static test (TDD)

Parameter		Unit	Tes	st 1	Tes	st 2
Bandwidth		MHz		10		
PDSCH transmissi					9	
Uplink downlink con	figuration				2	
Special subframe co	nfiguration			4		
	$ ho_{\scriptscriptstyle A}$	dB			0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0	
allocation	P_c	dB			-6	
	σ	dB			-3	
CRS reference s	ignals			Antenna	ports 0, 1	
CSI reference si	ignals				orts 15,,22	
CSI-RS periodicity an	d subframe					
offset				5	5/ 3	
$T_{ exttt{CSI-RS}}$ / $\Delta_{ exttt{CSI-RS}}$	·RS					
	CSI reference signal configuration		0			
Propagation condition and antenna				Clause	B.1 (8 x 2)	
configuratio						
Beamforming M					n Section B.4.	
CodeBookSubsetRestr			0x0000 0000 0020 0000 0000 0001 0000			
SNR (Note 2	2)	dB	4	5	10	11
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-93	-88	-87
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98		98	
Max number of HARQ t	ransmissions				1	
Physical channel for	CQI/PMI			DUISCL	H (Note 3)	
reporting				FUSCI	i (Note 3)	
PUCCH Report Type for CQI/second PMI				:	2b	
Physical channel for RI reporting				PU	ISCH	
PUCCH Report Type for RI/ first PMI					5	
Reporting periodicity		ms		N _p	_d = 5	
CQI delay		ms		10	or 11	
cqi-pmi-Configurat	ionIndex				3	
ri-ConfigInde				805 (Note 4)	
ACK/NACK feedba	ck mode			Multi	plexing	

- Note 1: Reference measurement channel RC.7 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.
- Note 4: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

9.2.4 Minimum requirement PUCCH 1-1 (With Single CSI Process)

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

9.2.4.1 FDD

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.4.1-1, and using the downlink physical channels specified in Tables C.3.4-1 and C.3.4-2, the reported offset level of the wideband spatial

differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband CQI_1 = wideband CQI_0 - Codeword 1 offset level

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 , median CQI_1+1 } for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0-1 and median CQI_1-1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0+1 and median CQI_1+1 shall be greater than or equal to 0.1.

Table 9.2.4.1-1: PUCCH 1-1 static test (FDD)

Description Test 1			Test 2					
Paramet	er	Unit	TP1 TP2		TP1 TP2		2	
Bandwidth		MHz	10					
PDSCH transmission	n mode				1	0		
	$ ho_{\scriptscriptstyle A}$	dB	0	0		0	0 0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0	0		0)
allocation (Note 1)	P _c	dB	-3	-3		-3		3
	σ	dB	-3	N/	A	-3	N,	/A
Cell ID			C))	
Cell-specific referer	nce signals		Antenna ports 0, 1	(Note	e 2)	Antenna ports 0, 1	(Not	te 2)
CSI reference signa	als		Antenna ports 15,,18	N/	A	Antenna ports 15,,18	N,	/A
CSI-RS periodicity a subframe offset $T_{\rm C}$			5/1	N/	A	5/1	N,	/A
CSI-RS configuration			0	N/	A	0	N,	/A
Zero-Power CSI-RS configuration I _{CSI-RS} / ZeroPower bitmap			1 / 001000000000 0000	1 100000 000	00000	1 / 001000000000 0000	100000	/ 000000 000
CSI-IM configuratio I _{CSI-RS} / ZeroPower0 bitmap	CSI-IM configuration I _{CSI-RS} / ZeroPowerCSI-RS		1 / 001000000000 0000	N/A		1 / 001000000000 0000	N/A	
	CSI process configuration Signal/Interference/Reporting		CSI-RS/CSI-IM/PUCCH 1-1		CSI-RS/CSI-II	CSI-RS/CSI-IM/PUCCH 1-1		
	Propagation condition and		Clause B.1 (4 x 2)	Clause (2 x		Clause B.1 (4 x 2)	Claus (2)	
CodeBookSubsetRobitmap			0x0000 0000 0100 0000	1000	000	0x0000 0000 0100 0000	100	000
SNR (Note 3)		dB	20	6	7	20	14	15
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-78	-92	-91	-78	-84	-83
$N_{oc}^{(j)}$		dB[mW/15kHz]	-9	8		-9)8	
Modulation / Inform payload	ation bit		(Note4)	QPSK /	4392	(Note4)	QPSK	/ 4392
Max number of HAI transmissions	RQ		1	N/A		1	N,	/A
Physical channel fo reporting			PUSCH (Note5)	N/A		PUSCH (Note5)	N,	/A
PUCCH Report Typ	e for		2	N/A		2	N,	/A
PUCCH Report Typ	e for RI		3	N/A		3	N,	/A
Reporting periodicit	Reporting periodicity		$N_{pd} = 5$	N/		$N_{pd} = 5$		/A
CQI Delay	•	ms	8	N/	A	8		/A
cqi-pmi-Configuration	onIndex		2	N/.	A	2	N.	/A
ri-ConfigIndex			1	N/	A	1	N,	/A
PDSCH scheduled	sub-frames		1,2,3,4,			1,2,3,4		
Timing offset betwe		us	, , <u>, , , , , , , , , , , , , , , , , </u>)	
Frequency offset be		Hz	C)		()	
Notal: Deference		nt shannal BC 10	CDD according to	Table A 4	1 with	one sided dynamic	OCNO I	Jottorn

Note1: Reference measurement channel RC.10 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 2: REs for antenna ports 0 and 1 CRS have zero transmission power.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: N/A.

Note 5: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

9.2.4.2 TDD

The following requirements apply to UE Category ≥2. For the parameters specified in table 9.2.4.2-1, and using the downlink physical channels specified in Tables C.3.4-1 and C.3.4-2, the reported offset level of the wideband spatial differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband CQI_1 = wideband CQI_0 – Codeword 1 offset level

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 , median CQI_1+1 } for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0-1 and median CQI_1-1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0+1 and median CQI_1+1 shall be greater than or equal to 0.1.

Table 9.2.4.2-1: PUCCH 1-1 static test (TDD)

Parameter		Unit	Tes	st 1		Tes	st 2	
			TP1	TP		TP1	TI	2
Bandwidth		MHz				10		
PDSCH transmissio						10		
Uplink downlink cor Special subframe co						<u>2</u> 4		
Special Subfraffie G		dB	0	0		0)
Downlink nower	$\rho_{\scriptscriptstyle A}$			_				
Downlink power allocation (Note 1)	$\rho_{\scriptscriptstyle B}$	dB	0	0		0)
anocation (Note 1)	Pc	dB	-6	-6		-6		6
	σ	dB	-3	N/	Α	-3		/A
Cell ID			C)		()	
Cell-specific referer	nce signals		Antenna ports 0, 1	(Not	e 2)	Antenna ports 0, 1	(No	te 2)
CSI reference signa	als		Antenna ports 15,,22	N/	Α	Antenna ports 15,,22	N.	/A
CSI-RS periodicity a subframe offset T_{CS}			5/3	N/	Α	5/3	N.	/A
CSI-RS configuration			0	N/	A	0	N.	/A
Zero-Power CSI-RS configuration I _{CSI-RS} / ZeroPower(bitmap			3 / 001000000000 0000	3 100001 000	00000	3 / 001000000000 0000	10000	/ 100000 000
CSI-IM configuratio I _{CSI-RS} / ZeroPowerC bitmap	CSI-RS		3 / 001000000000 0000	N/A		3 / 001000000000 0000	0000000 N/A	
CSI process configu Signal/Interference/ mode			CSI-RS/CSI-IN	M/PUCCH	1 1-1	CSI-RS/CSI-II	M/PUCCI	- 1 1-1
Propagation condition antenna configuration			Clause B.1 (8 x 2)	Claus (2 x		Clause B.1 (8 x 2)	Claus (2:	
CodeBookSubsetRobitmap	estriction		0x0000 0000 0020 0000 0000 0001 0000	1000	000	0x0000 0000 0020 0000 0000 0001 0000		000
SNR (Note 3)		dB	17	6	7	17	14	15
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-81	-92	-91	-81	-84	-83
$N_{oc}^{(j)}$		dB[mW/15kHz]	-9	8		-6	8	
Modulation / Information / Information			(Note4)	QPSK.	/ 4392	(Note4)	QPSK	/ 4392
Max number of HAF transmissions	₹Q		1	N/	Α	1	N.	/A
Physical channel fo reporting	r CQI/PMI		PUSCH (Note5)	N/	A	PUSCH (Note5)	N.	/A
PUCCH Report Type for CQI/second PMI			2b	N/	A	2b	N.	/A
Physical channel for RI reporting			PUSCH	N/	Α	PUSCH	N.	/A
PUCCH Report Typ PMI			5	N/		5		/A
Reporting periodicit	У	ms	$N_{\rm pd} = 5$	N/		$N_{\rm pd} = 5$		/A
CQI Delay	anladay	ms	10 or 11 3	N/		10 or 11 3		/A /^
cqi-pmi-Configuration ri-ConfigIndex	oninaex		805 (Note 6)	N/		805 (Note 6)		<u>/A</u> /A
ACK/NACK feedba	ck mode		Multiplexing	N/		Multiplexing		/A /A
PDSCH scheduled			3,4,		, \	3,4		,,,
Timing offset betwe		us	3,4,			3,4,		
Frequency offset be		Hz	C			(

- Note1: Reference measurement channel RC.10 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 2: REs for antenna ports 0 and 1 CRS have zero transmission power.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 4: N/A.
- Note 5: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.
- Note 6: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

9.2.5 Minimum requirement PUCCH 1-1 (when *csi-SubframeSet –r12* and *EIMTA-MainConfigServCell-r12* are configured)

The following requirements apply to UE Category ≥ 2 which supports eIMTA TDD UL-DL reconfiguration for TDD serving cell(s) via monitoring PDCCH with eIMTA-RNTI and Rel-12 CSI subframe sets. For the parameters specified in table 9.2.5-1, and using the downlink physical channels specified in Tables C.3.2-1 and C.3.2-2, for each CSI subframe set, the reported CQI value shall be in the range of ± 1 of the reported median more than 90% of the time. For each CSI subframe set, if the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI - 1) shall be less than or equal to 0.1. The difference of the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ and the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ shall be larger than or equal to 3.

Table 9.2.5 -1: PUCCH 1-1 static test (TDD)

Parameter		Unit	T	est
Bandwidth		MHz		10
PDSCH transmission m				9
Uplink downlink configu				0
Downlink HARQ referen	nce			
configuration (eimta-	40) (1) (1)			2
HarqReferenceConfig-r	12) (Note 4)			
Set of dynamic TDD UL			{0), 2}
configurations (Notes 4, Periodicity of monitoring			<u> </u>	· •
reconfiguration DCI (ein		ms		10
CommandPeriodicity-r1		1113		10
Set of subframes to mor				
reconfiguration DCI (ein			SI	F#5
CommandSubframeSet				
CSI-MeasSubframeSet-			0001	100011
Special subframe config	guration			4
	$ ho_{\scriptscriptstyle A}$	dB		0
Downlink power	$\rho_{\scriptscriptstyle B}$	dB		0
allocation	_	_		
anocation	P_{c}	dB		-3
	σ	dB		-3
CRS reference signals				ports 0, 1
CSI reference signals			Antenna	ports 15,16
CSI-RS periodicity and	subframe		_	- / 4
offset			5	5/4
	$T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$ CSI reference signal configuration			1
Zero-Power CSI-RS cor				<u>4</u> O /
I _{CSI-RS} / ZeroPowerCSI-I				00000000
Zero-Power CSI-RS cor				4 /
	I _{CSI-RS} / ZeroPowerCSI-RS bitmap			00000000
Propagation condition a				
configuration			Clause I	3.1 (2 x 2)
Beamforming Model			As specified i	n Section B.4.3
CodeBookSubsetRestri				0001'
SNR in CSI subframe se		dB	0	1
SNR in CSI subframe se	et 1	dB	10	11
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-97
$N_{oc1}^{(j)}$ for CSI subframe se	et 0	dB[mW/15kHz]	-98	-98
$N_{oc2}^{(j)}$ for CSI subframe se	et 1	dB[mW/15kHz]	-108	-108
PDSCH scheduled subf			(),5
CSI subframe set 0				-,-
PDSCH scheduled subf	rames for		3.4	1,8,9
CSI subframe set 1	ua na na ! !			
Max number of HARQ transmissions				1
Physical channel for CQI/PMI			PUSCH	I (Note 6)
reporting PLICCH Report Type to	PUCCH Report Type for CQI/second			
PMI				2b
Physical channel for RI reporting			PU	SCH
PUCCH Report Type for RI/ first PMI				5
Reporting periodicity		ms		el-12 CSI subframe set
CQI delay		ms	12 for CSI s	ubframe set 0 ubframe set 1
cqi-pmi-ConfigurationIn	dex		8 for	r set 0 or set 1
ri-ConfigIndex				and set 1 (Note 7)
ACK/NACK feedback m	ode			plexing
ACK/NACK reedback mode			ividiti	,9

- Note 1: Reference measurement channel RC.19 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for CSI subframe set 0.
- Note 2: Reference measurement channel RC.20 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 for CSI subframe set 1.
- Note 3: In the test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each CSI subframe set separately.
- Note 4: As specified in Table 4.2-2 in TS 36.211.
- Note 5: UL/DL configuration in PDCCH with eIMTA-RNTI is cyclically selected from the given set on a per-DCI basis.
- Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2. CQI/PMI reports for CSI subframe set 0 is transmitted in SF#2 and CQI/PMI reports for CSI subframe set 1 is transmitted in SF#7.
- Note 7: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.

9.3 CQI reporting under fading conditions

9.3.1 Frequency-selective scheduling mode

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective fading conditions is determined by a double-sided percentile of the reported differential CQI offset level 0 per sub-band, and the relative increase of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is transmitted on any sub-band in set *S* of TS 36.213 [6]. The purpose is to verify that preferred sub-bands can be used for frequently-selective scheduling. To account for sensitivity of the input SNR the sub-band CQI reporting under frequency selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.3.1.1 Minimum requirement PUSCH 3-0 (Cell-Specific Reference Symbols)

9.3.1.1.1 FDD

For the parameters specified in Table 9.3.1.1.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.1.1-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD.

Table 9.3.1.1.1-1 Sub-band test for single antenna transmission (FDD)

Parameter		Unit	Test 1 Test 2			st 2	
Bandwidth		MHz	10 MHz				
Transmiss	Transmission mode			1 (p	ort 0)		
Downlink	$ ho_{\scriptscriptstyle A}$	dB			0		
power	$ ho_{\scriptscriptstyle B}$	dB		-	0		
allocation	σ	dB			0		
SNR (Note 3)	dB	9	10	14	15	
	(j) or	dB[mW/15kHz]	-89 -88		-84	-83	
N	(j) oc	dB[mW/15kHz]	-98 -98		98		
_			Clause B.2.4 with $\tau_d = 0.45 \mu$).45 <i>μ</i> s,	
Propagation	on channel		$a = 1, f_D = 5 \text{ Hz}$				
Antenna co	onfiguration			1 x 2			
Reportin	Reporting interval			5			
CQI delay		ms		8			
Reporting mode				PUSCH 3-0			
Sub-band size		RB		6 (ful	l size)		
	er of HARQ issions				1		

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Table 9.3.1.1.1-2 Minimum requirement (FDD)

	Test 1	Test 2
α[%]	2	2
β[%]	55	55
γ	1.1	1.1
UE Category	≥1	≥1

9.3.1.1.2 TDD

For the parameters specified in Table 9.3.1.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.1.2-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD.

Table 9.3.1.1.2-1 Sub-band test for single antenna transmission (TDD)

Parameter		Unit	Te	Test 1 Test 2			
Bandwidth		MHz		10	MHz		
Transmiss	sion mode		1 (port 0)				
Downlink	$ ho_{\scriptscriptstyle A}$	dB		(0		
power	$ ho_{\scriptscriptstyle B}$	dB		(0		
allocation	σ	dB		(0		
Uplink d configu	lownlink uration				2		
Special s configu	subframe uration			,	4		
SNR (I	Note 3)	dB	9	10	14	15	
10	$\hat{I}_{or}^{(j)}$		-89	-88	-84	-83	
N_{c}	$N_{oc}^{(j)}$		-98 -98		8		
			Clause B.2.4 with			1	
Propagatio	on channel		$ au_d = 0.45 \mu \text{s}, a = 1,$			1,	
rropagatio	on channel			$f_D = 5 \mathrm{Hz}$			
Antenna co	onfiguration			1:	x 2		
Reporting	g interval	ms		;	5		
CQI	delay	ms			or 11		
Reportir	ng mode			PUSC	CH 3-0		
Sub-band size		RB		6 (ful	l size)		
Max number of HARQ					1		
transm							
	edback mode				olexing		
SF#							

- at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Table 9.3.1.1.2-2 Minimum requirement (TDD)

	Test 1	Test 2
α[%]	2	2
β [%]	55	55
γ	1.1	1.1
UE Category	≥1	≥1

9.3.1.1.3 FDD (CSI measurements in case two CSI subframe sets are configured and with CRS assistance information)

For the parameters specified in Table 9.3.1.1.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.1.3-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band:
- b) the ratio of the throughput in ABS subframes obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER in ABS subframes for the indicated transport formats shall be greater than or equal to ε .

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD.

Table 9.3.1.1.3-1 Sub-band test for single antenna transmission (FDD)

Parameter	,	Unit	Test 1			st 2		
			Се		Cell 2 and 3	Cell 1	Cell 2 and 3	
Bandwidth		MHz		10			0	
PDSCH transmission			1		Note 10	1	Note 10	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0		0		
allocation	$ ho_{\scriptscriptstyle B}$	dB		0			0	
	σ	dB		0	I		0	
Propagation con			with Td us, a =		EVA5 Low antenna correlation	Clause B.2.4 with Td = 0.45 us, a = 1, fd = 5 Hz	EVA5 Low antenna correlation	
Antenna configu	ration			1x			x2	
\widehat{E}_s/N_{oc2} (Not	te 1)	dB	4	5	Cell 2: 12 Cell 3: 10	14 15	Cell 2: 12 Cell 3: 10	
(i)	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (N	lote 7)	N/A	-98 (Note 7)	N/A	
$N_{oc}^{(j)}$ at antenna port	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (N	lote 8)	N/A	-98 (Note 8)	N/A	
·	$N_{oc3}^{(j)}$	dBm/15kHz	,	lote 9)	N/A	-93 (Note 9)	N/A	
Subframe Configu	uration		Non-M	IBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN	
Cell Id			()	Cell 2: 6	0	Cell 2: 6	
				Cell 2:	Cell 3: 1	Cell 3: 1		
Time Offset between	en Cells	μs		Cell 3:			ll 3: -1usec	
Frequency Shift betw	een Cells	Hz		Cell 2: 3 Cell 3: -	300Hz	Cell 2:	300Hz -100Hz	
ABS pattern (No	ote 2)		N,		01010101 01010101 01010101 01010101 01010101	N/A	01010101 01010101 01010101 01010101 01010101	
RLM/RRM Measu Subframe Pattern			0000 0000 0000 0000 0000	0100 0100 0100	N/A	00000100 00000100 00000100 00000100 00000100	N/A	
CSI Subframe Sets	C _{CSI,0}		0101 0101 0101 0101 0101	0101 0101 0101 0101	N/A	01010101 01010101 01010101 01010101 01010101	N/A	
(Note 3)	C _{CSI,1}		1010 1010 1010 1010	1010 1010 1010	N/A	10101010 10101010 10101010 10101010 10101010	N/A	
Number of control symbols	Number of control OFDM			3			3	
Max number of H				1			1	
CQI delay		ms			8	3		
Reporting interval (Note 13)	ms				0		
Reporting mo					PUSC			
Sub-band siz	ze	RB			6 (full	size)		

- Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 2: ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell1, Cell2, and Cell3 are the same.
- Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 10: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.1.5
- Note 11: Reference measurement channel in Cell 1 RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
- Note 12: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
- Note 13: The CSI reporting is such that reference subframes belong to Ccsi.0.

Table 9.3.1.1.3-2 Minimum requirement (FDD)

	Test 1	Test 2
α[%]	2	2
β[%]	55	55
γ	1.1	1.1
3	0.01	0.01
UE Category	≥1	≥1

9.3.1.1.4 TDD (CSI measurements in case two CSI subframe sets are configured and with CRS assistance information)

For the parameters specified in Table 9.3.1.1.4-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.1.4-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput in ABS subframes obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $> \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER in ABS subframes for the indicated transport formats shall be greater than or equal to ε .

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD.

Table 9.3.1.1.4-1: Sub-band test for single antenna transmission (TDD)

Parameter		Unit		Test 1		Test 2		
Parameter		Offic	Cel	ll 1	Cell 2 and 3	Ce	II 1	Cell 2 and 3
Bandwidth		MHz		1	0			0
PDSCH transmission			1		Note 10	,	1	Note 10
Uplink downlink con				1	1			1
Special subfra configuration				4	4			4
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		()		(0
allocation	$ ho_{\scriptscriptstyle B}$	dB))
	σ	dB))
Propagation con	dition		Clause with Td us, a =	= 0.45 1, fd =	EVA5 Low antenna correlation	with Td us, a =	e B.2.4 = 0.45 1, fd = Hz	EVA5 Low antenna correlation
Antenna configu	ration			1)	(2		1:	x2
\widehat{E}_s/N_{oc2} (Not	te 1)	dB	4	5	Cell 2: 12 Cell 3: 10	14	15	Cell 2: 12 Cell 3: 10
(1)	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (N	ote 7)	N/A	-98 (N	lote 7)	N/A
$N_{oc}^{(j)}$ at antenna	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (N	-98 (Note 8) N/A		-98 (N	lote 8)	N/A
port	$N_{oc3}^{(j)}$	dBm/15kHz	-93 (N	ote 9)	N/A	-93 (N	lote 9)	N/A
Subframe Configu	uration		Non-M	BSFN	Non-MBSFN	Non-M	IBSFN	Non-MBSFN
Cell Id			C)	Cell 2: 6 Cell 3: 1	()	Cell 2: 6 Cell 3: 1
Time Offset between	en Cells	μs		Cell 2: Cell 3:				3 usec -1usec
Frequency shift betw	een Cells	Hz		Cell 2:			Cell 2:	300Hz -100Hz
ABS pattern (No	•		N/	'A	0100010001 0100010001	N.	/A	0100010001 0100010001
RLM/RRM Measu Subframe Pattern			00000		N/A	00000		N/A
CSI Subframe Sets	C _{CSI,0}		01000 01000		N/A	01000 01000		N.A
(Note 3)	C _{CSI,1}		10001 10001	01000	N/A	10001	01000 01000	N/A
Number of control symbols	OFDM		3 3		3			
Max number of F transmission			1 1		1			
CQI delay		ms				4		
Reporting interval (ms				0		
Reporting mo						CH 3-0		
Sub-band siz		RB			6 (full	size)		
ACK/NACK feedba	ck mode			Multip	lexing		Multip	lexing

- Note 1: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 2: ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 3: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 4: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 6: Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell1, Cell2, and Cell3 is the same.
- Note 7: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 8: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
- Note 9: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
- Note 10: Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.2.5
- Note 11: Reference measurement channel in Cell 1 RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
- Note 12: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
- Note 13: The CSI reporting is such that reference subframes belong to Ccsi,0.

	Test 1	Test 2
α[%]	2	2
β[%]	55	55
γ	1.1	1.1
3	0.01	0.01
UE Category	≥1	≥1

Table 9.3.1.1.4-2 Minimum requirement (TDD)

9.3.1.1.5 TDD (when *csi-SubframeSet –r12* is configured)

The following requirements apply to UE Category ≥1 which supports Rel-12 CSI subframe sets. For the parameters specified in Table 9.3.1.1.5-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.1.5-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band for each CSI subframe set;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be ≥ γ for each CSI subframe set;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05 and less than 0.60 for each CSI subframe set.
- d) the difference of the wide-band median CQI obtained by reports in CSI subframe sets $C_{\text{CSI},0}$ and the wide-band median CQI obtained by reports in CSI subframe sets $C_{\text{CSI},1}$ shall be larger than or equal to 3.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.1.1.5-1: Sub-band test for TDD

	Parar	neter	Unit	Test	
Bandwidth			MHz		0
Transmissio					2
Uplink down					2
Special subf					00000
CSI-Meass	ibirames		4D		
Downlink po	wer	$ ho_{\scriptscriptstyle A}$	dB	-	3
allocation		$ ho_{\scriptscriptstyle B}$	dB	-	3
		σ	dB	(0
SNR in CSI			dB	0	1
SNR in CSI	subtram	e set 1	dB	10	11
$\hat{I}_{or}^{(j)}$			dB[mW/15kHz]	-98	-97
$N_{oc1}^{(j)}$ for CS			dB[mW/15kHz]	-98	-98
$N_{oc2}^{(j)}$ for CS	l subfram	e set 1	dB[mW/15kHz]	-108	-108
Propagation	channel				th $\tau_d = 0.45 \mu\text{s}$, $\tau_D = 5 \text{Hz}$
Antenna cor					
CRS referen					ort 0 and 1
		configuration 0 S <i>I-RS</i> bitmap		-	3 / 000000000
Zero-Power	CSI-RS	configuration 1		4	! /
PDSCH sch	eduled s	SI-RS bitmap ubframes for CSI			00000000
subframe se				8	,9
	heduled subframes for CSI			3,4	
Reporting in		ote 4)	ms	10 per sul	bframe set
CQI delay			ms	15 for CSI su	ubframe set 0 ubframe set 1
Reporting m	ode				CH 3-0
Sub-band si			RB		l size)
Max number	r of HAR	Q transmissions		,	1
ACK/NACK					lexing
		Sets Configured		2 (No	te 5,6)
		EPDCCH Set			4
EPDCCH St					IA
EPDCCH A					CCE
EPDCCH be			unlink reporting insta		KB.4.4 SE#p based on
C	QI estim r wideba	eports in an available ation at a downlink su nd CQI cannot be app measurement chann	bframe not later than lied at the eNB down	SF#(n-4), this replink before SF#(n-	oorted subband +4)
si	ided dyna	amic OCNG Pattern C , the minimum require	P.1/2 TDD as describ	oed in Annex A.5.	2.1/2.
S	NR(s) ar	nd the respective want	ted signal input level f	or each subframe	set separately
tr S	For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#8 to allow aperiodic CQI/PMI/RI to be transmitted				
O	on uplink SF#2. In case UE supports EPDCCH, the PDSCH scheduling grants are transmitted via				
E	PDCCH,	otherwise PDCCH is	used.		
fc ai P E	or the firs fter sche RBs, res PDCCH	ets are distributed EPI t set and PRB = {40, 4 duling decision for PD pectively. EPDCCH is derived from the PO	43, 46, 49} for the sec SCH to avoid collision s only transmitted fron	ond set. EPDCCH n between PDSCI n one set. The sta	H set is selected H and EPDCCH arting symbol for
C	onfigured	1			

Table 9.3.1.1.5-2: Minimum requirement (TDD)

	Test
α[%]	2
β[%]	55
γ	1.1
UE Category	≥1

9.3.1.2 Minimum requirement PUSCH 3-1 (CSI Reference Symbol)

9.3.1.2.1 FDD

For the parameters specified in Table 9.3.1.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.1-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.1.2.1-1 Sub-band test for FDD

Parameter		Unit	Te	Test 1 Test 2		st 2
Band	width	MHz		10	MHz	
Transmiss	sion mode				9	
	$ ho_{\scriptscriptstyle A}$	dB		0		
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0	
allocation	P_c	dB			0	
	σ	dB			0	
SNR (Note 3)	dB	4	5	11	12
\hat{I}_{c}^{st}	(j) or	dB[mW/15kHz]	-94	-93	-87	86
$N_{oc}^{(j)}$		dB[mW/15kHz]	-!	98	-6	98
Propagation channel			Clause	Clause B.2.4 with $\tau_{\scriptscriptstyle d}=0.45\mu{\rm s},$		
op again	1 Topagation chainer			$a = 1, f_D = 5 \text{ Hz}$		
	onfiguration			2x2		
	ning Model		As s	pecified in		B.4.3
CRS refere	nce signals			Antenna	a ports 0	
	nce signals		P	ntenna p	orts 15, '	16
	and subframe offset			5	/ 1	
	$^{\prime}\Delta_{ extsf{CSI-RS}}$					
	signal configuration				4	
CodeBookSubsetRestriction bitmap				000001		
Reporting interval (Note 4)		ms			5	
CQI delay		ms			8	
Reporting mode					CH 3-1	
	nd size	RB		6 (ful	l size)	
	ARQ transmissions				1	
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on						

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.8 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

Table 9.3.1.2.1-2 Minimum requirement (FDD)

	Test 1	Test 2
α[%]	2	2
β[%]	40	40
γ	1.1	1.1
UE Category	≥1	≥1

9.3.1.2.2 TDD

For the parameters specified in Table 9.3.1.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.2-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.1.2.2-1 Sub-band test for TDD

Parai	meter	Unit	Те	Test 1 Test 2		st 2
Band	lwidth	MHz		10 MHz		
Transmiss	sion mode				9	
Uplink downlin	k configuration				2	
Special subfran	ne configuration				4	
	$ ho_{\scriptscriptstyle A}$	dB			0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0	
allocation	P_c	dB			0	
	σ	dB			0	
SNR (I	Note 3)	dB	4	5	11	12
\hat{I}_c	(j) or	dB[mW/15kHz]	-94	-93	-87	-86
N	(j) oc	dB[mW/15kHz]	-9	98	-9	98
			Clause	B.2.4 wi	th $\tau_d = 0$).45 μs,
Propagation channel				$a = 1, f_D = 5 \text{ Hz}$		
Antenna configuration				2	x2	
Beamforming Model			As sp	pecified in	n Section	B.4.3
CRS refere	nce signals			Antenn	a port 0	
CSI refere	nce signals			Antenna	port 15,1	6
CSI-RS periodicity	and subframe offset			5	/ 3	
$T_{\text{CSI-RS}}$	$/\Delta_{ extsf{CSI-RS}}$			3/	/ 3	
	signal configuration				4	
CodeBookSubset	Restriction bitmap			000	0001	
Reporting into	erval (Note 4)	ms	5			
	delay	ms			10	
Reportir	ng mode			PUSC	CH 3-1	
Sub-ba	ınd size	RB		6 (full size)		
Max number of HA	ARQ transmissions				1	
	edback mode				olexing	
	reports in an available					
	bframe not later than				bband	
	nd CQI cannot be app					
	el RC.8 TDD accordir				′two	
sided dynamic OCNG Pattern OP.1/2 TDD as						
				two		
	SNR(s) and the respective wanted signal input level. PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink					
SF#3 and	#8 to allow aperiodic	CQI/PMI/RI to be tran	nsmitted	on uplink	SF#2 an	nd #7.

Table 9.3.1.2.2-2 Minimum requirement (TDD)

	Test 1	Test 2
α[%]	2	2
β[%]	40	40
γ	1.1	1.1
UE Category	≥1	≥1

9.3.1.2.3 FDD (Modulation and TBS index Table 2 and 4-bit CQI Table 2 are used)

For the parameters specified in Table 9.3.1.2.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.3-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

In this test, 4-bit CQI Table 2 in Table 7.2.3-2 in TS 36.213 [6], and Modulation and TBS index table 2 in Table 7.1.7.1-1A for PDSCH in TS 36.213 [6] are applied.

Unit Test 1 **Parameter** Bandwidth 10 MHz MHz Transmission mode 9 0 dB $\rho_{\scriptscriptstyle A}$ dΒ 0 Downlink power $\rho_{\scriptscriptstyle B}$ allocation P_c 0 dB dB 0 σ SNR (Note 3) dB 16 17 $\hat{I}_{or}^{(j)}$ dB[mW/15kHz] -82 -81 $N_{oc}^{(j)}$ dB[mW/15kHz] -98 -98 Clause B.2.4 with $\tau_{_d}=0.45\,\mu\mathrm{s}$, Propagation channel a = 1, $f_D = 5 \text{ Hz}$ Antenna configuration 2x2 Beamforming Model As specified in Section B.4.3 CRS reference signals Antenna ports 0 CSI reference signals Antenna ports 15, 16 CSI-RS periodicity and subframe offset 5/1 T_{CSI-RS} / Δ_{CSI-RS} CSI-RS reference signal configuration

Table 9.3.1.2.3-1 Sub-band test for FDD

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

ms

ms

RB

000001

5

8

PUSCH 3-1

6 (full size)

CodeBookSubsetRestriction bitmap

Reporting interval (Note 4)

CQI delay

Reporting mode

Sub-band size

Max number of HARQ transmissions

- Note 2: Reference measurement channel RC.8A FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

Table 9.3.1.2.3-2 Minimum requirement (FDD)

	Test 1
α[%]	2
β[%]	40
γ	1.1
UE Category	11-12
UE DL Category	≥11

9.3.1.2.4 TDD (Modulation and TBS index Table 2 and 4-bit CQI Table 2 are used)

For the parameters specified in Table 9.3.1.2.4-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.4-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$,
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

In this test, 4-bit CQI Table 2 in Table 7.2.3-2 in TS 36.213 [6], and Modulation and TBS index table 2 in Table 7.1.7.1-1A for PDSCH in TS 36.213 [6] are applied.

Table 9.3.1.2.4-1 Sub-band test for TDD

Parameter		Unit	Test 1
Band	Bandwidth		20 MHz
Transmiss	sion mode		9
Uplink downlin	k configuration		2
Special subfran	Special subframe configuration		4
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	P_{c}	dB	0
	σ	dB	0

SNR (Note 3)	dB	16	17
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-82	-81
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	-98
Decreasion showed		Clause B.2.4 wi	th $\tau_d = 0.45 \mu\text{s}$,
Propagation channel		a=1, f	$_{D} = 5 \mathrm{Hz}$
Antenna configuration			x2
Beamforming Model		As specified in Section B.4.3	
CRS reference signals		Antenna port 0	
CSI reference signals		Antenna port 15,16	
CSI-RS periodicity and subframe offset $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$		5/ 3	
CSI-RS reference signal configuration			4
CodeBookSubsetRestriction bitmap		000	0001
Reporting interval (Note 4)	ms	5	
CQI delay	ms	10	
Reporting mode		PUSCH 3-1	
Sub-band size	RB	8 (full size)	
Max number of HARQ transmissions		1	
ACK/NACK feedback mode		Multiplexing	

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.8A TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2 and #7.

Table 9.3.1.2.4-2 Minimum requirement (TDD)

	Test 1
<i>α</i> [%]	2
β [%]	40
γ	1.1
UE Category	11-12
UE DL Category	≥11

9.3.1.2.5 Void

Table 9.3.1.2.5-1: Void

Table 9.3.1.2.5-2: Void

9.3.1.2.6 TDD (when *csi-SubframeSet –r12* is configured with one CSI process)

The following requirements apply to UE Category ≥1 which supports Rel-12 CSI subframe sets and TM10. For the parameters specified in Table 9.3.1.2.6-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.6-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band for each CSI subframe set;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the

TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$ for each CSI subframe set;

- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.01 for each CSI subframe set.
- d) The difference of the wide-band median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ and the wide-band median CQI obtained by reports in CSI subframe sets $C_{CSI,1}$ shall be larger than or equal to 3.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.1.2.6-1: Sub-band test for TDD

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Para	ameter	Unit	Ta	est	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$						
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	CSI-MeasSu	ıbframeSet-r12				
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $		$ ho_{\scriptscriptstyle A}$	dB	(0	
$ \begin{array}{ c c c c c } \hline & \sigma & dB & -3 \\ \hline & SNR in CSI subframe set 0 & dB & 0 & 1 \\ \hline SNR in CSI subframe set 1 & dB & 10 & 11 \\ \hline & \hat{I}_{or}^{(J)} & dB[mW/15kHz] & -98 & -97 \\ \hline & N_{ocl}^{(J)} \text{ for CSI subframe set 0} & dB[mW/15kHz] & -98 & -98 \\ \hline & N_{ocl}^{(J)} \text{ for CSI subframe set 0} & dB[mW/15kHz] & -98 & -98 \\ \hline & N_{ocl}^{(J)} \text{ for CSI subframe set 1} & dB[mW/15kHz] & -108 & -108 \\ \hline & N_{ocl}^{(J)} \text{ for CSI subframe set 1} & dB[mW/15kHz] & -108 & -108 \\ \hline & Propagation channel & Clause B.2.4 with \tau_d = 0.45\mu\text{s}, \\ a = 1, f_D = 5\text{Hz} \\ \hline & Antenna configuration & 2xz \\ \hline & Beamforming Model & As specified in Section B.4.3 \\ \hline & CSI reference signals & Antenna port 0 and 1 \\ \hline & CSI reference signals & Antenna port 0 and 1 \\ \hline & CSI reference signals & Antenna port 15,16 \\ \hline & CSI-RS periodicity and subframe offset & 5/0 \\ \hline & CSI-RS reference signal configuration & 0 \\ \hline & 2ex-Power CSI-RS-RS interpolate & 5/0 \\ \hline & 2ex-Power CSI-RS-RS configuration 0 & 3/ \\ \hline & 2ex-Power CSI-RS configuration 1 & 4/ \\ \hline & 2ex-Power CSI-RS configuration 1 & 4/ \\ \hline & 2ex-Power CSI-RS configuration 2 & 3/ \\ \hline & CSI-RS configuration 0 & 3/ \\ \hline & CSI-RS configuration 0 & 3/ \\ \hline & CSI-RS configuration 0 & 3/ \\ \hline & CSI-RS configuration 0 & 3/ \\ \hline & CSI-RS configuration 1 & 4/ \\ \hline & 2ex-Power CSI-RS bitmap & 0100000000000000 \\ \hline & CSI-M configuration 1 & 4/ \\ \hline & 2ex-Power CSI-RS bitmap & 00000100000000000 \\ \hline & CSI-RS-CSI-RS bitmap & 00000100000000000 \\ \hline & CSI-RS-CSI-RS bitmap & 000001000000000000 \\ \hline & CSI-RS-CSI-RS bitmap & 000001000000000000 \\ \hline & CSI-RS-CSI-RS bitmap & 01000000000000000 \\ \hline & CSI-RS-CSI-RS bitmap & 01000000000000000 \\ \hline & CSI-RS-CSI-RS bitmap & 010000000000000000 \\ \hline & CSI-RS-CSI-RS bitmap & 0100000000000000000 \\ \hline & CSI-RS-CSI-RS bitmap & 010000000000000000000000000000000000$			dB	(0	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	allocation	P_{c}	dB	-	3	
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				-		
$\begin{array}{c c} \hat{I}_{or}^{(j)} & \text{dB[mW/15kHz]} & -98 & -97 \\ \hline N_{oc1}^{(j)} \text{ for CSI subframe set 0} & \text{dB[mW/15kHz]} & -98 & -98 \\ \hline N_{oc2}^{(j)} \text{ for CSI subframe set 1} & \text{dB[mW/15kHz]} & -108 & -108 \\ \hline N_{oc2}^{(j)} \text{ for CSI subframe set 1} & \text{dB[mW/15kHz]} & -108 & -108 \\ \hline N_{oc2}^{(j)} \text{ for CSI subframe set 1} & \text{dB[mW/15kHz]} & -108 & -108 \\ \hline N_{oc2}^{(j)} \text{ for CSI subframe set 1} & \text{dB[mW/15kHz]} & -108 & -108 \\ \hline N_{oc2}^{(j)} \text{ for CSI subframe set 1} & \text{CIause B.2.4 with } \tau_d = 0.45\mu\text{s.s.} \\ a = 1, f_D = 5\text{Hz} \\ a = 1, f_D = 5\text{Hz} \\ Antenna configuration & 2x2 \\ \hline Beamforming Model & As specified in Section B.4.3 \\ CRS reference signals & Antenna port 0 and 1 \\ CSI-RS periodicity and subframe offset & 5/0 \\ \hline CSI-RS periodicity and subframe offset & 5/0 \\ \hline CSI-RS reference signal configuration & 0 \\ \hline ZGI-RS reference signal configuration & 0 \\ \hline ZGI-RS reference signal configuration & 0 \\ \hline ZGI-RS reference signal configuration & 0 \\ \hline ZGI-RS reference signal configuration & 0 \\ \hline ZGI-RS reference signal configuration & 0 \\ \hline ZGI-RS configuration & 0 \\ \hline CSI-RS configuration & 0 \\ \hline CSI-RS configuration & 0 \\ \hline CSI-RS configuration & 0 \\ \hline CSI-RS configuration & 0 \\ \hline CSI-M configuration & 0 \\ \hline CSI-M configuration & 0 \\ \hline Signal/Interference/Reporting mode for \\ \hline CSI process configuration \\ \hline Signal/Interference/Reporting mode for \\ \hline CSI subframe set 0 \\ \hline CSI subframe set 0 \\ \hline COdeBookSubsetRestriction bitmap \\ \hline Reporting interval (Note 4) & ms & 10 per subframe set 0 \\ \hline COdeBookSubsetRestriction bitmap \\ \hline Reporting interval (Note 4) & ms & 15 for CSI subframe set 1 \\ \hline Max number of HARQ transmissions \\ \hline ACK/NACK feedback mode \\ \hline Note 1: & If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4) this reported subband$					·	
$N_{oc1}^{(f)} \text{ for CSI subframe set 0} \qquad \text{dB[mW/15kHz]} \qquad -98 \qquad -98$ $N_{oc2}^{(f)} \text{ for CSI subframe set 1} \qquad \text{dB[mW/15kHz]} \qquad -108 \qquad -108$ $N_{oc2}^{(f)} \text{ for CSI subframe set 1} \qquad \text{dB[mW/15kHz]} \qquad -108 \qquad -108$ -108 $-$				10	11	
$N_{oc2}^{(f)} \text{ for CSI subframe set 1} \qquad \text{dB[mW/15kHz]} \qquad -108 \qquad -108$ $Propagation channel \qquad \qquad \text{Clause B.2.4 with } \tau_d = 0.45 \mu\text{s}, \\ a = 1, f_D = 5 \text{Hz}$ $Antenna configuration \qquad \qquad 2xz$ $Beamforming Model \qquad \qquad As specified in Section B.4.3$ $CRS reference signals \qquad \qquad \qquad Antenna port 0 \text{ and 1}$ $CSI reference signals \qquad \qquad \qquad Antenna port 0 \text{ and 1}$ $CSI-RS periodicity and subframe offset \\ T_{CSI-RS} / \Delta_{CSI-RS} \qquad \qquad \qquad 5/0$ $2xrO-Power CSI-RS configuration \qquad \qquad 0$ $2xrO-Power CSI-RS configuration 0 \qquad \qquad 3/$ $2xrO-Power CSI-RS bitmap \qquad \qquad 0000010000000000000000000000000000$			dB[mW/15kHz]	-98	-97	
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Propagation channel $a = 1, \ f_D = 5\mathrm{Hz}$ Antenna configuration $2x2$ Beamforming Model As specified in Section B.4.3 CRS reference signals Antenna port 0 and 1 CSI reference signals Antenna port 15,16 CSI-RS periodicity and subframe offset $T_{CSI-RS} / C_{CSI-RS} = 5/0$ CSI-RS periodicity and subframe offset $T_{CSI-RS} / C_{CSI-RS} = 5/0$ CSI-RS reference signal configuration 0 $Zero-Power CSI-RS configuration 0$ $Zero-Power CSI-RS configuration 0$ $Zero-Power CSI-RS configuration 1$ $Zero-Power CSI-RS bitmap$ $Zero-Power$	$N_{oc2}^{(j)}$ for CS	I subframe set 1	dB[mW/15kHz]			
	Propagat	ion channel		Clause B.2.4 wit	th $\tau_d = 0.45 \mu\text{s}$,	
Beamforming Model As specified in Section B.4.3	Tiopagat	ion onantio		a = 1, f	$_{D} = 5 \mathrm{Hz}$	
CRS reference signals CSI reference signals CSI-RS periodicity and subframe offset T_CSI-RS / ACSI-RS CSI-RS reference signal configuration CSI-RS reference signal configuration CFero-Power CSI-RS configuration 0 I_CSI-RS / ZeroPowerCSI-RS bitmap Zero-Power CSI-RS configuration 1 I_CSI-RS / ZeroPowerCSI-RS bitmap CSI-IM configuration 0 CSI-IM configuration 0 CSI-IM configuration 1 I_CSI-RS / ZeroPowerCSI-RS bitmap CSI-IM configuration 1 I_CSI-RS / ZeroPowerCSI-RS bitmap CSI-IM configuration 1 I_CSI-RS / ZeroPowerCSI-RS bitmap CSI-IM configuration 1 I_CSI-RS / ZeroPowerCSI-RS bitmap CSI-IM configuration 1 CSI-IM configuration 1 I_CSI-RS / ZeroPowerCSI-RS bitmap CSI process configuration Signal/Interference/Reporting mode for CSI subframe set 0 CSI process configuration Signal/Interference/Reporting mode for CSI subframe set 1 CodeBookSubsetRestriction bitmap Reporting interval (Note 4) TSI D per subframe set 1 CQI delay TS for CSI subframe set 1 Sub-band size PDSCH scheduled subframes for CSI subframe set 1 Max number of HARQ transmissions TACK/NACK feedback mode Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fullfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately. Note 4: For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF# 7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI						
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CSI-IR ZeroPowerCSI-RS bitmap						
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CSI-IM configuration 1 I _{CSI-RS} / ZeroPowerCSI-RS bitmap				_	•	
CSI process configuration Signal/Interference/Reporting mode for CSI subframe set 0 CSI process configuration Signal/Interference/Reporting mode for CSI process configuration Signal/Interference/Reporting mode for CSI subframe set 1 CodeBookSubsetRestriction bitmap CQI delay Ms 10 per subframe set CQI delay Ms 15 for CSI subframe set 0 15 for CSI subframe set 1 Sub-band size RB 6 (full size) PDSCH scheduled subframes for CSI subframe set 1 Max number of HARQ transmissions 1 ACK/NACK feedback mode Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately. Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI	CSI-IM co	nfiguration 1		4	. /	
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Signal/Interference/Reporting mode for CSI subframe set 1 CodeBookSubsetRestriction bitmap Reporting interval (Note 4) CQI delay MS 10 per subframe set 0 15 for CSI subframe set 0 Sub-band size RB 6 (full size) PDSCH scheduled subframes for CSI subframe set 0 Subframe set 0 PDSCH scheduled subframes for CSI subframe set 1 Max number of HARQ transmissions ACK/NACK feedback mode Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately. Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI						
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CQI delay ms 15 for CSI subframe set 0 15 for CSI subframe set 1 Sub-band size RB 6 (full size) PDSCH scheduled subframes for CSI subframe set 0 PDSCH scheduled subframes for CSI subframe set 1 Max number of HARQ transmissions ACK/NACK feedback mode Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately. Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI				000	0001	
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Max number of HARQ transmissions ACK/NACK feedback mode Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately. Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI	PDSCH scheduled subframes for CSI			3	,4	
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately. Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI	Max number of HARQ transmissions			B # 1-1	1	
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or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel RC.18 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level for each subframe set separately. Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI						
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Note 4: For CSI subframe set 0, PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI		Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two				
transmitted in downlink SF#3 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI						
SF #7. For CSI subframe set 1, PDCCH DCI format 0 with a trigger for aperiodic CQI						

on uplink SF#2.

Table 9.3.1.2.6-2: Minimum requirement (TDD)

	Test
α[%]	2
β[%]	55
γ	1.02
UE Category	≥1

9.3.2 Frequency non-selective scheduling mode

The reporting accuracy of the channel quality indicator (CQI) under frequency non-selective fading conditions is determined by the reporting variance, and the relative increase of the throughput obtained when the transport format transmitted is that indicated by the reported CQI compared to the case for which a fixed transport format configured according to the reported median CQI is transmitted. In addition, the reporting accuracy is determined by a minimum BLER using the transport formats indicated by the reported CQI. The purpose is to verify that the UE is tracking the channel variations and selecting the largest transport format possible according to the prevailing channel state for frequently non-selective scheduling. To account for sensitivity of the input SNR the CQI reporting under frequency non-selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.3.2.1 Minimum requirement PUCCH 1-0 (Cell-Specific Reference Symbol)

9.3.2.1.1 FDD

For the parameters specified in Table 9.3.2.1.1-1 and Table 9.3.2.1.1-3, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.1.1-2 and Table 9.3.2.1.1-4 and by the following

- a) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least α % of the time;
- b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;
- c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02

The applicability of the requirement with 5MHz bandwidth as specificed in Table 9.3.2.1.1-3 and Table 9.3.2.1.1-4 is defined in 9.1.1.1.

Table 9.3.2.1.1-1 Fading test for single antenna (FDD)

Parameter		Unit	Te	Test 1 Test 2		st 2	
Band	width	MHz		10 N	ИНz		
Transmiss	sion mode			1 (po	ort 0)		
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()		
power	$ ho_{\scriptscriptstyle B}$	dB		()		
allocation	σ	dB		()		
SNR (N	Note 3)	dB	6	7	12	13	
- 0	(j) or	dB[mW/15kHz]	-92	-91	-86	-85	
N_{c}	(j) oc	dB[mW/15kHz]	-98 -98		-98		86
Propagation	on channel			EP	A5		
Correlat				High ((1 x 2)		
antenna co	nfiguration						
Reportir	ng mode			PUCC	CH 1-0		
Reporting	periodicity	ms		N_{pd}	= 2		
CQI delay		ms		8	3		
Physical o	hannel for		DUCCU (Note 4)				
CQI re	porting		PUSCH (Note 4)				
PUCCH Report Type			4				
	omi- ationIndex		1				
Max number of HARQ transmissions			1				

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.1 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Table 9.3.2.1.1-2 Minimum requirement (FDD)

	Test 1	Test 2
α[%]	20	20
γ	1.05	1.05
UE Category	≥1	≥1

Table 9.3.2.1.1-3 Fading test for single antenna (FDD)

Parameter		Unit	Test 1 Test 2			st 2
Bandwidth		MHz		5 N	ИHz	
Transmissi	on mode			1 (po	ort 0)	
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	σ	dB		()	
SNR (Note	3)	dB	6	7	12	13
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-92	-91	-86	-85
$N_{oc}^{(j)}$		dB[mW/15kHz]	-6	98	-6)8
Propagatio				EP	PA5	
Correlation				High ((1 x 2)	
antenna configuration						
Reporting I					CH 1-0	
Reporting	periodicity	ms	$N_{\rm pd} = 2$			
CQI delay		ms			3	
Physical c				PUSCH	(Note 4)	
CQI report					• •	
PUCCH Re	ероп туре				4	
cqi-pmi- Configurati	ionIndov			•	1	
	er of HARQ					
transmission			1			
Note 1: If the UE reports in an available uplink reporting instance at						
subframe SF#n based on CQI estimation at a downlink SF not later						
than SF#(n-4), this reported wideband CQI cannot be applied at the						
eNB downlink before SF#(n+4)						
Note 2: Reference measurement channel RC.14 FDD according to Table						
	A.4-1 for Category ≥ 2 with one sided dynamic OCNG Pattern OP.1					
	FDD as described in Annex A.5.1.1 and RC.15 FDD according to				•	
	Table A.4-1 for Category 1 with one/two sided dynamic OCNG				IG _	

one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.

Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.Note 3: each test, the minimum requirements shall be fulfilled for at least

Table 9.3.2.1.1-4 Minimum requirement (FDD)

	Test 1	Test 2
α[%]	20	20
γ	1.05	1.05
UE Category	≥1	≥1

9.3.2.1.2 TDD

For the parameters specified in Table 9.3.2.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.1.2-2 and by the following

- a) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least α % of the time;
- b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;
- c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

Table 9.3.2.1.2-1 Fading test for single antenna (TDD)

Parameter		Unit	Tes	Test 1 Test 2		st 2
Band	width	MHz		10 N	ИНz	
Transmiss	sion mode			1 (po	ort 0)	
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	σ	dB		()	
Uplink c	lownlink uration			2	2	
Special s configi	subframe uration			2	1	
SNR (1	Note 3)	dB	6	7	12	13
	(j) or	dB[mW/15kHz]	-92	-91	-86	-85
N	(j) oc	dB[mW/15kHz]	-6	98	-6	98
Propagation	on channel			EP	A5	
Correla				Hiah ((1 x 2)	
	nfiguration				` '	
	ng mode				H 1-0	
	periodicity	ms			= 5	
	delay	ms		10 c	or 11	
Physical c CQI re	hannel for porting		PUSCH (Note 4)			
PUCCH R	eport Type		4			
	omi- ationIndex		3			
	er of HARQ		1			
ACK/NACI mo	K feedback ode	rts in an available u		•	lexing	

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
- Note 2: Reference measurement channel RC.1 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and RC.4 TDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

Table 9.3.2.1.2-2 Minimum requirement (TDD)

	Test 1	Test 2
α[%]	20	20
γ	1.05	1.05
UE Category	≥1	≥1

9.3.2.2 Minimum requirement PUCCH 1-1 (CSI Reference Symbol)

9.3.2.2.1 FDD

For the parameters specified in Table 9.3.2.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.2.1-2 and by the following

- a) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least α % of the time;
- b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;
- c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

Table 9.3.2.2.1-1 Fading test for FDD

Parar	meter	Unit	Test 1 Test 2		st 2	
Band	Bandwidth			10 N	ИHz	
Transmiss	sion mode			(9	
	$ ho_{\scriptscriptstyle A}$	dB		()	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	P_c	dB		-	3	
	σ	dB		-	3	
SNR (I	Note 3)	dB	2	3	7	8
\hat{I}_{a}^{0}	(j) or	dB[mW/15kHz]	-96	-95	-91	-90
N_{i}	(j) oc	dB[mW/15kHz]	-9	98	-6	8
Propagation	on channel		EPA5			
Correlation and and	Correlation and antenna configuration		ULA High (4 x 2)			
Beamforming Model			As specified in Section B.4.3		B.4.3	
Cell-specific reference signals			Antenna ports 0,1			
	nce signals		Antenna ports 15,,18			
	and subframe offset $^{\prime}$ $\Delta_{ exttt{CSI-RS}}$		5/1			
	signal configuration		2			
	Restriction bitmap		0x0000 0000 0000 0001		001	
Reportir	ng mode			PUCC	CH 1-1	
Reporting	periodicity	ms	$N_{\rm pd} = 5$			
CQI	delay	ms	8			
,	nel for CQI/ PMI		PUSCH (Note 4)			
reporting PUCCH Report Type for CQI/PMI			2			
	I for RI reporting		PUCCH Format 2			
PUCCH repo			3			
	gurationIndex		2			
	igIndex		1			
	RQ transmissions		1			

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.7 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 4: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Table 9.3.2.2.1-2 Minimum requirement (FDD)

	Test 1	Test 2
α[%]	20	20
γ	1.05	1.05
UE Category	≥2	≥2

9.3.2.2.2 TDD

For the parameters specified in Table 9.3.2.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.2.2-2 and by the following

- a) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least α % of the time;
- b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;
- c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

Table 9.3.2.2.2-1 Fading test for TDD

Parameter		Unit	Test 1 Test 2		st 2	
Bandwidth		MHz	10 MHz			
Transmission mode			9			
Uplink downlink configuration			2			
Special subfran	ne configuration		4			
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	0			
	$ ho_{\scriptscriptstyle B}$	dB	0			
	P_{c}	dB	-6			
	σ	dB	-3			
SNR (I	Note 3)	dB	1	2	7	8
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-97	-96	-91	-90
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98		18	
Propagation channel			EPA5			
Correlation and antenna configuration			XP High (8 x 2)			
Beamforming Model			As specified in Section B.4.3			
CRS reference signals			Antenna ports 0, 1			
CSI reference signals			Antenna ports 15,,22			
CSI-RS periodicity and subframe offset			5/ 3			
$T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$						
CSI-RS reference signal configuration			2			
CodeBookSubsetRestriction bitmap			0x0000 0000 0000 0020 0000 0000 0001			
Reporting mode			PUCCH 1-1 (Sub-mode: 2)			
Reporting periodicity		ms	$N_{pd} = 5$			
CQI delay		ms	10			
Physical channel for CQI/ PMI reporting			PUSCH (Note 4)			
PUCCH Report Type for CQI/ PMI			2c			
Physical channel for RI reporting			PUCCH Format 2			
PUCCH report type for RI			3			
cqi-pmi-ConfigurationIndex			3			
ri-ConfigIndex				805 (Note 5)		
Max number of HARQ transmissions			1			
ACK/NACK feedback mode Multiplexing Note 1: If the UE reports in an available uplink reporting instance at subframe SE#n base						

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.7 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 4: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.
- Note 5: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

Table 9.3.2.2.2-2 Minimum requirement (TDD)

	Test 1	Test 2
<i>α</i> [%]	20	20
γ	1.05	1.05
UE Category	≥2	≥2

9.3.3 Frequency-selective interference

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective interference conditions is determined by a percentile of the reported differential CQI offset level +2 for a preferred sub-band, and the relative increase of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is transmitted on any sub-band in set *S* of TS 36.213 [6]. The purpose is to verify that preferred sub-bands are used for frequently-selective scheduling under frequency-selective interference conditions.

9.3.3.1 Minimum requirement PUSCH 3-0 (Cell-Specific Reference Symbol)

9.3.3.1.1 FDD

For the parameters specified in Table 9.3.3.1.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.3.1.1-2 and by the following

- a) a sub-band differential CQI offset level of +2 shall be reported at least $\alpha\%$ for at least one of the sub-bands of full size at the channel edges;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.3.1.1-1 Sub-band test for single antenna transmission (FDD)

Parameter		Unit	Test 1	Test 2	
Bandwidth		MHz	10 MHz	10 MHz	
Transmission mode			1 (port 0)	1 (port 0)	
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	0	0	
	$ ho_{\scriptscriptstyle B}$	dB	0	0	
	σ	dB	0	0	
$I_{ot}^{(j)}$ for RB 05		dB[mW/15kHz]	-102	-93	
$I_{ot}^{(j)}$ for RB 641		dB[mW/15kHz]	-93	-93	
$I_{ot}^{(j)}$ for RB 4249		dB[mW/15kHz]	-93	-102	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-94	
Max number of HARQ transmissions			1		
Propagation channel			Clause B.2.4 with $\tau_d = 0.45 \mu\text{s}$,		
			$a = 1, f_D = 5 \text{ Hz}$		
Reporting interval		ms	5		
Antenna configuration			1 x 2		
CQI delay		ms	8		
Reporting mode			PUSCH 3-0		
Sub-band size		RB	6 (full size)		

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Table 9.3.3.1.1-2 Minimum requirement (FDD)

	Test 1	Test 2
<i>α</i> [%]	60	60
γ	1.6	1.6
UE Category	≥1	≥1

9.3.3.1.2 TDD

For the parameters specified in Table 9.3.3.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.3.1.2-2 and by the following

- a) a sub-band differential CQI offset level of +2 shall be reported at least $\alpha\%$ for at least one of the sub-bands of full size at the channel edges;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.3.1.2-1 Sub-band test for single antenna transmission (TDD)

Parar	neter	Unit	Test 1	Test 2
Band	width	MHz	10 MHz	10 MHz
Transmiss	sion mode		1 (port 0)	1 (port 0)
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0	0
power	$ ho_{\scriptscriptstyle B}$	dB	0	0
allocation	σ	dB	0	0
	lownlink uration		2	
	subframe uration		4	
$I_{ot}^{(j)}$ for	RB 05	dB[mW/15kHz]	-102 -93	
$I_{ot}^{(j)}$ for F	RB 641	dB[mW/15kHz]	-93 -93	
$I_{ot}^{(j)}$ for RB 4249		dB[mW/15kHz]	-93 -102	
\hat{I}_o^{i}	(j) or	dB[mW/15kHz]	-94 -94	
Max number transm	er of HARQ issions		1	
Dropogotic	n channal		Clause B.2.4 with	h $ au_d=0.45\mu\mathrm{s},$
Fropagalic	on channel		$a = 1, f_{I}$	$_{0} = 5 \mathrm{Hz}$
Antenna co	onfiguration		1 x	2
Reporting	g interval	ms	1 x 2	
	delay	ms	10 or 11	
Reportir	ng mode		PUSCH 3-0	
	nd size	RB	6 (full	size)
	K feedback	ata in an anailabla	Multipl	

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.3 TDD according to table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.

Table 9.3.3.1.2-2 Minimum requirement (TDD)

	Test 1	Test 2
α[%]	60	60
γ	1.6	1.6
UE Category	≥1	≥1

9.3.3.2 Void

9.3.3.2.1 Void

9.3.3.2.2 Void

9.3.4 UE-selected subband CQI

The accuracy of UE-selected subband channel quality indicator (CQI) reporting under frequency-selective fading conditions is determined by the relative increase of the throughput obtained when transmitting on the UE-selected subbands with the corresponding transport format compared to the case for which a fixed format is transmitted on any subband in set *S* of TS 36.213 [6]. The purpose is to verify that correct subbands are accurately reported for frequency-selective scheduling. To account for sensitivity of the input SNR the subband CQI reporting under frequency-selective fading conditions is considered to be verified if the reporting accuracy is met for at least one of two SNR levels separated by an offset of 1 dB.

9.3.4.1 Minimum requirement PUSCH 2-0 (Cell-Specific Reference Symbols)

9.3.4.1.1 FDD

For the parameters specified in Table 9.3.4.1.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.4.1.1-2 and by the following

a) the ratio of the throughput obtained when transmitting on a randomly selected subband among the best M subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set S shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each TTI for FDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the $N_{\rm PRB}$ entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the subband size.

Table 9.3.4.1.1-1 Subband test for single antenna transmission (FDD)

Para	meter	Unit	Tes	st 1	Tes	st 2
Band	lwidth	MHz	10 MHz			
Transmis	sion mode			1 (po	ort 0)	
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power allocation	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	σ	dB		()	
SNR (Note 3)	dB	9	10	14	15
\hat{I}_{c}	(j) or	dB[mW/15kHz]	-89	-88	-84	-83
N	oc (j)	dB[mW/15kHz]	-9)8	-6)8
			Clause	B.2.4 wit	th $\tau_d = 0$.45 <i>μ</i> s,
Propagation	on channel		$a = 1, f_D = 5 \text{ Hz}$			
	g interval	ms	5 8			
	delay	ms	_			
	ng mode			PUSC	H 2-0	
	er of HARQ				1	
	issions			- // !!		
	d size (k)	RBs		3 (full	size)	
	f preferred nds (<i>M</i>)			Ę	5	
Note 1: I					CQI	
/	4.4-1 with one	e measurement channel RC.5 FDD according to Table one/two sided dynamic OCNG Pattern OP.1/2 FDD as in Annex A.5.1.1/2.				
		, the minimum requi ne two SNR(s) and t				

Table 9.3.4.1.1-2 Minimum requirement (FDD)

	Test 1	Test 2
γ	1.2	1.2
UE Category	≥1	≥1

9.3.4.1.2 TDD

level.

For the parameters specified in Table 9.3.4.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.4.1.2-2 and by the following

a) the ratio of the throughput obtained when transmitting on a randomly selected subband among the best M subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set S shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the subband size.

Table 9.3.4.1.2-1 Sub-band test for single antenna transmission (TDD)

Para	meter	Unit	Tes	st 1	Tes	st 2
Band	lwidth	MHz		10 N	ИНz	
Transmis	sion mode		1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	σ	dB		()	
	downlink uration			2	2	
	subframe uration			4	1	
SNR (Note 3)	dB	9	10	14	15
\hat{I}_{c}	(j) or	dB[mW/15kHz]	-89	-88	-84	-83
N	oc (j)	dB[mW/15kHz]	-98 -98		18	
			Clause B.2.4 with $\tau_d = 0.45 \mu$		$0.45 \mu s$,	
Propagation	on channel		$a = 1, f_D = 5 \text{ Hz}$		·	
Reportin	g interval	ms	5			
	delay	ms			or 11	
	ng mode			PUSC	H 2-0	
	er of HARQ				1	
	issions	DD-		0 /6 .11	-:\	
	d size (k)	RBs		3 (full	size)	
	f preferred nds (<i>M</i>)				5	
	K feedback					
	ode			Multip	lexing	
Note 1: I	If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)					
Note 3:	A.4-1 with one described in Arecore	4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as scribed in Annex A.5.2.1/2. In each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input				

Table 9.3.4.1.2-2 Minimum requirement (TDD)

	Test 1	Test 2
γ	1.2	1.2
UE Category	≥1	≥1

9.3.4.2 Minimum requirement PUCCH 2-0 (Cell-Specific Reference Symbols)

9.3.4.2.1 FDD

For the parameters specified in Table 9.3.4.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.4.2.1-2 and by the following

a) the ratio of the throughput obtained when transmitting on subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set S shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each TTI for FDD. The transport block size TBS (wideband CQI median) is that resulting

from the code rate which is closest to that indicated by the wideband CQI median and the $N_{\rm PRB}$ entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the subband size.

Table 9.3.4.2.1-1 Subband test for single antenna transmission (FDD)

Para	meter	Unit	Te	st 1	Test 2	
Ban	dwidth	MHz			ИНz	
Transmis	ssion mode			1 (po	ort 0)	
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	σ	dB		()	
SNR	(Note 3)	dB	8	9	13	14
Î	$\widehat{r}(j)$ or	dB[mW/15kHz]	-90	-89	-85	-84
Λ	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	98	-6	98
ъ .			Clause	B.2.4 wit	th $\tau_d = 0$).45 <i>µ</i> s
Propagat	ion channel			a = 1, f	$_D = 5 \mathrm{Hz}$	
Reporting	periodicity	ms	N _P = 2			
CQI delay		ms	8			
	channel for eporting		PUSCH (Note 4)			
PUCCH F	Report Type band CQI		4			
PUCCH F for subl	Report Type band CQI		1			
Max numb	er of HARQ			,	1	
	nissions	DDa		C /fII	-:\	
	nd size (<i>k</i>) of bandwidth	RBs		6 (full	Size)	
	rts (<i>J</i>)			3	3	
	K			,	1	
	ConfigIndex			•	1	
Note 2:	subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as					
Note 3:	For each test,	Annex A.5.1.1/2. the minimum requine two SNR(s) and t				

- level.
- Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.
- CQI reports for the short subband (having 2RBs in the last Note 5: bandwidth part) are to be disregarded and data scheduling according to the most recent subband CQI report for bandwidth part
- Note 6: In the case where wideband CQI is reported, data is to be scheduled according to the most recently used subband CQI report.

Table 9.3.4.2.1-2 Minimum requirement (FDD)

	Test 1	Test 2
γ	1.15	1.15
UE Category	≥1	≥1

9.3.4.2.2 TDD

For the parameters specified in Table 9.3.4.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.4.2.2-2 and by the following

a) the ratio of the throughput obtained when transmitting on subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set S shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the subband size.

Table 9.3.4.2.2-1 Sub-band test for single antenna transmission (TDD)

Para	meter	Unit	Tes	st 1	Tes	st 2
	dwidth	MHz			ИНz	
	sion mode			1 (pc		
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	σ	dB		()	
	downlink			•	2	
	uration				<u> </u>	
	subframe			4	1	
	uration (Note 3)	dB	8	9	13	14
	f(j)					
I	or	dB[mW/15kHz]	-90	-89	-85	-84
N	7 (j) oc	dB[mW/15kHz]	-9	98	-9	18
Propagati	on channel		Clause	B.2.4 wit	th $ au_d=0$	$.45 \mu$ s,
Fiopagati	on channe			a = 1, f	$_D = 5 \mathrm{Hz}$	
	periodicity	ms		N_{P}		
	delay	ms		10 c	r 11	
	channel for eporting			PUSCH	(Note 4)	
PUCCH R	eport Type		4			
	band CQI Leport Type					
	and CQI		1			
	er of HARQ		1			
	nissions					
	d size (<i>k</i>) f bandwidth	RBs		6 (full	size)	
	ts (<i>J</i>)			3	3	
	K			,	1	
cqi-pmi-C	ConfigIndex			3	3	
	K feedback			Multip	lexing	
	ode	l orts in an available υ	ınlink ron			
	subframe SF#	tn based on CQI es SF#(n-4), this repor	timation a	at a down	link subfi	
		olied at the eNB dov				JQI
Note 2:	Reference me	easurement channe	I RC.3 TE	DD accord	ding to Ta	
		e/two sided dynamic	OCNG I	Pattern C	P.1/2 TD	D as
		Annex A.5.2.1/2.	romonto	ahall ha f	ساؤناامط ف	r ot
		the minimum requine two SNR(s) and t				
	evel.	io two orango, and i	ine respe	onvo wai	itou sigile	a input
		sions between CQI				
	necessary to report both on PUSCH instead of PUCCH. PDCCH					
		ormat 0 shall be transmitted in downlink SF#3 and #8 to allow				
		eriodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink ubframe SF#7 and #2.				
		If reports for the short subband (having 2RBs in the last				
	bandwidth part) are to be disregarded and data scheduling					
	•	he most recent subl	band CQ	report fo	r bandwi	dth part
	with j=1. In the case wi	nere wideband CQI	is report	i etch he	s to be	
		cording to the most				I
	report.					

Table 9.3.4.2.2-2 Minimum requirement (TDD)

	Test 1	Test 2
γ	1.15	1.15
UE Category	≥1	≥1

9.3.5 Additional requirements for enhanced receiver Type A

The purpose of the test is to verify that the reporting of the channel quality is based on the receiver of the enhanced Type A. Performance requirements are specified in terms of the relative increase of the throughput obtained when the transport format is that indicated by the reported CQI subject to an interference model compared to the case with a white Gaussian noise model, and a requirement on the minimum BLER of the transmitted transport formats indicated by the reported CQI subject to an interference model.

9.3.5.1 Minimum requirement PUCCH 1-0 (Cell-Specific Reference Symbol)

9.3.5.1.1 FDD

For the parameters specified in Table 9.3.5.1.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.5.1.1-2 and by the following

- a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;
- b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

Table 9.3.5.1.1-1 Fading test for single antenna (FDD)

	ameter	Unit	Cell 1	Cell 2
Bar	ndwidth	MHz		MHz
	ission mode			ort 0)
	lic Prefix		Normal	Normal
	ell ID		0	1
	R (Note 8)	dB	-2	N/A
	$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	N/A
Propaga	tion channel		EPA5	Static (Note 7)
antenna	lation and configuration		Low (1 x 2)	(1 x 2)
	(Note 4)	dB	N/A	-0.41
	ference ment channel		Note 2	R.2 FDD
	ting mode		PUCCH 1-0	N/A
	ng periodicity	ms	$N_{pd} = 2$	N/A
	l delay	ms	8	N/A
CQI	l channel for reporting		PUSCH (Note 3)	N/A
PUCCH	Report Type		4	N/A
Configu	cqi-pmi- ConfigurationIndex			N/A
	ber of HARQ missions		1	N/A
Note 1: Note 2: Note 3:	subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4) e 2: Reference measurement channel RC.1 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2. e 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.			
Note 5: Note 6: Note 7:	2 is the interfering cell. The number of the CRS ports in both cells is the same. Intefering cell is fully loaded. 8 6: Both cells are time-synchronous.			

Table 9.3.5.1.1-2 Minimum requirement (FDD)

SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause

γ	1.8
UE Category	≥1

9.3.5.1.2 TDD

Note 8:

For the parameters specified in Table 9.3.5.1.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.3.5.1.2-2 and by the following

a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;

b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

Table 9.3.5.1.2-1 Fading test for single antenna (TDD)

Parameter	Unit	Cell 1	Cell 2	
Bandwidth	MHz	10 MHz		
Transmission mode		1 (port 0)		
Uplink downlink			2	
configuration		4	<u> </u>	
Special subframe			4	
configuration				
Cyclic Prefix		Normal	Normal	
Cell ID		0	1	
SINR (Note 8)	dB	-2	N/A	
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	-98	
Propagation channel		EPA5	Static (Note 7)	
Correlation and antenna configuration		Low (1 x 2)	(1 x 2)	
DIP (Note 4)	dB	N/A	-0.41	
Reference		Note 2	R.2A TDD	
measurement channel		Note 2	K.ZA IDD	
Reporting mode		PUCCH 1-0	N/A	
Reporting periodicity	ms	$N_{\rm pd} = 5$	N/A	
CQI delay	ms	10 or 11	N/A	
Physical channel for CQI reporting		PUSCH (Note 3)	N/A	
PUCCH Report Type		4	N/A	
cqi-pmi-		3	N/A	
ConfigurationIndex		3	IN/A	
Max number of HARQ transmissions		1	N/A	
ACK/NACK feedback mode		Multiplexing N/A		

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.1 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1 and RC.4 TDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
- Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.
- Note 4: The respective received power spectral density of each interfering cell relative to N_{oc} ' is defined by its associated DIP value as specified in clause B.5.1.
- Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. The number of the CRS ports in both cells is the same. Intefering cell is fully loaded.
- Note 6: Both cells are time-synchronous.
- Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.
- Note 8: SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Table 9.3.5.1.2-2 Minimum requirement (TDD)

γ	1.8
UE Category	≥1

9.3.5.2 Minimum requirement PUCCH 1-1 (CSI Reference Symbol)

9.3.5.2.1 FDD

For the parameters specified in Table 9.3.5.2.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.5.2.1-2 and by the following

- a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;
- b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

Table 9.3.5.2.1-1 Fading test for single antenna (FDD)

Parameter	Unit	Cell 1	Cell 2	
Bandwidth	MHz	10 MHz		
Transmission mode			9	
Cyclic Prefix		Normal	Normal	
Cell ID		0	1	
SINR (Note 8)	dB	-2	N/A	
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	N/A	
Propagation channel		EPA5	Static (Note 7)	
Correlation and antenna configuration		Low (2 x 2)	(1 x 2)	
DIP (Note 4)	dB	N/A	-0.41	
Cell-specific reference signals		Antenna ports 0,1	Antenna port 0	
CSI reference signals		Antenna ports 15,16	N/A	
CSI-RS periodicity and subframe offset		5/1	N/A	
CSI-RS reference signal configuration		2	N/A	
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap	Subframes / bitmap	N/A	1 / 001000000000 000	
CodeBookSubsetRestr iction bitmap		001111	N/A	
Reference measurement channel		Note 2	R.2 FDD	
Reporting mode		PUCCH 1-1	N/A	
Reporting periodicity	ms	$N_{\rm pd} = 5$	N/A	
CQI delay	ms	8	N/A	
Physical channel for CQI/PMI reporting		PUSCH (Note 3)	N/A	
PUCCH Report Type for CQI/PMI		2	N/A	
PUCCH channel for RI reporting		PUCCH Format 2	N/A	
PUCCH Report Type for RI		3	N/A	
cqi-pmi- ConfigurationIndex		2	N/A	
ri-ConfigIndex		1	N/A	
Max number of HARQ transmissions		1	N/A	

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Note 4: The respective received power spectral density of each interfering cell relative to N_{oc} is defined by its associated DIP value as specified in clause B.5.1.

Note 5: Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Intefering cell is fully loaded.

Note 6: Both cells are time-synchronous.

Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.

Note 8: SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.

Table 9.3.5.2.1-2 Minimum requirement (FDD)

γ	1.8
UE Category	≥2

9.3.5.2.2 TDD

For the parameters specified in Table 9.3.5.2.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.3.5.2.2-2 and by the following

- a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;
- b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

Table 9.3.5.2.2-1 Fading test for single antenna (TDD)

$\begin{array}{c c} & \text{Bandwidth} \\ \hline \text{Transmission mode} \\ & \text{Uplink downlink} \\ & \text{configuration} \\ & \text{Special subframe} \\ & \text{configuration} \\ \hline & \text{Cyclic Prefix} \\ \hline & \text{Cell ID} \\ \hline & \text{SINR (Note 8)} \\ \hline & N_{oc}^{(j)} & \text{dl} \\ \hline & \text{Propagation channel} \\ \end{array}$	MHz dB B[mW/15kHz]	10 Normal 0 -2	2 1 Normal
$ \begin{array}{c c} \text{Uplink downlink} \\ \text{configuration} \\ \text{Special subframe} \\ \text{configuration} \\ \text{Cyclic Prefix} \\ \text{Cell ID} \\ \text{SINR (Note 8)} \\ \hline \\ N_{oc}^{(j)} \\ \text{dl} \end{array} $		Normal 0 -2	2 1 Normal 1
$ \begin{array}{c} \text{configuration} \\ \text{Special subframe} \\ \text{configuration} \\ \text{Cyclic Prefix} \\ \text{Cell ID} \\ \text{SINR (Note 8)} \\ \hline \\ N_{oc}^{(j)} \\ \text{dl} \end{array} $		Normal 0 -2	1 Normal 1
$ \begin{array}{c c} \text{Special subframe} \\ \text{configuration} \\ \hline \text{Cyclic Prefix} \\ \hline \text{Cell ID} \\ \hline \text{SINR (Note 8)} \\ \hline \\ N_{oc}^{(j)} & \text{dl} \\ \end{array} $		Normal 0 -2	1 Normal 1
$ \begin{array}{c} \text{configuration} \\ \text{Cyclic Prefix} \\ \text{Cell ID} \\ \text{SINR (Note 8)} \\ \\ N_{oc}^{(j)} \\ \text{dl} \end{array} $		Normal 0 -2	Normal 1
$ \begin{array}{c c} \textbf{Cyclic Prefix} \\ \hline \textbf{Cell ID} \\ \textbf{SINR (Note 8)} \\ \hline \\ N_{oc}^{(j)} & \textbf{dl} \\ \end{array} $		Normal 0 -2	Normal 1
Cell ID SINR (Note 8) $N_{oc}^{(j)}$ dl		0 -2	1
$N_{oc}^{(j)}$ dl		-2	
$N_{oc}^{(j)}$ dl			NI/A
	B[mW/15kHz]	_	N/A
Propagation channel		-98	-98
		EPA5	Static (Note 7)
Correlation and antenna configuration		Low (2 x 2)	(1 x 2)
DIP (Note 4)	dB	N/A	-0.41
Cell-specific reference		Antenna ports	Antenna port 0
signals		0,1	, and ma port o
CSI reference signals		Antenna ports 15,16	N/A
CSI-RS periodicity and subframe offset		5/3	N/A
CSI-RS reference signal configuration		2	N/A
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap	Subframes / bitmap	N/A	3 / 001000000000 0000
CodeBookSubsetRestr iction bitmap		001111	N/A
Reference measurement channel		Note 2	R.2A TDD
Reporting mode		PUCCH 1-1 (Sub-mode: 2)	N/A
Reporting periodicity	ms	$N_{\rm pd} = 5$	N/A
CQI delay	ms	10	N/A
Physical channel for CQI/PMI reporting		PUSCH (Note 3)	N/A
PUCCH Report Type for CQI/PMI		2c	N/A
Physical channel for RI reporting		PUCCH Format 2	N/A
PUCCH Report Type for RI		3	N/A
cqi-pmi- ConfigurationIndex		3	N/A
ri-ConfigIndex		805 (Note 9)	N/A
Max number of HARQ		1	
transmissions		1	N/A
ACK/NACK feedback mode Note 1: If the UE reports i		Multiplexing	N/A

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.

Note 4: The respective received power spectral density of each interfering

	cell relative to N_{xx} is defined by its associated DIP value as
	specified in clause B.5.1.
Note 5:	Two cells are considered in which Cell 1 is the serving cell and Cell 2 is the interfering cell. Intefering cell is fully loaded.
Note 6:	Both cells are time-synchronous.
Note 7:	Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.
Note 8:	SINR corresponds to \widehat{E}_s/N_{oc} of Cell 1 as defined in clause
	8.1.1.
Note 9:	RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that
	CQI/PMI reports will be dropped, while RI and HARQ-ACK will be
	multiplexed. At eNB, CQI report collection shall be skipped every
	160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink
	subframes until a new CQI (after CQI/PMI dropping) is available.

Table 9.3.5.2.2-2 Minimum requirement (TDD)

γ	1.8
UE Category	≥2

9.3.6 Minimum requirement (With multiple CSI processes)

The purpose of the test is to verify the reporting accuracy of the CQI and the UE processing capability for multiple CSI processes. Each CSI process is associated with a CSI-RS resource and a CSI-IM resource as shown in Table 9.3.6-1. For UE supports one CSI process, CSI process 2 is configured and the corresponding requirements shall be fulfilled. For UE supports three CSI processes, CSI processes 0, 1 and 2 are configured and the corresponding requirements shall be fulfilled. For UE supports four CSI processes, CSI processes 0, 1, 2 and 3 are configured and the corresponding requirements shall be fulfilled.

Table 9.3.6-1: Configuration of CSI processes

	CSI process 0	CSI process 1	CSI process 2	CSI process 3
CSI-RS resource	CSI-RS signal 0	CSI-RS signal 1	CSI-RS signal 0	CSI-RS signal 1
CSI-IM resource	CSI-IM resource 0	CSI-IM resource 0	CSI-IM resource 1	CSI-IM resource 2

9.3.6.1 FDD

For the parameters specified in Table 9.3.6.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.6.1-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band for CSI process 1, 2, or 3;
- b) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least δ % of the time for CSI process 0;
- c) the difference of the median CQIs of the reported wideband CQI for configurated CSI processes shall be greater or equal to the values as in Table 9.3.6.1-3;
- d) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;

e) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.6.1-1: Fading test for FDD

Parameter		l lmi4	Test 1			Test 2				
		Unit	TP			2	TP1 TP2			2
Band		MHz					0 MHz			
Transmiss			10		10		10 10		10	
	$ ho_{\scriptscriptstyle A}$	dB	0		0					
Downlink power	$ ho_{\scriptscriptstyle B}$	dB		())		0		
allocation	P_c	dB	-3	3	0		-3		0	
	σ	dB		-	3			-	3	
SNR (Note 7)	dB	10	11	7	8	14	15	9	10
\hat{I}_{c}^{i}	(j) or	dB[mW/15kHz]	-88	-87	-91	-90	-84	-85	-89	-88
N	(j) oc	dB[mW/15kHz]		-6	98			-(98	
Propagatio	on channel		EPA 5 Low Clause B.2.4.1 with $ \tau_d = 0.45 \mu \text{s}, \\ a = 1, \\ f_D = 5 \text{Hz} $				$ au_d = 0$	Clause B.2.4.1 with $\tau_d = 0.45 \mu\text{s},$ $a = 1,$ $f_D = 5 \text{Hz}$		
Antenna co			4x	2	2)		4	x2	2	k 2
Beamform	ning Model		As spe		Section	B.4.3	As sp		Section	B.4.3
Timing offset		us))	
Frequency offset Cell-specific re		Hz	ļ ,) ports 0,1				0 ports 0,1	
CSI-RS	Ŭ		Antenna 15,	a ports	<u> </u>	/A	Antenr	na ports ,18		/A
	and subframe offset / $\Delta_{\text{CSI-RS}}$		5/1		N	/A		/1	N.	/A
CSI-RS 0 c	onfiguration		0		N.	/A	0		N/A	
CSI-RS	signal 1		N/A		Antenna ports 15,16				a ports ,16	
	and subframe offset $/$ $\Delta_{ extsf{CSI-RS}}$		N/A		5/1 N/A		5.	/1		
CSI-RS 1 c	onfiguration		N/A 5						5	
Zero-power CSI-F I _{CSI-RS} / ZeroPow	RS 0 configuration erCSI-RS bitmap		N/A 11100000000 0000		000000	N/A 111000		/ 000000 00		
Zero-power CSI-F I _{CSI-RS} / ZeroPow	RS 1 configuration erCSI-RS bitmap		1 / 00100110000 N/. 00000		/A	1 / 00100110000 N/ 00000		/A		
T _{CSI-RS}	and subframe offset $/$ $\Delta_{\text{CSI-RS}}$		5/1 5/1		/1	5/1 5/		/1		
CSI-IM 0 co	onfiguration		2		2	2		2	2	2
	and subframe offset $/$ $\Delta_{ extsf{CSI-RS}}$		5/	1	N,	/A	5	/1	N.	/A
CSI-IM 1 co	onfiguration		6		N,	/A		6	N.	/A
T _{CSI-RS}	and subframe offset $/$ $\Delta_{ extsf{CSI-RS}}$		N/	A	5/	/1	N	/A	5.	/1
CSI-IM 2 co	onfiguration		N/A 1		<u> </u>	N/A 1		1		
	CSI-RS				RS 0		CSI-RS 0			
	CSI-IM Reporting mode						SI-IM 0 CCH 1-1			
	CodeBookSubsetR estriction bitmap		0x0	0x0000 0000 0000 0001			001			
	Reporting periodicity	ms	N _{pd} = 5		$= 5 N_{pd} = 5$		= 5			
CSI process 0	CQI delay	ms		1	0			1	0	
	Physical channel for CQI/ PMI reporting			PUSCH	(Note 6)		PUSCH (Note 6)			
	PUCCH Report Type for CQI/PMI			2	2		2			
	PUCCH channel		F	PUCCH	Format 2			PUCCH	Format 2	

	for RI reporting						
PUCCH report				n	,)	
	type for RI		,	3	3	3	
	cqi-pmi-			2	2		
	ConfigurationIndex		4	2			
	ri-ConfigIndex			1	1		
	CSI-RS		CSI-	RS 1	CSI-	RS 1	
	CSI-IM			-IM 0	CSI-	IM 0	
	Reporting mode		PUSC	CH 3-1	PUSCH 3-1		
	CodeBookSubsetR		000	0001	000	001	
CSI process 1	estriction bitmap		000	1001	000	001	
	Reporting interval (Note 9)	ms		5	Ę	5	
	CQI delay	ms	1	0	1	Λ	
	Sub-band size	RB	6 (ful		6 (full		
	CSI-RS	ND		RS 0	CSI-		
	CSI-IM			-IM 1	CSI-		
	Reporting mode			CH 3-1			
	CodeBookSubsetR				PUSCH 3-1		
CSI process 2	estriction bitmap		0x0000 0000 0000 0001		0x0000 0000 0000 0001		
OOI process 2	Reporting interval						
	(Note 9)	ms	5		5		
	CQI delay	ms	1	0	1	0	
	Sub-band size	RB	6 (full size) (Note 8)		6 (full size) (Note 8)		
	CSI-RS	1,0	CSI-RS 1		CSI-		
	CSI-IM		CSI-IM 2		CSI-		
	Reporting mode		PUSCH 3-1		PUSCH 3-1		
	CodeBookSubsetR						
CSI process 3	estriction bitmap		000	0001	000001		
00. p. 00000 0	Reporting interval			_	+		
	(Note 9)	ms	,	5	5	5	
	CQI delay	ms	1	0	1	0	
	Sub-band size	RB	6 (ful	l size)	6 (full	size)	
CSI process for F	PDSCH scheduling		CSI pro	ocess 2	CSI pro	cess 2	
	ell ID		0	6	0	6	
Quasi-co-lo	cated CSI-RS		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1	
			Same Cell ID	Same Cell ID	Same Cell ID	Same Cell ID	
Quasi-co-i	ocated CRS		as Cell 1	as Cell 2	as Cell 1	as Cell 2	
PMI for subframe	2, 3, 4, 7, 8 and 9		0x0000 0000 0000 0001	100000	0x0000 0000 0000 0001	100000	
PMI for sub	frame 1 and 6		0x0000 0000 0001 0000	100000	0x0000 0000 0001 0000	100000	
Max number of H	ARQ transmissions		1	N/A	1	N/A	
Note 1: If the LIE reports in an available unlink reporting instance at subframe SE#n based on COI estimation at a downlink SE not							

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: 3 symbols allocated to PDCCH

Note 3: Reference measurement channel RC.12 FDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 2, 3, 4, 7, 8 and 9 from TP1.

Note 4: TM10 OCNG as specified in A.5.1.8 is transmitted on subframe 1 and 6 from TP1.

Note 5: TM10 OCNG as specified in A.5.1.8 is transmitted on subframe 1, 2, 3, 4, 6, 7, 8 and 9 from TP2

Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.

Note 7: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

Note 9: For these sub-bands which are not selected for PDSCH transmission, TM10 OCNG should be transmitted.

Table 9.3.6.1-2: Minimum requirement (FDD)

	CSI process 0	CSI process 1	CSI process 2	CSI process 3		
<i>α</i> [%]	N/A	2	2	2		
β[%]	N/A	40	40	40		
δ[%]	10	N/A	N/A	N/A		
γ	N/A	N/A	1.02	N/A		
UE Category	≥1					

Table 9.3.6.1-3: Minimum median CQI difference between configured CSI processes (FDD)

	CSI process 1	CSI process 2	CSI process 3
CSI process 0	N/A	1	3
UE Category		≥1	

9.3.6.2 TDD

For the parameters specified in Table 9.3.6.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.6.2-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band for CSI process 1, 2, or 3;
- b) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least δ % of the time for CSI process 0;
- c) the difference of the median CQIs of the reported wideband CQI for configurated CSI processes shall be greater or equal to the values as in Table 9.3.6.2-3;
- d) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;
- e) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.6.2-1: Fading test for TDD

Parameter		l lnit	Unit Test 1			Test 2					
	meter		TF		TP2		TP1 TP2		P2		
Bandwidth		MHz			MHz		10 MH				
Transmission mode Uplink downlink configuration			1		10			0	10		
Special subframe co			2			<u>² </u>	2 4		4		
Opecial Subframe co		dB	_	0		<u> </u>			0		
5 " 1	ρ_A				0)		
Downlink power allocation	$\rho_{\scriptscriptstyle B}$	dB			_				-		
anocanori	P_c	dB	-;		()	-	3		0	
SNR (Note 7)	σ	dB dB	10	11	3	8	14	15	3 9	10	
					İ	-90	-84		-89		
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-87	-91	-90	-04	-85	-69	-88	
$N_{oc}^{(j)}$		dB[mW/15kHz]		-6	98			-6	98		
Propagation channe	1		EPA (5 Low	$ \begin{array}{c c} B.2.4. \\ \tau_d = 0 \\ a = 0 \end{array} $.45 μ s,	EPA	5 Low	$B.2.4.$ $\tau_d = 0$ $a = 0$	ause .1 with).45 \(\mu \text{s}\), = 1, = 5 Hz	
Antenna configuration			4>		2)			x2	2:	x2	
Beamforming Model			As sp		Section	B.4.3	As sp	ecified in		B.4.3	
Timing offset between		US			0)		
Frequency offset be Cell-specific referen		Hz	0 Antenna port						nna ports 0,1		
CSI-RS signal 0	oo digiralo		Antenna ports 15,, 18		N/A		Antenna ports 15,, 18			/A	
CSI-RS 0 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		5/3		N/A		5/3		N	/A	
CSI-RS 0 configurat	ion		0		N/A		(0	N	/A	
CSI-RS signal 1			N/A		Antenna ports 15, 16		N/A			na ports , 16	
$T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		N/A		5/3		N/A			/3	
CSI-RS 1 configurat	ion		N/A		5		N/A			5	
Zero-power CSI-RS I _{CSI-RS} / ZeroPowerC			N/A		3 / 11100000000 00000			/A	111000	3 / 000000 000	
Zero-power CSI-RS I _{CSI-RS} / ZeroPowerC	SI-RS bitmap		3 / 00100110000 00000		N/A		00100	3 / 110000 000	N	/A	
CSI-IM 0 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		5/	/3	5/	/3	5	/3	5.	/3	
CSI-IM 0 configurati			2	2	2	2	:	2	2	2	
CSI-IM 1 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		5/	/3	N,	/A	5	/3	N	/A	
CSI-IM 1 configurati	on		6	3	N,	/A	(6	N	/A	
CSI-IM 2 periodicity	and subframe offset		N/	/A	5/	/3	N	/A	5	/3	
$T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$ CSI-IM 2 configuration	on		N/	/A	1]	N	/A		1	
J	CSI-RS			CSI-	RS 0			CSI-	RS 0		
CSI-IM					-IM 0	· 			·IM 0		
	Reporting mode CodeBookSubsetR estriction bitmap				PUCCH 1-1 0000 0000 0001				OCH 1-1 00 0000 0001		
CSI process 0	Reporting periodicity	ms		N_{pd}	<i>N</i> _{pd} = 5		N _{pd} = 5		= 5		
	CQI delay	ms		1	2			1	2		
	Physical channel for CQI/ PMI			PUSCH	(Note 6)		PUSCH (Not		(Note 6)		
	reporting PUCCH Report				2		2				

	Type for CQI/PMI						
	PUCCH channel		DIICCH	Format 2	PUCCH	Format 2	
	for RI reporting		PUCCH Format 2		FUCCITI	FUIIIal Z	
	PUCCH report			3	3	1	
	type for RI					,	
	cqi-pmi-		;	3	3	3	
	ConfigurationIndex						
	ri-ConfigIndex			lote 10)	805 (N		
	CSI-RS			RS 1	CSI-I		
	CSI-IM			-IM 0	CSI-		
	Reporting mode		PUSC	CH 3-1	PUSC	H 3-1	
001	CodeBookSubsetR		000	0001	000	001	
CSI process 1	estriction bitmap						
	Reporting interval (Note 9)	ms	:	5	5	5	
	CQI delay	ms	1	2	1	2	
	Sub-band size	RB	6 (ful		6 (full		
	CSI-RS	ND		RS 0	CSI-I		
	CSI-IM			-IM 1			
	Reporting mode			CH 3-1	CSI-IM 1 PUSCH 3-1		
	CodeBookSubsetR						
CSI process 2	estriction bitmap		0x0000 000	0x0000 0000 0000 0001		0x0000 0000 0000 0001	
	Reporting interval			_	_	_	
	(Note 9)	ms	;	5	5	5	
	CQI delay	ms	12		12		
	Sub-band size	RB	6 (full size) (Note 8)		6 (full size) (Note 8)		
	CSI-RS		CSI-RS 1		CSI-RS 1		
	CSI-IM			-IM 2	CSI-IM 2		
	Reporting mode		PUSC	CH 3-1	PUSCH 3-1		
	CodeBookSubsetR		000	0001	000001		
CSI process 3	estriction bitmap		000	1001	000001		
	Reporting interval	ms		5			
	(Note 9)	1113					
	CQI delay	ms		2	1:		
	Sub-band size	RB		l size)	6 (full		
CSI process for PE	OSCH scheduling		CSI process 2		CSI pro		
Cell ID			0	6	0	6	
Quasi-co-located C	CSI-RS		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1	
Quasi-co-located C	CRS		Same Cell ID	Same Cell ID	Same Cell ID	Same Cell ID	
	quadres resulted of the		as Cell 1	as Cell 2	as Cell 1	as Cell 2	
PMI for subframe 4 and 9			0x0000 0000	100000	0x0000 0000	100000	
			0000 0001		0000 0001		
PMI for subframe 3	3 and 8		0x0000 0000	100000	0x0000 0000	100000	
Max number of HA	PO transmissions		0001 0000	N/A	0001 0000	N/A	
ACK/NACK feedba			Multiplexing	N/A N/A	Multiplexing	N/A N/A	
	= reports in an available	unlink reporting inete		· ·			

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: 3 symbols allocated to PDCCH
- Note 3: Reference measurement channel RC.12 TDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 4 and 9 from TP1.
- Note 4: TM10 OCNG is transmitted as specified in A.5.2.8 on subframe 3 and 8 from TP1.
- Note 5: TM10 OCNG is transmitted as specified in A.5.2.8 on subframe 3, 4, 8 and 9 from TP2
- Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#7 and #2.
- Note 7: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#7 and #2.
- Note 9: For these sub-bands which are not selected for PDSCH transmission, TM10 OCNG should be transmitted.
- Note 10: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.

Table 9.3.6.2-2: Minimum requirement (TDD)

	CSI process 0	CSI process 1	CSI process 2	CSI process 3	
<i>α</i> [%]	N/A	2	2	2	
β[%]	N/A	40	40	40	
δ[%]	10	N/A	N/A	N/A	
γ	N/A	N/A	1.02	N/A	
UE Category	≥1				

Table 9.3.6.2-3: Minimum median CQI difference between configured CSI processes (TDD)

	CSI process 1	CSI process 2	CSI process 3
CSI process 0	N/A	1	3
UE Category		≥1	

9.3.7 Minimum requirement PUSCH 3-2

9.3.7.1 FDD

For the parameters specified in Table 9.3.7.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.7.1-2 and by the following.

- a) the ratio of the throughput obtained when transmitting based on UE PUSCH 3-2 reported wideband CQI and subband PMI and that obtained when transmitting based on PUSCH 3-1 reported wideband CQI and wideband PMI shall be $\geq \alpha$;
- b) The ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS based on UE PUSCH3-2 reported subband CQI and subband PMI and that obtained when transmitting on a randomly selected sub-band in set S based on PUSCH 1-2 reported wideband CQI and subband PMI shall be $\geq \beta$;

The transport block sizes TBS for wideband CQI and subband CQI are selected according to RC.17 FDD for test 1 and according to RC.18 FDD for test 2.

Table 9.3.7.1-1 Sub-band test for FDD

Paran	neter	Unit	Te	est 1	Test 2	
Bandy	Bandwidth			101	ИНz	
PDSCH resou	rce allocation	RB	50PRB		a subba	nd, 6PRB
Transmiss	ion mode		T	M6	TI	M9
	$ ho_{_{A}}$	dB		-6		0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB		-6		0
allocation	P_c	dB		-	-	3
	σ	dB		3	-	3
SNR (N	lote 3)	dB	0	1	5	6
$\hat{I}_{oi}^{()}$	j) -	dB[mW/15kHz]	-98	-97	-93	-92
$N_o^{()}$	(j) c	dB[mW/15kHz]	-98	-98	-98	-98
Propagatio	n channel		EVA5		EVA5	
Antenna co	nfiguration		4x2 ULA low		4x2 XP high (Note 4)	
Beamformi			-		B.4.3	
CRS referer			Antenna ports 0, 1, 2, 3		Antenna ports 0, 1	
Time offset between 5)	TX antenna (Note	ns	65		-	
CSI referen	ce signals				Antenna ports 15, 16, 17, 18	
CSI-RS periodicity a $T_{\text{CSI-RS}}$ /			-		5/ 1	
CSI-RS reference s			-			4
alternativeCodeboo	okEnabledFor4TX		No		Y	es
CodeBookSubsetRestriction bitmap			0x0000 000	00 0000 FFFF		0 0000 FFFF FFFF
Reporting inte	rval (Note 6)	ms	5			5
	CQI delay			8		8
Reporting	g mode		PUSCH 3-2	2, PUSCH 3-1	PUSCH 3-2	, PUSCH 1-2
Sub-bar	nd size	RB	6 (fu	ll size)	6 (full size)	
Max number of HA				1		1

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.17 FDD / RC.18 FDD for Test 1 / 2 according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.
- Note 5: The values of time offset are [0ns 65ns 0ns 65ns] for antenna port [0, 1, 2, 3] respectively.
- Note 6: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.

Table 9.3.7.1-2 Minimum requirement (FDD)

	Test 1	Test 2
α	1.05	-
β	-	1.15
UE Category	≥2	≥2

9.3.7.2 TDD

For the parameters specified in Table 9.3.7.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.7.2-2 and by the following.

a) the ratio of the throughput obtained when transmitting based on UE PUSCH 3-2 reported wideband CQI and subband PMI and that obtained when transmitting based on PUSCH 3-1 reported wideband CQI and wideband PMI shall be >\alpha:

b) The ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS based on UE PUSCH3-2 reported subband CQI and subband PMI and that obtained when transmitting on a randomly selected sub-band in set S based on PUSCH 1-2 reported wideband CQI and subband PMI shall be $\geq \beta$;

The transport block sizes TBS for wideband CQI and subband CQI are selected according to RC.17 TDD for test 1 and RC.18 TDD for test 2.

Table 9.3.7.2-1 Sub-band test for TDD

Paran	Parameter		Test 1		Test 2	
Bandwidth		MHz	10N		MHz	
PDSCH resou	PDSCH resource allocation		50PRB		a subband, 6PRB	
Transmiss	ion mode		Т	M6	TI	Л 9
Uplink downlink	configuration			1		1
Special subfram	e configuration			4	4	4
	$ ho_{\scriptscriptstyle A}$	dB		-6)
Downlink power	$ ho_{\scriptscriptstyle B}$	dB		-6)
allocation	P_c	dB		-	-	3
	σ	dB		3	-	3
SNR (N	lote 3)	dB	0	1	5	6
$\hat{I}_{oi}^{(\cdot)}$	j) r	dB[mW/15kHz]	-98	-97	-93	-92
N_c^0	(j) oc	dB[mW/15kHz]	-98	-98	-98	-98
Propagatio	n channel		EVA5		EVA5	
Antenna co	nfiguration		4x2 ULA low		4x2 XP high (Note 4)	
Beamform	ing Model		-		B.4.3	
CRS referer	nce signals		Antenna ports 0, 1, 2, 3		Antenna ports 0, 1	
Time offset betweer 5	n TX antenna (Note)	ns	65		-	
CSI referen	ice signals				Antenna ports 15, 16, 17, 18	
CSI-RS periodicity a			-		5/ 4	
CSI-RS reference s	ignal configuration		-		4	4
alternativeCodebookEnabledFor4TX			No		Y	es
CodeBookSubsetRestriction bitmap			0x0000 0000 0000 FFFF		0x0000 0000 0000 FFFF 0000 FFFF	
	Reporting interval (Note 6) ms		5		;	5
CQI delay		ms	8			3
Reportin			PUSCH 3-2	, PUSCH 3-1	PUSCH 3-2,	PUSCH 1-2
Sub-bar		RB	6 (fu	ll size)	6 (ful	size)
Max number of HA	RQ transmissions			1		1

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.17 TDD / RC.18 TDD for Test 1 / 2 according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 4: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.
- Note 5: The values of time offset are [0ns 65ns 0ns 65ns] for antenna port [0, 1, 2, 3] respectively.
- Note 6: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#3 and #8.

Table 9.3.7.2-2 Minimum requirement (TDD)

	Test 1	Test 2
α	1.05	-
β	-	1.15
UE Category	≥2	≥2

9.3.8 Additional requirements for enhanced receiver Type B

The purpose of the test is to verify that the reporting of the channel quality based on the receiver of the enhanced Type B meets a minimum performance. Performance requirements are specified in terms of the relative throughput obtained when the transport format is that indicated by the reported CQI with NeighCellsInfo-r12 configured compared to the case without NeighCellsInfo-r12 configured. Cell 1 is the serving cell, and Cell 2 and Cell 3 are the interference cells.

9.3.8.1 Minimum requirement PUCCH 1-1 (Cell-Specific Reference Symbols)

9.3.8.1.1 FDD

For the parameters specified in Table 9.3.8.1.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.1.1-2 and by the following

Table 9.3.8.1.1-1 Fading test for FDD

Parameter		Unit	Cell 1	Cell 2	Cell 3		
Bandwidth		MHz	10				
Transmission mod	е		4				
	$ ho_{\scriptscriptstyle A}$	dB	-3				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB		-3			
	σ	dB		0			
Cyclic Prefix			Normal	Normal	Normal		
Cell ID			0	1	6		
SNR		dB	8.34	N/A	N/A		
\hat{E}_s/N_{oc}			N/A	3.28	0.74		
$\hat{I}_{or}^{(j)}$		dB [mW/15kHz]	-89.66	-94.72	-97.26		
N_{oc}		dB [mW/15kHz]	-98				
Propagation chann			EPA5	EPA5 EPA5			
Correlation and an	tenna configuration		Low 2 x 2	Low 2 x 2	Low 2 x 2		
Cell-specific refere	ence signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1		
Interference mode	I		N/A	As specified in clause B.6.3	As specified in clause B.6.3		
Reporting periodic	ity	ms	$N_{pd} = 5$	N/A	N/A		
Physical channel	for CQI/PMI reporting		PUCCH Format 2	PUCCH N/A			
PUCCH Report Ty	pe for CQI/PMI		2	N/A	N/A		
PUCCH Report Ty			3	N/A	N/A		
cgi-pmi-ConfigurationIndex			6	6 N/A			
ri-ConfigurationIndex			1 N/A		N/A		
CodeBookSubsetRestriction bitmap			000001	000001 N/A			
Max number of HARQ transmissions			1 N/A		N/A		
NeighCellsInfo-	p-aList-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}		
r12 (Note 4)	transmissionModeList -r12		N/A	{2,3,4,8,9}	{2,3,4,8,9}		
N - 4 - 4 - 16 4 1 1		ı. ı		05"	001		

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.2 FDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 3: All cells are time-synchronous.

Note 4: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 9.3.8.1.1-2 Minimum requirement (FDD)

	Test 1
γ	0.925
UE Category	≥2

9.3.8.1.2 TDD

For the parameters specified in Table 9.3.8.1.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.3.8.1.2-2 and by the following

Table 9.3.8.1.2-1 Fading test for TDD

Parameter		Unit	Cell 1	Cell 2	Cell 3		
Bandwidth		MHz		10			
Transmission mod	de		4				
Uplink downlink co				2			
Special subframe	configuration			4			
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB		-3			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB		-3			
	σ	dB		0			
Cyclic Prefix			Normal	Normal	Normal		
Cell ID			0	1	6		
SNR		dB	8.34	N/A	N/A		
\hat{E}_s/N_{oc}			N/A	3.28	0.74		
$\hat{I}_{or}^{(j)}$		dB [mW/15kHz]	-89.66	-94.72	-97.26		
N_{oc}	N_{oc}		-98				
Propagation chan	nel		EPA5 EPA5		EPA5		
Correlation and ar	ntenna configuration		Low 2 x 2	Low 2 x 2	Low 2 x 2		
Cell-specific refere	ence signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1		
Interference mode	el		N/A As specified in clause B.6.3		As specified in clause B.6.3		
Reporting periodic	city	ms	$N_{\rm pd} = 5$	N/A	N/A		
Physical channel f	for CQI/PMI reporting		PUSCH (Note 3)	N/A	N/A		
PUCCH Report Ty	/pe		2	N/A	N/A		
cqi-pmi-Configura	cqi-pmi-ConfigurationIndex		3	N/A	N/A		
ri-ConfigIndex			805 (Note 5)	N/A	N/A		
CodeBookSubsetRestriction bitmap			000001	N/A	N/A		
Max number of HARQ transmissions			1 N/A		N/A		
ACK/NACK feedback mode		·	Multiplexing	N/A	N/A		
NeighCellsInfo-	p-aList-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}		
r12 (Note 6)	transmissionModeList -r12		N/A	{2,3,4,8,9}	{2,3,4,8,9}		

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.2 TDD according to Table A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.
- Note 4: All cells are time-synchronous.
- Note 5: RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification.
- Note 6: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 9.3.8.1.2-2 Minimum requirement (TDD)

	Test 1
γ	0.925
UE Category	≥2

9.3.8.2 Minimum requirement PUCCH 1-1 (CSI Reference Symbols)

9.3.8.2.1 FDD

For the parameters specified in Table 9.3.8.2.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.2.1-2 and by the following

Table 9.3.8.2.1-1 Fading test for FDD

Parameter		Unit	Cell 1	Cell 2	Cell 3
Bandwidth		MHz	10		
Transmission	mode		9		
	$ ho_{\scriptscriptstyle A}$	dB	0		
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0		
allocation	Pc	dB		0	
	σ	dB		0	
Cyclic Prefix			Normal	Normal	Normal
Cell ID			0	1	6
SNR		dB	8.34	N/A	N/A
\hat{E}_s/N_{oc}			N/A 3.28		0.74
$\hat{I}_{or}^{(j)}$		dB [mW/15kHz]	-89.66	-94.72	-97.26
N_{oc}		dB [mW/15kHz]		-98	
Propagation of	hannel		EPA5	EPA5	EPA5
Correlation ar configuration			Low 2 x 2	Low 2 x 2	Low 2 x 2
	eference signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1
Beamforming	Model			specified in Section B	.4.3
CSI reference	signals		Antenna ports 15,16	N/A	N/A
CSI-RS period subframe offs			5/1	N/A	N/A
CSI-RS reference signal configuration			2	N/A	N/A
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap		Subframes / bitmap	N/A	1 / 00010000000000 00	1 / 0001000000000 00
CodeBookSul bitmap	osetRestriction		000001	N/A	N/A
Interference n	Interference model		N/A	As specified in clause B.6.4	As specified in clause B.6.4
Reporting per	iodicity	ms	$N_{\rm pd} = 5$	N/A	N/A
	Physical channel for CQI/PMI		PUSCH (Note 3)	N/A	N/A
PUCCH Report Type for CQI/PMI			2	N/A	N/A
PUCCH channel for RI reporting			PUCCH Format 2	N/A	N/A
	PUCCH Report Type for RI		3	N/A	N/A
	cqi-pmi-ConfigurationIndex		2	N/A	N/A
ri-ConfigIndex			1	N/A	N/A
Max number of HARQ					
transmissions			1	N/A	N/A
NeighCellsInfo	p-aList-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
-r12 (Note 5)	transmission ModeList-r12		N/A	{2,3,4,8,9}	{2,3,4,8,9}

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
- Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.
- Note 4: All cells are time-synchronous.
- Note 5: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 9.3.8.2.1-2 Minimum requirement (FDD)

	Test 1
γ	0.925
UE Category	≥2

9.3.8.2.2 TDD

For the parameters specified in Table 9.3.8.2.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.3.8.2.2-2 and by the following

Table 9.3.8.2.2-1 Fading test for TDD

Parameter		Unit	Cell 1	Cell 2	Cell 3		
Bandwidth		MHz	10				
Transmission	mode			9			
	$ ho_{\scriptscriptstyle A}$	dB	0				
Downlink	$ ho_{\scriptscriptstyle B}$	dB	0				
power allocation	Pc	dB	0				
	σ	dB		0			
Uplink downli	nk configuration			2			
	ame configuration						
Cyclic Prefix	J		Normal	Normal	Normal		
Cell ID			0	1	6		
SNR		dB	8.34	N/A	N/A		
\hat{E}_s/N_{oc}			N/A	3.28	0.74		
$\hat{I}_{or}^{(j)}$		dB [mW/15kHz]	-89.66	-94.72	-97.26		
N_{oc}		dB [mW/15kHz]		-98			
Propagation of			EPA5	EPA5	EPA5		
Correlation and configuration	nd antenna		Low 2 x 2	Low 2 x 2	Low 2 x 2		
	eference signals		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1		
Beamforming	Model		As sne	As specified in Section B.4.3			
CSI reference			Antenna ports 15,16				
CSI-RS periodicity and					N/A		
subframe offs	subframe offset		5/3	N/A	N/A		
CSI-RS reference signal configuration			2	N/A	N/A		
bitmap	eroPowerCSI-RS	Subframes / bitmap	N/A	3 / 0001000000000 000	3 / 0001000000000 000		
CodeBookSubsetRestriction bitmap			000001	N/A	N/A		
	Interference model		N/A	As specified in clause B.6.4	As specified in clause B.6.4		
Reporting per	iodicity	ms	$N_{\rm pd} = 5$	N/A	N/A		
reporting	Physical channel for CQI/PMI reporting		PUSCH (Note 3)	N/A	N/A		
PUCCH Report Type for CQI/PMI			2	N/A	N/A		
Physical channel for RI reporting			PUCCH Format 2	N/A	N/A		
PUCCH Report Type for RI			3	N/A	N/A		
cqi-pmi-ConfigurationIndex			3	N/A	N/A		
ri-ConfigIndex			805 (Note 5)	N/A	N/A		
Max number of HARQ transmissions			1	N/A	N/A		
ACK/NACK feedback mode			Multiplexing	N/A	N/A		
NeighCellsInf	n-al iet-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}		
-r12 (Note 6)	transmission ModeList-r12		N/A	{2,3,4,8,9}	{2,3,4,8,9}		
Note 1: If the UE reports in an available uplink reporting instance at subframe SE#n based on COI							

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.
- Note 4: All cells are time-synchronous.

Note 5:	RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between
	RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that
	CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report
	collection shall be skipped every 160ms during performance verification and the reported CQI in
	subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after
	CQI/PMI dropping) is available.
Note 6:	NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 9.3.8.2.2-2 Minimum requirement (TDD)

	Test 1
γ	0.925
UE Category	≥2

9.3.8.3 Minimum requirement with CSI process

9.3.8.3.1 FDD

For the parameters specified in Table 9.3.8.3.1-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.3.1-2 and by the following

a) the ratio of the throughput obtained for the Type B receiver with NAICS assistance information when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with specified \hat{E}_s/N_{oc} and that obtained for the Type B receiver without NAICS assistance information when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with the same specified \hat{E}_s/N_{oc} shall be $\geq \gamma$;

Table 9.3.8.3.1-1 Fading test for single antenna (FDD)

	ameter	Unit	Cell 1	Cell 2	Cell 3
Bandwidth		MHz		10	
Transmission mode	9		10	9	9
	$ ho_{\scriptscriptstyle A}$	dB		0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB		0	
allocation	Pc	dB		0	
	σ	dB		0	
Cyclic Prefix			Normal	Normal	Normal
Cell ID			0	1	6
SNR		dB	8.34	N/A	N/A
\widehat{E}_s/N_{oc}		dB	N/A	3.28	0.74
$\hat{I}_{or}^{(j)}$		dB [mW/15kHz]	-89.66	-94.72	-97.26
N_{oc}		dB[mW/15kHz]		-98	
Propagation channe	el		EPA5	EPA5	EPA5
Correlation and ant			Low 2 x 2	Low 2 x 2	Low 2 x 2
Cell-specific referen	nce signals		Antenna ports	Antenna port 0,	Antenna port
			0,1	1	0, 1
Beamforming Mode	el			pecified in Section	B.4.3
CSI reference signa	als		Antenna ports	N/A	N/A
CSI-PS periodicity	and subframe offset		15,16 5/1	N/A	N/A
CSI-RS reference s			2	N/A	N/A
	<u> </u>	0.14		1/	1 /
Zero-power CSI-RS I _{CSI-RS} / ZeroPo	S configuration werCSI-RS bitmap	Subframes / bitmap	N/A	000100000000	0001000000 00000
Interference model			N/A	As specified in clause B.6.4	As specified in clause B.6.4
	CSI-RS		CSI-RS	N/A	N/A
	CSI-IM		CSI-IM	N/A	N/A
	Reporting mode		PUCCH 1-1	N/A	N/A
	CodeBookSubsetRe striction bitmap		000001	N/A	N/A
	Reporting periodicity	ms	$N_{\rm pd} = 5$	N/A	N/A
İ	CQI delay	ms	8	N/A	N/A
CSI process	Physical channel for CQI/ PMI reporting		PUSCH (Note 3)	N/A	N/A
Coi piocess	PUCCH Report Type for CQI/PMI		2	N/A	N/A
	PUCCH channel for RI reporting		PUCCH Format 2	N/A	N/A
	PUCCH report type for RI		3	N/A	N/A
	cqi-pmi- ConfigurationIndex		2	N/A	N/A
	ri-ConfigIndex		1	N/A	N/A
$T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		5/1	N/A	N/A
CSI-IM configuration			6	N/A	N/A
CSI process for PDSCH scheduling			CSI process	N/A	N/A
Quasi-co-located C			CSI-RS Same Cell ID as Cell 1	N/A N/A	N/A N/A
Reference measurement channel			Note 2	N/A	N/A
Max number of HARQ transmissions			1	N/A	N/A
NeighCellsInfo-	p-aList-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
r12 (Note 5)	transmissionModeLis t-r12		N/A	{2,3,4,8,9}	{2,3,4,8,9}
Note 1: If the LIE	reports in an available u	unlink reporting inct	anaa at aubframa	SE#n boood on CC) ootimation of

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.11 FDD according to Table A.4-1 with one sided dynamic OCNG

	Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 3:	To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH
	instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic
	CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.

Note 4: All cells are time-synchronous.

Note 5: NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 9.3.8.3.1-2 Minimum requirement (FDD)

	Test 1
γ	0.925
UE Category	≥2

9.3.8.3.2 TDD

For the parameters specified in Table 9.3.8.3.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in Table 9.3.8.3.2-2 and by the following

a) the ratio of the throughput obtained obtained for the Type B receiver with NAICS assistance information when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with specified \hat{E}_s/N_{oc} and that obtained for the Type B receiver without NAICS assistance information when transmitting the transport format indicated by each reported wideband CQI index subject to interference sources with the same specified \hat{E}_s/N_{oc} shall be $\geq \gamma$;

Table 9.3.8.3.2-1 Fading test for single antenna (TDD)

	Parameter	Unit	Cell 1	Cell 2	Cell 3
Bandwidth	arameter	MHz	Cell I	10	Cell 3
Transmission mode		IVII IZ	10	9	9
	$\rho_{\scriptscriptstyle A}$	dB		0	<u> </u>
Downlink power					
allocation	$\rho_{\scriptscriptstyle B}$	dB		0	
anocation	Pc	dB		0	
I Indials describeds as	σ of a constitute	dB		2	
Uplink downlink co				<u> </u>	
Cyclic Prefix	configuration		Normal	Normal	Normal
Cell ID			0	1	6
SNR		dB	8.34	N/A	N/A
\hat{E}_s/N_{oc}		dB	N/A	3.28	0.74
		dB	. 471		U. .
$\hat{I}_{or}^{(j)}$		[mW/15kHz]	-89.66	-94.72	-97.26
		dB[mW/15k			
N_{oc}		Hz]		-98	
Propagation chann			EPA5	EPA5	EPA5
Correlation and ant			Low 2 x 2	Low 2 x 2	Low 2 x 2
Cell-specific refere	nce signals		Antenna ports	Antenna port	Antenna port
5 (: 1/			0,1	0,1	0,1
Beamforming Mode	91			ecified in Section	B.4.3
CSI reference sign	als		Antenna ports 15,16	N/A	N/A
CSI-RS periodicity	and subframe offset		5/3	N/A	N/A
	signal configuration		2	N/A	N/A
		0.17		3 /	3/
Zero-power CSI-RS		Subframes /	N/A	000100000000	00010000000
I _{CSI-RS} / ZeroPo	werCSI-RS bitmap	bitmap		0000	00000
Interference model			N/A	As specified in	As specified in
michieronee meder			-	clause B.6.4	clause B.6.4
	CSI-RS		CSI-RS	N/A	N/A
	CSI-IM Reporting mode		CSI-IM PUCCH 1-1	N/A N/A	N/A N/A
	CodeBookSubsetRestricti				
	on bitmap		000001	N/A	N/A
	Reporting periodicity	ms	$N_{\rm pd} = 5$	N/A	N/A
	CQI delay	ms	8	N/A	N/A
	Physical channel for CQI/		PUSCH	N/A	N/A
CSI process	PMI reporting		(Note 3)	IN/A	IN/A
	PUCCH Report Type for		2	N/A	N/A
	CQI/PMI				. 47.1
	PUCCH channel for RI reporting		PUCCH Format 2	N/A	N/A
	PUCCH report type for RI		3	N/A	N/A
	cqi-pmi-				
	ConfigurationIndex		3	N/A	N/A
	ri-ConfigIndex		805 (Note 5)	N/A	N/A
CSI-IM periodicity a	and subframe offset T _{CSI-RS} /		5/1	N/A	N/A
$\Delta_{ extsf{CSI-RS}}$					
CSI-IM configuration			6	N/A	N/A
CSI process for PDSCH scheduling			CSI process	N/A	N/A
Quasi-co-located CSI-RS			CSI-RS	N/A	N/A
Quasi-co-located CRS			Same Cell ID as Cell 1	N/A	N/A
Reference measurement channel			Note 2	N/A	N/A
Max number of HARQ transmissions			1	N/A	N/A
ACK/NACK feedback mode			Multiplexing	N/A	N/A
NeighCellsInfo-	p-aList-r12		N/A	{dB-6, dB-3, dB0}	{dB-6, dB-3, dB0}
r12 (Note 6)	transmissionModeList-r12		N/A	{2,3,4,8,9}	{2,3,4,8,9}
Note 1: If the UE	reports in an available uplink	reporting instar		F#n based on CQ	I estimation at a

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink

	before SF#(n+4)
Note 2:	Reference measurement channel RC.11 TDD according to Table A.4-1 with one sided dynamic OCNG
	Pattern OP.1 TDD as described in Annex A.5.1.1.
Note 3:	To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH
	instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic
	CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#0 and #5.
Note 4:	All cells are time-synchronous.
Note 5:	RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI,
	CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI
	reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall
	be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the
	previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available.
Note 6:	NeighCellsInfo-r12 is described in subclause 6.3.2 of [7].

Table 9.3.8.3.2-2 Minimum requirement (TDD)

	Test 1
γ	0.925
UE Category	≥2

9.4 Reporting of Precoding Matrix Indicator (PMI)

The minimum performance requirements of PMI reporting are defined based on the precoding gain, expressed as the relative increase in throughput when the transmitter is configured according to the UE reports compared to the case when the transmitter is using random precoding, respectively. When the transmitter uses random precoding, for each PDSCH allocation a precoder is randomly generated and applied to the PDSCH. A fixed transport format (FRC) is configured for all requirements.

The requirements for transmission mode 6 with 1 TX and transmission mode 9 with 4 TX are specified in terms of the ratio

$$\gamma = \frac{t_{ue}}{t_{rnd}} \, \cdot$$

In the definition of γ , for PUSCH 3-1 single PMI and PUSCH 1-2 multiple PMI requirements, t_{rnd} is 60% of the maximum throughput obtained at SNR_{rnd} using random precoding, and t_{ue} the throughput measured at SNR_{rnd} with precoders configured according to the UE reports;

For the PUCCH 2-1 single PMI requirement, t_{md} is 60% of the maximum throughput obtained at SNR_{md} using random precoding on a randomly selected full-size subband in set S subbands, and t_{ue} the throughput measured at SNR_{md} with both the precoder and the preferred full-size subband applied according to the UE reports;

For PUSCH 2-2 multiple PMI requirements, t_{rnd} is 60% of the maximum throughput obtained at SNR_{rnd} using random precoding on a randomly selected full-size subband in set S subbands, and t_{ue} the throughput measured at SNR_{rnd} with both the subband precoder and a randomly selected full-size subband (within the preferred subbands) applied according to the UE reports.

The requirements for transmission mode 9 with 8 TX and transmission mode 9 with 4TX enhanced codebook are specified in terms of the ratio

$$\gamma = \frac{t_{ue, follow1, follow2}}{t_{rnd1, rnd2}}$$

In the definition of γ , for PUSCH 3-1 single PMI, PUCCH 1-1 single PMI and PUSCH 1-2 multiple PMI requirements, $t_{follow1,follow2}$ is 70% of the maximum throughput obtained at $SNR_{follow1,follow2}$ using the precoders configured according to the UE reports, and $t_{md1,md2}$ is the throughput measured at $SNR_{follow1,follow2}$ with random precoding.

9.4.1 Single PMI

9.4.1.1 Minimum requirement PUSCH 3-1 (Cell-Specific Reference Symbols)

9.4.1.1.1 FDD

For the parameters specified in Table 9.4.1.1.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.1.1-2.

Table 9.4.1.1.1-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmiss	sion mode		6
Propagation	on channel		EVA5
Precoding	granularity	PRB	50
Correlation and antenna configuration			Low 2 x 2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3
power	$ ho_{\scriptscriptstyle B}$	dB	-3
allocation	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 3-1
Reporting	g interval	ms	1
PMI delay (Note 2)		ms	8
Measurement channel			R. 10 FDD
OCNG Pattern			OP.1 FDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity).

Note 2: If the UE reports in an available uplink reporting

instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the

eNB downlink before SF#(n+4).

Table 9.4.1.1.1-2 Minimum requirement (FDD)

Parameter	Test 1
γ	1.1
UE Category	≥1

9.4.1.1.2 TDD

For the parameters specified in Table 9.4.1.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in 9.4.1.1.2-2.

Table 9.4.1.1.2-1: PMI test for single-layer (TDD)

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode			6	
	lownlink		1	
configu			'	
	subframe		4	
configu			•	
	on channel		EVA5	
	granularity	PRB	50	
Correla			Low 2 x 2	
antenna co	nfiguration			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3	
power	$ ho_{\scriptscriptstyle B}$	dB	-3	
allocation	σ	dB	0	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	
Reporting mode			PUSCH 3-1	
Reporting interval		ms	1	
PMI delay	/ (Note 2)	ms	10 or 11	
Measureme	ent channel		R.10 TDD	
OCNG Pattern			OP.1 TDD	
Max number of HARQ			4	
transmissions			-	
Redundancy version			{0,1,2,3}	
coding sequence			[0,1,2,0]	
ACK/NACK feedback			Multiplexing	
mc				
	Note 1: For random precoder selection, the precoder			

Note 1: For random precoder selection, the precoder shall be updated in each available downlink

transmission instance.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Table 9.4.1.1.2-2: Minimum requirement (TDD)

Parameter	Test 1
γ	1.1
UE Category	≥1

9.4.1.2 Minimum requirement PUCCH 2-1 (Cell-Specific Reference Symbols)

9.4.1.2.1 FDD

For the parameters specified in Table 9.4.1.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.2.1-2.

Table 9.4.1.2.1-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode			6	
Propagation channel			EVA5	
	tion and onfiguration		Low 4 x 2	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-6	
power	$ ho_{\scriptscriptstyle B}$	dB	-6	
allocation	σ	dB	3	
N	c(j) oc	dB[mW/15kHz]	-98	
PMI	delay	ms	8 or 9	
	ng mode		PUCCH 2-1 (Note 6)	
Reporting	periodicity	ms	$N_{\rm pd} = 2$	
	hannel for porting		PUSCH (Note 3)	
	eport Type nd CQI/PMI		2	
	eport Type and CQI		1	
Measurem	ent channel		R.14-1 FDD	
OCNG	Pattern		OP.1/2 FDD	
Precoding	granularity	PRB	6 (full size)	
	bandwidth s (<i>J</i>)		3	
K			1	
cqi-pmi-ConfigIndex			1	
Max number of HARQ transmissions			4	
	icy version			
	equence		{0,1,2,3}	
		racador calaction th	ne precoder shall be updated	
		(2 ms granularity).	le precoder shall be updated	
Note 2:	f the UE repo	orts in an available u	plink reporting instance at imation at a downlink SF not later	
than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). Note 3: To avoid collisions between HARQ-ACK and wideband CQI/PMI or subband CQI, it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the				
Note 4: F Note 5: I	HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3. Reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and instead data is to be transmitted on the most recently used subband for bandwidth part with j=1.			
Note 6: 1	transmitted on the most recently used subband. The bit field for PMI confirmation in DCI format 1B shall be mapped to "0" and TPMI information shall indicate the codebook index used in Table 6.3.4.2.3-2 of TS36.211 [4] according to the latest PMI report on PUCCH.			

Table 9.4.1.2.1-2: Minimum requirement (FDD)

	Test 1
γ	1.2
UE Category	≥1

9.4.1.2.2 **TDD**

For the parameters specified in Table 9.4.1.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.2.2-2.

Table 9.4.1.2.2-1: PMI test for single-layer (TDD)

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode			6	
Uplink c	lownlink		1	
configu	uration		I	
	subframe		4	
configu			-	
Propagation	on channel		EVA5	
Correla			Low 4 x 2	
antenna co	nfiguration		2511 1 1 2	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-6	
power	$ ho_{\scriptscriptstyle B}$	dB	-6	
allocation	σ	dB	3	
N	(j) oc	dB[mW/15kHz]	-98	
PMI (delay	ms	10	
	ng mode		PUCCH 2-1 (Note 6)	
Reporting periodicity		ms	$N_{P} = 5$	
Physical channel for CQI reporting			PUSCH (Note 3)	
PUCCH R	eport Type		2	
for wideband CQI/PMI			2	
PUCCH Report Type			1	
for subband CQI			•	
Measurement channel			R.14-1 TDD	
OCNG Pattern		555	OP.1/2 TDD	
Precoding granularity		PRB	6 (full size)	
Number of bandwidth parts (J)			3	
	S (J) (1	
	onfigIndex		4	
			4	
Max number of HARQ transmissions			4	
Redundancy version			(0.4.0.0)	
coding sequence			{0,1,2,3}	
ACK/NACK fedback			Multiplexing	
mode			. •	
Note 1: For random precoder selection, the precoder shall be updated in				
each available downlink transmission instance.				
Note 2: If the UE reports in an available uplink reporting instance at				
			imation at a downlink SF not later	
than SF#(n-4), this reported PMI cannot be applied at the eNB				

- downlink before SF#(n+4).
- To avoid collisions between HARQ-ACK and wideband CQI/PMI or Note 3: subband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
- Note 4: Reports for the short subband (having 2RBs in the last bandwidth part) are to be disregarded and instead data is to be transmitted on the most recently used subband for bandwidth part with j=1.
- In the case where wideband PMI is reported, data is to be Note 5: transmitted on the most recently used subband.
- Note 6: The bit field for PMI confirmation in DCI format 1B shall be mapped to "0" and TPMI information shall indicate the codebook index used in Table 6.3.4.2.3-2 of TS36.211 [4] according to the latest PMI report on PUCCH.

Table 9.4.1.2.2-2: Minimum requirement (TDD)

	Test 1
γ	1.2
UE Category	≥1

9.4.1.3 Minimum requirement PUSCH 3-1 (CSI Reference Symbol)

9.4.1.3.1 FDD

For the parameters specified in Table 9.4.1.3.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.3.1-2.

Table 9.4.1.3.1-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Propagation	on channel		EPA5
Precoding	granularity	PRB	50
Correlat			Low
antenna co	nfiguration		ULA 4 x 2
Cell-specifi			Antenna ports
sigr	nals		0,1
CSI referer	nce signals		Antenna ports 15,,18
Beamform			Annex B.4.3
CSI-RS per subfram			5/ 1
T _{CSI-RS} /	$^{\prime}$ $\Delta_{ t CSI ext{-RS}}$		
CSI-RS r	eference		6
signal cor			-
CodeBookS iction b	SubsetRestr oitmap		0x0000 0000 0000 FFFF
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	Pc	dB	-3
	σ	dB	-3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 3-1
Reporting interval		ms	5
PMI delay (Note 2)		ms	8
Measurement channel			R.44 FDD
OCNG Pattern			OP.1 FDD
Max number of HARQ transmissions			4
Redundan coding s			{0,1,2,3}
		l	

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity).

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note 3: PDSCH_RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.

Table 9.4.1.3.1-2: Minimum requirement (FDD)

Parameter	Test 1
γ	1.2
UE Category	≥1

9.4.1.3.2 TDD

For the parameters specified in Table 9.4.1.3.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.3.2-2.

Table 9.4.1.3.2-1: PMI test for single-layer (TDD)

Para	meter	Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Uplink downlink			1
	uration		1
	subframe		4
	uration on channel		EVA5
	granularity	PRB	50
	onfiguration	110	8 x 2
	n modeling		High, Cross polarized
Cell-specifi	c reference		Antenna ports
	nals		0,1
CSI refere	nce signals		Antenna ports 15,,22
	ning model		Annex B.4.3
	riodicity and ne offset		5/ 4
	$/\Delta_{\text{CSI-RS}}$		3/ 4
	reference		
signal cor	nfiguration		0
	SubsetRestr		0x0000 0000 001F FFE0
iction	bitmap		0000 0000 FFFF
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	Pc	dB	-6
	σ	dB	-3
N	oc (j)	dB[mW/15kHz]	-98
Reporti	ng mode		PUSCH 3-1
	g interval	ms	5
PMI dela	y (Note 2)	ms	10
Measurement channel			R.45-1 TDD for UE Category 1, R.45 TDD for UE Category ≥2
OCNG	Pattern		OP.1 TDD
Max numb	er of HARQ		4
transmissions			7
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback mode			Multiplexing
Note 1: For random precoder selection, the precoder			
shall be updated in each TTI (1 ms granularity). Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-			
4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). Note 3: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8. Note 4: Randomization of the principle beam direction			er for aperiodic ink SF#4 and #9 pe transmitted
shall be used as specified in B.2.3A.4			

Table 9.4.1.3.2-2: Minimum requirement (TDD)

Parameter	Test 1
γ	3
UE Category	≥1

9.4.1.4 Minimum requirement PUCCH 1-1 (CSI Reference Symbol)

9.4.1.4.1 FDD (with 4Tx enhanced codebook)

For the parameters specified in Table 9.4.1.4.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.4.1-2.

Table 9.4.1.4.1-1 PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Propagation channel			EPA5
Precoding gra		PRB	50
Correlation and			High XP 4 x 2
configura			_
Beamforming			Annex B.4.3
Cell-specific re signals			Antenna ports 0,1
CSI reference	signals		Antenna ports 15,,18
CSI-RS period subframe offset	T _{CSI-RS}		5/ 1
CSI-RS referer configura	nce signal		6
CodeBookSubse bitmap	tRestriction		0x0000 0000 0000 FFFF 0000 00FF
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	Pc	dB	-3
	σ	dB	-3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting i	mode		PUCCH 1-1 submode1
Reporting in		ms	5
PMI delay (I		ms	10
Physical char CQI/PMI rep			PUSCH (Note 3)
PUCCH Repor	t Type for		2b
	CQI/second PMI Physical channel for RI		
reportin			PUSCH
PUCCH Report Type for RI/			5
first PMI			-
cqi-pmi-ConfigurationIndex			4
ri-ConfigIndex			
Measurement channel			R.60 FDD OP.1 FDD
OCNG Pattern Max number of HARQ			
transmiss			4
Redundancy vers	sion coding		{0,1,2,3}
sequen		or coloction the pr	ecoder shall be undated

- Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)

 Note 2: If the UE reports in an available uplink reporting instance at
- Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
- Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH.
- Note 4: PDSCH_RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver.
- Note 5: Randomization of the principle beam direction shall be used as specified in B.2.3A.4

Table 9.4.1.4.1-2 Minimum requirement (FDD)

Parameter	Test 1
γ	1.8
UE Category	≥1

9.4.1.4.2 TDD (with 4Tx enhanced codebook)

For the parameters specified in Table 9.4.1.4.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.1.4.2-2.

Table 9.4.1.4.2-1 PMI test for single-layer (TDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Uplink downlink			1
configuration			'
Special subfr			4
configuration			-
Propagation ch			EPA5
Precoding gran		PRB	50
Correlation and			High XP 4 x 2
configuration			
Beamforming Cell-specific ref			Annex B.4.3
signals	erence		Antenna ports 0,1
CSI reference s	signals		Antenna ports
			15,,18
CSI-RS periodic subframe offset / I _{CSI-RS}	T _{CSI-RS}		5/ 4
CSI-RS reference configuration			6
CodeBookSubsetF			0x0000 0000 0000
bitmap			FFFF 0000 00FF
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink	$\rho_{\scriptscriptstyle B}$	dB	0
power – allocation	Pc	dB	-3
anocation	σ	dB	-3
$N_{oc}^{(j)}$	0		-98
		dB[mW/15kHz]	
Reporting m			PUCCH 1-1 submode1
Reporting into		ms	5
PMI delay (N		ms	15
Physical chani CQI/PMI repo			PUSCH (Note 3)
PUCCH Report			2b
CQI/second Physical channe	el for RI		
			PUSCH
	1		
reporting PUCCH Report Ty	/pe for RI/		5
reporting PUCCH Report Ty first PMI	pe for RI/		
reporting PUCCH Report Ty first PMI cqi-pmi-Configura	pe for RI/		5 4 1
reporting PUCCH Report Ty first PMI cqi-pmi-Configura ri-Configlio	pe for RI/ ationIndex dex		4
reporting PUCCH Report Ty first PMI cqi-pmi-Configura ri-Configlio Measurement of	rpe for RI/ ationIndex dex channel		4 1 R.60 TDD
reporting PUCCH Report Ty first PMI cqi-pmi-Configura ri-Configlio	rpe for RI/ ationIndex dex channel ern		4 1 R.60 TDD OP.1 TDD
reporting PUCCH Report Ty first PMI cqi-pmi-Configura ri-Configlio Measurement of	rpe for RI/ ationIndex dex channel ern HARQ		4 1 R.60 TDD
reporting PUCCH Report Ty first PMI cqi-pmi-Configura ri-Configura Measurement of OCNG Patt Max number of transmissio Redundancy versi	ationIndex dex channel ern HARQ ons on coding		4 1 R.60 TDD OP.1 TDD
reporting PUCCH Report Ty first PMI cqi-pmi-Configura ri-ConfigInd Measurement of OCNG Patt Max number of transmission	rpe for RI/ ationIndex dex channel ern HARQ ons on coding		4 1 R.60 TDD OP.1 TDD

- Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).
- Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH.
- Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8.
- Note 5: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.

Table 9.4.1.4.2-2 Minimum requirement (TDD)

Parameter	Test 1
γ	1.8
UE Category	≥1

9.4.1a Void

9.4.1a.1 Void

9.4.1a.1.1 Void

9.4.1a.1.2 Void

9.4.2 Multiple PMI

9.4.2.1 Minimum requirement PUSCH 1-2 (Cell-Specific Reference Symbols)

9.4.2.1.1 FDD

For the parameters specified in Table 9.4.2.1.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in 9.4.2.1.1-2.

Table 9.4.2.1.1-1: PMI test for single-layer (FDD)

Para	meter	Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Propagati	on channel		EPA5
Precoding granularity (only for reporting and following PMI)		PRB	6
	tion and onfiguration		Low 2 x 2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3
power	$ ho_{\scriptscriptstyle B}$	dB	-3
allocation	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporti	ng mode		PUSCH 1-2
	g interval	ms	1
PMI	delay	ms	8
Measurement channel			R.11-3 FDD for UE Category 1, R.11 FDD for UE Category ≥2
OCNG	Pattern		OP.1/2 FDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Note 1:	For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity).		
Note 3:	4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). Cone/two sided dynamic OCNG Pattern OP.1/2		

Table 9.4.2.1.1-2: Minimum requirement (FDD)

FDD as described in Annex A.5.1.1/2 shall be

Parameter	Test 1
γ	1.2
UE Category	≥1

9.4.2.1.2 **TDD**

For the parameters specified in Table 9.4.2.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in 9.4.2.1.2-2.

Table 9.4.2.1.2-1: PMI test for single-layer (TDD)

Para	meter	Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Uplink downlink			1
	uration		•
	subframe uration		4
	on channel		EPA5
	granularity		21710
(only for re following	porting and ng PMI)	PRB	6
Correla	tion and onfiguration		Low 2 x 2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3
power	$ ho_{\scriptscriptstyle B}$	dB	-3
allocation	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting mode			PUSCH 1-2
	g interval	ms	1
PMI	delay	ms	10 or 11
Measurement channel			R.11-3 TDD for UE Category 1 R.11 TDD for UE Category ≥2
OCNG Pattern			OP.1/2 TDD
	er of HARQ		4
	issions		•
	icy version equence		{0,1,2,3}
ACK/NAC	K feedback		Multiplexing
		recoder selection, th	ne precoders
Note 2:	shall be updated in each available downlink transmission instance.		
4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). Note 3: One/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2 shall be used.			attern OP.1/2

Table 9.4.2.1.2-2: Minimum requirement (TDD)

Parameter	Test 1
γ	1.2
UE Category	≥1

9.4.2.2 Minimum requirement PUSCH 2-2 (Cell-Specific Reference Symbols)

9.4.2.2.1 FDD

For the parameters specified in Table 9.4.2.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.2.2.1-2.

Table 9.4.2.2.1-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmiss	sion mode		6
Propagation	on channel		EVA5
Correlation and antenna configuration			Low 4 x 2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-6
power	$ ho_{\scriptscriptstyle B}$	dB	-6
allocation	σ	dB	3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
PMI delay		ms	8
Reporting mode			PUSCH 2-2
Reporting interval		ms	1
Measurement channel			R.14-2 FDD
OCNG Pattern			OP.1/2 FDD
Subband size (k)		RBs	3 (full size)
Number of preferred subbands (M)			5
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Nista di E			a managarahali ba wadatadika

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB

than SF#(n-4), this reported PMI cannot be applied at the downlink before SF#(n+4)

Table 9.4.2.2.1-2: Minimum requirement (FDD)

	Test 1
γ	1.2
UE Category	≥1

9.4.2.2.2 TDD

For the parameters specified in Table 9.4.2.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.2.2.2-2.

Table 9.4.2.2.2-1: PMI test for single-layer (TDD)

Parai	neter	Unit	Test 1
Bandwidth		MHz	10
Transmiss	sion mode		6
	lownlink		1
	uration		<u>'</u>
Special subframe configuration			4
Propagation	on channel		EVA5
	tion and onfiguration		Low 4 x 2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-6
power	$ ho_{\scriptscriptstyle B}$	dB	-6
allocation	σ	dB	3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
PMI delay		ms	10
Reporting mode			PUSCH 2-2
Reporting interval		ms	1
Measurement channel			R.14-2 TDD
OCNG	Pattern		OP.1/2 TDD
Subband	d size (<i>k</i>)	RBs	3 (full size)
Number of preferred subbands (M)			5
Max number of HARQ			4
transmissions			
	cy version equence		{0,1,2,3}
ACK/NACK	K feedback ode		Multiplexing
Note 1: For random precoder selection, the precoders shall be undated in			

Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance.

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Table 9.4.2.2.2-2 Minimum requirement (TDD)

	Test 1
γ	1.15
UE Category	≥1

9.4.2.3 Minimum requirement PUSCH 1-2 (CSI Reference Symbol)

9.4.2.3.1 FDD

For the parameters specified in Table 9.4.2.3.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in 9.4.2.3.1-2.

Table 9.4.2.3.1-1: PMI test for single-layer (FDD)

Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Propagation			EVA5
Precoding (only for reposition following)		PRB	6
Correlat	tion and		Low ULA 4 x 2
Cell-specific sign			Antenna ports 0,1
CSI referer			Antenna ports 15,,18
Beamform			Annex B.4.3
	ie offset $^\prime$ $\Delta_{ exttt{CSI-RS}}$		5/ 1
CSI-RS r signal cor	figuration		8
CodeBookS iction b			0x0000 0000 0000 FFFF
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	Pc	dB	-3
	σ	dB	-3
N_{c}		dB[mW/15kHz]	-98
Reportir			PUSCH 1-2
Reporting		ms	5
PMI	delay	ms	8
Measurement channel			R.45-1 FDD for UE Category 1, R.45 FDD for UE Category ≥2
OCNG Pattern			OP.7 FDD for UE Category 1 OP.1 FDD for UE Category 2-8
Max number			4
Redundan coding s	cy version		{0,1,2,3}

Note 1: For random precoder selection, the precoders shall be updated in each TTI (1 ms granularity).

Note 2: If the UE reports in an available uplink reporting

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

to 2. Vaid

Note 3: Void.

Note 4: PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per

subcarrier at the receiver.

Table 9.4.2.3.1-2: Minimum requirement (FDD)

Parameter	Test 1
γ	1.3
UE Category	≥1

9.4.2.3.2 TDD

For the parameters specified in Table 9.4.2.3.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in 9.4.2.3.2-2.

Table 9.4.2.3.2-1: PMI test for single-layer (TDD)

Parar	neter	Unit	Test 1		
Band		MHz	10		
Transmiss			9		
Uplink downlink configuration			1		
Special s			4		
Propagation			EVA5		
Precoding (only for rep following	granularity porting and	PRB	6		
Antenna co			8 x 2		
Correlation			High, Cross polarized		
Cell-specific			Antenna ports 0,1		
CSI referer			Antenna ports 15,,22		
Beamform	ing model		Annex B.4.3		
CSI-RS per subfram T _{CSI-RS} /	iodicity and e offset		5/ 4		
CSI-RS r			4		
signal configuration CodeBookSubsetRestr iction bitmap			0x0000 0000 001F FFE0 0000 0000 FFFF		
	$ ho_{\scriptscriptstyle A}$	dB	0		
Downlink	$ ho_{\scriptscriptstyle B}$	dB	0		
power allocation	Pc	db	-6		
	σ	dB	-3		
N_{c}	(j) oc	dB[mW/15kHz]	-98		
Reportin			PUSCH 1-2		
Reporting		ms	5 (Note 4)		
PMI delay Measurement channel		ms	10 R.45-1 TDD for UE Category 1, R.45 TDD for UE Category ≥2		
OCNG Pattern			OP.7 TDD for UE Category 1 OP.1 TDD for UE Category 2-8		
Max numbe transm			4		
Redundan coding s	cy version		{0,1,2,3}		
ACK/NACK	K feedback		Multiplexing		
Note 1: For random precoder selection, the precoders					
shall be updated in each TTI (1 ms granularity). Note 2: If the UE reports in an available uplink reporting					

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the

eNB downlink before SF#(n+4).

Note 3: Void.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic

CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted

on uplink SF#3 and #8.

Note 5: Randomization of the principle beam direction

shall be used as specified in B.2.3A.4.

Table 9.4.2.3.2-2: Minimum requirement (TDD)

Parameter	Test 1
γ	3.5
UE Category	≥1

9.4.2.3.3 FDD (with 4Tx enhanced codebook)

For the parameters specified in Table 9.4.2.3.3-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in 9.4.2.3.3-2.

Table 9.4.2.3.3-1 PMI test for dual-layer (FDD)

Parame	ter	Unit	Test 1
Bandwidth		MHz	10
Transmission mode			9
Propagation of			EVA5
Precoding gra			
(only for repor following F		PRB	6
Correlation and			
configura			High XP 4 x 2
Beamforming			Annex B.4.3
Cell-specific re			
signals			Antenna ports 0,1
CSI reference	signals		Antenna ports 15,,18
CSI-RS period	licity and		, ,
subframe offset	T _{CSI-RS}		5/ 1
/ I _{CSI-RS}	8		
CSI-RS referen			8
configura			-
CodeBookSubse			0x0000 0000 FFFF
bitmap)		0000 FFFF 0000
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	Pc	dB	-3
	σ	dB	-3
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reporting r	node		PUSCH1-2
Reporting in		ms	5
PMI delay (I	Note 2)	ms	8
Measurement	channel		R.45-1 FDD for UE Category 1, R.45 FDD
Rank Number of	of PDSCH		for UE Category 2-8 2
Marik Murriber C	, i DOCI I		OP.7 FDD for UE
20112			Category 1
OCNG Pa	ttern		OP.1 FDD for UE
			Category 2-8
Max number of	of HARQ		4
transmiss			4
Redundancy vers	-		{0,1,2,3}
sequenc			
	ndom precod n TTI (1 ms a	•	ecoder shall be updated

in each TTI (1 ms granularity)

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the

eNB downlink before SF#(n+4).

Note 3: Void.

PDSCH_RA= 0 dB, PDSCH_RB= 0 dB in order to have the Note 4: same PDSCH and OCNG power per subcarrier at the receiver.

Randomization of the principle beam direction shall be used Note 5: as specified in B.2.3A.4

Table 9.4.2.3.3-2 Minimum requirement (FDD)

Parameter	Test 1
γ	1.2
UE Category	≥1

9.4.2.3.4 TDD (with 4Tx enhanced codebook)

For the parameters specified in Table 9.4.2.3.4-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in 9.4.2.3.4-2.

Table 9.4.2.3.4-1 PMI test for dual-layer (TDD)

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode			9	
Uplink downlink configuration			1	
Special sub configura			4	
Propagation (EVA5	
Precoding gra				
(only for repor	ting and	PRB	6	
Correlation and configura	l antenna		XP High 4 x 2	
Beamforming			Annex B.4.3	
Cell-specific re			Antenna ports 0,1	
CSI reference			Antenna ports 15,,18	
CSI-RS periodicity and subframe offset T _{CSI-RS}			5/ 4	
CSI-RS reference signal configuration			4	
CodeBookSubse bitmap	CodeBookSubsetRestriction		0x0000 0000 FFFF 0000 FFFF 0000	
	$ ho_{\scriptscriptstyle A}$	dB	0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0	
allocation	Pc	dB	-3	
	σ	dB	-3	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	
Reporting i	mode		PUSCH1-2	
Reporting in		ms	5	
PMI delay (I		ms	10	
Measurement channel			R.61-1 TDD for UE Category 1, R.61 TDD for UE Category 2-8	
Rank Number of PDSCH			2	
OCNG Pa			OP.1 TDD	
Max number of				
transmiss	ions		4	
Redundancy vers	•		{0,1,2,3}	
ACK/NACK feed	back mode		Multiplexing	
Note 1: For random precoder selection, the precoder shall be updated				

Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity)

Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

Note3: One/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.1.1/2 shall be used.

Note 4: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#4 and #9 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#3 and #8.

Note 5: Randomization of the principle beam direction shall be used as specified in B.2.3A.4.

Table 9.4.2.3.4-2 Minimum requirement (TDD)

Parameter	Test 1
γ	1.2
UE Category	≥1

9.4.3 Void 9.4.3.1 Void

9.4.3.1.1 Void

9.4.3.1.2 Void

9.5 Reporting of Rank Indicator (RI)

The purpose of this test is to verify that the reported rank indicator accurately represents the channel rank. The accuracy of RI (CQI) reporting is determined by the relative increase of the throughput obtained when transmitting based on the reported rank compared to the case for which a fixed rank is used for transmission. Transmission mode 4 is used with the specified CodebookSubSetRestriction in section 9.5.1, transmission mode 9 is used with the specified CodebookSubSetRestriction in section 9.5.2 and transmission mode 3 is used with the specified CodebookSubSetRestriction in section 9.5.3, and transmission mode 10 is used with the specified CodebookSubSetRestriction in section 9.5.5.

For fixed rank 1 transmission in sections 9.5.1, 9.5.2 and 9.5.5, the RI and PMI reporting is restricted to two single-layer precoders, For fixed rank 2 transmission in sections 9.5.1, 9.5.2 and 9.5.5, the RI and PMI reporting is restricted to one two-layer precoder, For follow RI transmission in sections 9.5.1 and 9.5.2, the RI and PMI reporting is restricted to select the union of these precoders. Channels with low and high correlation are used to ensure that RI reporting reflects the channel condition.

For fixed rank 1 transmission in section 9.5.3, the RI reporting is restricted to single-layer, for fixed rank 2 transmission in section 9.5.3, the RI reporting is restricted to two-layers. For follow RI transmission in section 9.5.3, the RI reporting is either one or two layers.

9.5.1 Minimum requirement (Cell-Specific Reference Symbols)

9.5.1.1 FDD

The minimum performance requirement in Table 9.5.1.1-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.1.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.1.1-2.

Table 9.5.1.1-1: RI Test (FDD)

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz	10		
PDSCH transmission mode			4		
ρ		dB	-3		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3		
	σ	dB		0	
Propagation condit antenna configur				2 x 2 EPA5	
CodeBookSubsetRe bitmap	estriction		01000	11 for fixed RI = 1 00 for fixed RI = 2 for UE reported	2
Antenna correla	ation		Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=1 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of transmission			1		
Reporting mo	de		PUCCH 1-1 (Note 4)		
Physical channel for reporting	CQI/PMI		PUCCH Format 2		
PUCCH Report Ty CQI/PMI	PUCCH Report Type for		2		
Physical channel for RI reporting			PUSCH (Note 3)		
PUCCH Report Type for RI			3		
Reporting period		ms		$N_{pd}=5$	<u></u>
PMI and CQI d		ms		8	
cqi-pmi-Configurati			6		
ri-Configuration	nInd		(:::	1 (Note 5)	DMI

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
- Note 2: Reference measurement channel RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
- Note 3: To avoid collisions between RI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
- Note 4: The bit field for precoding information in DCI format 2 shall be mapped as:
 - For reported RI = 1 and PMI = 0 >> precoding information bit field index = 1
 - For reported RI = 1 and PMI = 1 >> precoding information bit field index = 2
 - For reported RI = 2 and PMI = 0 >> precoding information bit field index = 0
- Note 5: To avoid the ambiguity of TE behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the TE with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

Table 9.5.1.1-2: Minimum requirement (FDD)

	Test 1	Test 2	Test 3
29	N/A	1.05	0.9
72	1	N/A	N/A
UE Category	≥2	≥2	≥2

9.5.1.2 TDD

The minimum performance requirement in Table 9.5.1.2-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.1.2-2.

Table 9.5.1.2-1: RI Test (TDD)

Parameter		Unit	Test 1	Test 2	Test 3
Bandwidth		MHz		10	
PDSCH transmission mode				4	
Downlink nower	Downlink power allocation ρ_A			-3	
			-3		
	σ	dB		0	
Uplink downlink conf	figuration			2	
Special subfra configuration				4	
Propagation condit antenna configur				2 x 2 EPA5	
CodeBookSubsetRe	estriction		000011 for fixed RI = 1		
bitmap			010000 for fixed RI = 2 010011 for UE reported RI		
Antenna correlation			Low	Low	High
RI configuration			Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=1 and follow RI
SNR		dB	0	20	20
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78
Maximum number of HARQ transmissions			1		
Reporting mode			PUSCH 3-1 (Note 3)		
Reporting inter	val	ms	5		
	PMI and CQI delay		10 or 11		
ACK/NACK feedback	ck mode		Bundling		-

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.

Table 9.5.1.2-2: Minimum requirement (TDD)

	Test 1	Test 2	Test 3
21	N/A	1.05	0.9
72	1	N/A	N/A
UE Category	≥2	≥2	≥2

9.5.2 Minimum requirement (CSI Reference Symbols)

9.5.2.1 FDD

The minimum performance requirement in Table 9.5.2.1-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.2.1-2.

Table 9.5.2.1-1: RI Test (FDD)

Parameter		Unit	Test 1	Test 2	Test 3			
Bandwidth		MHz		10				
PDSCH transmission	on mode			9				
	$ ho_{\scriptscriptstyle A}$	dB		0				
Downlink power $ ho_{\!\scriptscriptstyle B}$		dB		0				
allocation	Pc	dB		0				
	σ	dB		0				
Propagation condit antenna configur				2 x 2 EPA5				
Cell-specific reference			Aı	ntenna ports 0				
Beamforming M				ified in Section B.	4.3			
CSI reference si				enna ports 15, 16	-			
CSI-RS periodicit subframe offs $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-II}}$	y and et			5/1				
CSI reference si configuration	•			6				
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI					
Antenna correlation			Low	Low	High			
RI configuration	RI configuration		Fixed RI=2 and follow RI	Fixed RI=1 and follow RI	Fixed RI=1 and follow RI			
SNR		dB	0	20	20			
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98			
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78			
Maximum number o				1				
Reporting mo	de			PUCCH 1-1				
Physical channel for reporting			Pl	JSCH (Note 3)				
PUCCH Report Ty	pe for		2					
Physical channel reporting	for RI		PUCCH Format 2					
PUCCH Report Type for RI				3				
Reporting periodicity		ms	$N_{\rm pd} = 5$					
PMI and CQI de		ms	8					
cqi-pmi-Configurati			2					
ri-Configuration			1 (Note 4)					
Note 1: If the UE reports in an available uplink reporting instance at subframe SE#n based on PMI and								

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
- Note 2: Reference measurement channel RC.9 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
- Note 3: To avoid collisions between CQI/ PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/ PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5
- Note 4: To avoid the ambiguity of TE behaviour when applying CQI and PMI during rank switching, RI reports are to be applied at the TE with one subframe delay in addition to Note 1 to align with CQI and PMI reports.

Table 9.5.2.1-2: Minimum requirement (FDD)

	Test 1	Test 2	Test 3
21	N/A	1.05	0.9
72	1	N/A	N/A
UE Category	≥2	≥2	≥2

9.5.2.2 TDD

The minimum performance requirement in Table 9.5.2.2-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.2.2-2.

Table 9.5.2.2-1: RI Test (TDD)

Parameter		Unit	Test 1	Test 2	Test 3		
Bandwidth		MHz		10			
PDSCH transmission	on mode			9			
	$ ho_{\scriptscriptstyle A}$	dB	0				
Downlink power	$\rho_{\scriptscriptstyle B}$	dB	0				
allocation	Pc	dB		0			
	σ	dB		0			
Uplink downlink con		uБ		1			
Special subfra							
configuration				4			
Propagation condit							
antenna configui				2 x 2 EPA5			
Cell-specific reference			A	ntenna ports 0			
CSI reference si			Ante	enna ports 15, 16			
Beamforming M	lodel		As spec	ified in Section B.	4.3		
CSI reference s				4			
configuration				4			
CSI-RS periodicit							
subframe offs			5/4				
$T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$			000044 for five I DI - 4				
CodeBookSubsetRestriction			000011 for fixed RI = 1				
bitmap			010000 for fixed RI = 2 010011 for UE reported RI				
Antenna correlation			Low Low High				
			Fixed RI=2 and	Fixed RI=1	Fixed RI=1		
RI configuration	on		follow RI	and follow RI	and follow RI		
SNR		dB	0	20	20		
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98		
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78		
Maximum number of	of HARQ			4			
transmission	IS		1				
Reporting mo				PUCCH 1-1			
Physical channel for	CQI/ PMI		DI	JSCH (Note 3)			
reporting			Г	Joci i (Note 3)			
PUCCH report type PMI	for CQI/			2			
Physical channel for RI			PL	ICCH Format 2			
reporting Reporting periodicity		ms		$N_{pd} = 5$			
PMI and CQI delay		ms		10			
ACK/NACK feedba		1110		Bundling			
cqi-pmi-Configurati				4			
ri-Configuration				1			
Note 1: If the LIE reports in an available unlink reporting instance at subframe SE#n based on PMI and					od on BMI and		

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on PMI and CQI estimation at a downlink subframe not later than SF#(n-4), this reported PMI and wideband CQI cannot be applied at the eNB downlink before SF#(n+4).

Note 2: Reference measurement channel RC.9 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#3 and #8.

Table 9.5.2.2-2: Minimum requirement (TDD)

	Test 1	Test 2	Test 3
74	N/A	1.05	0.9
72	1	N/A	N/A
UE Category	≥2	≥2	≥2

9.5.3 Minimum requirement (CSI measurements in case two CSI subframe sets are configured)

9.5.3.1 FDD

The minimum performance requirement in Table 9.5.3.1-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$

For the parameters specified in Table 9.5.3.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.3.1-2.

Table 9.5.3.1-1: RI Test (FDD)

			Te	est 1	Tes	st 2
Parameter		Unit	Cell 1	Cell 2	Cell 1 Cell 2	
Bandwidth		MHz		10	1	
PDSCH transmissio	n mode		3	Note 10	3	Note 10
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		-3	-:	
allocation	$ ho_{\scriptscriptstyle B}$	dB		-3	-;	3
	σ	dB		0	()
Propagation conditi antenna configur			2 x 2	2 EPA5	2 x 2	EPA5
CodeBookSubsetRestriction bitmap			01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A	01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A
Antenna correla	tion			_OW	Lo)W
RI configuration			Fixed RI=1 and follow RI	N/A	Fixed RI=1 and follow RI	N/A
\widehat{E}_s/N_{oc2}		dB	0	-12	20	6
	$N_{oc1}^{(j)}$		-98 (Note 3)	N/A	-102 (Note 3)	N/A
$N_{oc}^{(j)}$	$N_{\text{oc}2}^{(j)}$	dBmW/15kH z	-98 (Note 4)	N/A	-98 (Note 4)	N/A
	$N_{\text{oc}3}^{(j)}$	dB[mW/15k	-98 (Note 5)	N/A	-94.8 (Note 5)	N/A
$\hat{I}_{or}^{(j)}$	$\hat{I}_{or}^{(j)}$		-98	-110	-78	-92
Subframe Configu	ration		Non- MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN
Cell Id	- 0-11-		0 5 (1	0	1
Time Offset betwee		μѕ	N/A	10000000 10000000 10000000 10000000 1000000	2.5 (synchro	1000000 1000000 1000000 1000000 1000000
RLM/RRM Measur Subframe Pattern (l			1000000 1000000 1000000 1000000 1000000	N/A	1000000 1000000 1000000 1000000 1000000	N/A
CSI Subframe Sets (Note 8)	C _{CSI,0}		10000000 10000000 10000000 10000000 0111111	N/A	10000000 10000000 10000000 10000000 1000000	N/A
	C _{CSI,1}		01111111 01111111 01111111		01111111 011111111 011111111 011111111	
Number of control Symbols	OFDM		3	3	3	3
Maximum number o				1	1	<u>. </u>
Reporting mod	de		PUC	CH 1-0	PUCC	H 1-0
Physical channel for	or CQI		PUCCH	l Format 2	PUCCH	Format 2
reporting PUCCH Report Type	for CQI			4		1
		•				

Physical	channel for RI reporting		PUCCH	Format 2	PUCCH	Format 2
PUCC	CH Report Type for RI		3	3	3	3
Re	eporting periodicity	ms	N _{pd} =	= 10	N _{pd} =	= 10
cqi-pi	mi-ConfigurationIndex		1	1	1	1
ri	-ConfigurationInd		5	;	Į.	5
cqi-pn	ni-ConfigurationIndex2		1	0	1	0
ri-	·ConfigurationInd2		2)	2	2
	Cyclic prefix		Normal	Normal	Normal	Normal
Note 1:	If the UE reports in an av	ailable uplink re	eporting instance	e at subframe	SF#n based on C	QI estimation at
	a downlink subframe not	later than SF#(n-4), this report	ed wideband C	CQI cannot be app	lied at the eNB
	downlink before SF#(n+4	4).	•			
Note 2:	Reference measuremen	t channel in Cell	11 RC.2 FDD a	ccording to Tal	ble A.4-1 with one	sided dynamic
	OCNG Pattern OP.1 FD	D as described i	in Annex A.5.1.	1.		•
Note 3:	This noise is applied in 0	OFDM symbols a	#1, #2, #3, #5, #	#6, #8, #9, #10	,#12, #13 of a sub	oframe
	overlapping with the agg	ressor ABS.				
Note 4:	This noise is applied in (OFDM symbols a	#0, #4, #7, #11	of a subframe	overlapping with t	he aggressor
	ABS.					
Note 5:	This noise is applied in a	II OFDM symbo	ls of a subfram	e overlapping v	with aggressor noi	n-ABS
Note 6:	ABS pattern as defined i	n [9].				
Note 7:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].					
Note 8:	· · · · · · · · · · · · · · · · · · ·					
	measurements defined in	n [7].				
Note 9:	Cell 1 is the serving cell.	Cell 2 is the ag	gressor cell. Th	e number of th	e CRS ports in Ce	ell 1 and Cell 2
		•	-		•	

Table 9.5.3.1-2: Minimum requirement (FDD)

Note 10: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as

	Test 1	Test 2
29	0.9	1.05
UE Category	≥2	≥2

9.5.3.2 TDD

is the same.

defined in Annex A.5.1.5.

The minimum performance requirement in Table 9.5.3.2-2 is defined as

a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$.

For the parameters specified in Table 9.5.3.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.3.2-2.

Table 9.5.3.2-1: RI Test (TDD)

		Unit	Test1		Test2	
Parameter			Cell 1	Cell 2	Cell 1	Cell 2
Bandwidth	n mada	MHz	3	0 Note 11	3	
PDSCH transmission Uplink downlink conf			3		<u> </u>	Note 11
Special subfra	me					
configuration		15		-		
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	-(-3	
allocation	$ ho_{\scriptscriptstyle B}$	dB	-:	_	-3	
Propagation condit	σ ion and	dB	C		0	
antenna configur			2 x 2 l	EPA5	2 x 2 l	EPA5
CodeBookSubsetRe bitmap	estriction		01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A	01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A
Antenna correla	ition		Lo)W	Lo	W
RI configuration			Fixed RI=1 and follow RI	N/A	Fixed RI=1 and follow RI	N/A
\widehat{E}_s/N_{oc2}		dB	0	-12	20	6
	$N_{oc1}^{(j)}$		-98 (Note 4)	N/A	-102 (Note 4)	N/A
$N_{oc}^{(j)}$	$N_{\text{oc}2}^{(j)}$	dB[mW/15k Hz]	-98 (Note 5)	N/A	-98 (Note 5)	N/A
	$N_{\text{oc}3}^{(j)}$		-98 (Note 6)	N/A	-94.8 (Note 6)	N/A
$\hat{I}_{or}^{(j)}$		dB[mW/15k Hz]	-98	-110	-78	-92
Subframe Configu	ıration		Non- MBSFN	Non- MBSFN	Non-MBSFN	Non-MBSFN
Cell Id			0 1 2.5 (synchronous		0 1	
Time Offset between	en Cells	μs	cells)		2.5 (synchronous cells)	
ABS Pattern (No	te 7)		N/A	0000000 001 0000000 001	N/A	000000001 000000001
RLM/RRM Measur Subframe Pattern (00000000 01 00000000 01	N/A	0000000001 0000000001	N/A
CSI Subframe Sets	C _{CSI,0}		00000000 01 00000000 01	N/A	0000000001 0000000001	N/A
(Note 9)	C _{CSI,1}		11001110 00 11001110 00		1100111000 1100111000	IWA
Number of control Symbols	OFDM		3	3	3	3
Maximum number of			1		1	
transmission						
Reporting mo			PUCC		PUCCH 1-0 PUCCH Format 2	
and RI reporti	ng		PUCCH			
PUCCH Report Type	e for CQI	<u> </u>	4	+	4	

Physical channel for C _{CSI,1} CQI and RI reporting		PUSCH (Note 3)		PUSCH (Note 3)	
PUCCH Report Type for RI		;	3	3	3
Reporting periodicity	ms	ms $N_{pd}=10$		N _{pd} = 10	
ACK/NACK feedback mode		Multiplexing		Multiplexing	
cqi-pmi-ConfigurationIndex		8		8	
ri-ConfigurationInd		5		5	
cqi-pmi-ConfigurationIndex2		9		9	
ri-ConfigurationInd2		0		()
Cyclic prefix		Normal	Normal	Normal	Normal

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
- Note 2: Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 3: To avoid collisions between RI/CQI reports and HARQ-ACK it is necessary to report them on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI/CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
- Note 4: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS
- Note 5: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 6: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 7: ABS pattern as defined in [9].
- Note 8: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7].
- Note 9: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 10: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell 1 and Cell 2 is the same.
- Note 11: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.2.5.

Table 9.5.3.2-2: Minimum requirement (TDD)

	Test 1	Test 2
74	0.9	1.05
UE Category	≥2	≥2

9.5.4 Minimum requirement (CSI measurements in case two CSI subframe sets are configured and CRS assistance information are configured)

9.5.4.1 FDD

For the parameters specified in Table 9.5.4.1-1, the minimum performance requirement in Table 9.5.4.1-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_{1}$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

In Table 9.5.4.1-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggresso cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Table 9.5.4.1-1: RI Test (FDD)

Parameter	Parameter		Cell 1	Cell 2	Cell 3
Bandwidth		MHz	10	10	10
PDSCH transmissio	n mode		3	As defined in Note 1	As defined in Note 1
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3	-3	-3
	σ	dB	0	N/A	N/A
Propagation conditi antenna configura			2x2 EPA5 (Note 2)	2×2 EPA5 (Note 2)	2x2 EPA5 (Note 2)
CodeBookSubsetRe bitmap			01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	As defined in Note 1	As defined in Note 1
	N_{oc1}	dB[mW/15k Hz]	-98 (Note 3)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dB[mW/15k Hz]	-98 (Note 4)	N/A	N/A
	N_{oc3}	dB[mW/15k Hz]	-93 (Note 5)	N/A	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 9.5.4.1-2 for each test	12	10
$\hat{I}_{or}^{(j)}$		dB[mW/15k Hz]	Reference Value in Table 9.5.4.1-2 for each test	-86	-88
Subframe Configuration			Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset between Cells		μs	N/A	3	-1
Frequency shift between Cells		Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (No	ABS pattern (Note 6)		N/A	1000000 1000000 1000000 1000000 1000000	1000000 1000000 1000000 1000000 1000000
RLM/RRM Measur Subframe Pattern (I			10000000 10000000 10000000 10000000	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		10000000 10000000 10000000 10000000 1000000	N/A	N/A
(Note 8)	C _{CSI,1}		01111111 01111111 01111111 01111111 0111111	N/A	N/A
Number of control OFDM symbols			3	Note 9	Note 9
Maximum number o			1	N/A	N/A
transmissions Reporting mode			PUCCH 1-0	N/A	N/A
Physical channel for			PUCCH format 2	N/A	N/A
reporting PUCCH Report Type	for COI		4	N/A	N/A
Physical channel for R			PUCCH Format 2	N/A	N/A
PUCCH Report Typ			3	N/A	N/A
Reporting period		ms	<i>N_{pd}</i> = 10	N/A	N/A

cqi-pn	ni-ConfigurationIndex		11	N/A	N/A	
ri-	ConfigurationInd		5	N/A	N/A	
cqi-pm	i-ConfigurationIndex2		10	N/A	N/A	
ri-0	ConfigurationInd2		2	N/A	N/A	
	Cyclic prefix		Normal	Normal	Normal	
Note 1:	Downlink physical chan pattern OP.5 FDD as de			Annex C.3.3 app	lying OCNG	
Note 2:	The propagation conditi	ons for Cell 1, C	ell 2 and Cell 3 are s	tatistically indeper	ndent.	
Note 3:	This noise is applied in	OFDM symbols	#1, #2, #3, #5, #6, #8	3, #9, #10,#12, #1	3 of a subframe	
	overlapping with the age					
Note 4:	This noise is applied in	OFDM symbols	#0, #4, #7, #11 of a s	subframe overlapp	ing with the	
	aggressor ABS.					
Note 5:	This noise is applied in					
Note 6:	ABS pattern as defined					
	PDCCH/PCFICH are tra					
	overlapped with the AB		ggressor cell and the	subframe is availa	able in the	
	definition of the reference					
Note 7:	Time-domain measuren	nent resource re	striction pattern for P	Cell measuremen	ts as defined in	
	[7]					
Note 8:	As configured according		nain measurement re	source restriction	pattern for CSI	
	measurements defined					
Note 9:	The number of control (s not available for AB	BS and is 3 for the	subframe	
	indicated by "0" of ABS					
Note 10:	If the UE reports in an a					
	estimation at a downlink			is reported wideb	and CQI cannot	
	be applied at the eNB d					
Note 11:						
	dynamic OCNG Pattern					
Note 12:				e same.		
Note 13:	SIB-1 will not be transm	itted in Cell2 an	d Cell 3 in this test.			

Table 9.5.4.1-2: Minimum requirement (FDD)

	Test 1	Test 2	Test 3
\hat{E}_s/N_{oc2} for Cell 1 (dB)	4	20	20
$\hat{I}_{or}^{(j)}$ for Cell 1 (dB[mW/15kHz])	-94	-78	-78
Antenna correlation	High for Cell 1, low for Cell 2 and Cell 3	Low for Cell 1, Cell 2 and Cell 3	High for Cell 1, low for Cell 2 and Cell 3
74	N/A	1.05	0.9
72	1.05	N/A	N/A
UE Category	≥2	≥2	≥2

9.5.4.2 TDD

For the parameters specified in Table 9.5.4.2-1, the minimum performance requirement in Table 9.5.4.2-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_{l;}$
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

In Table 9.5.4.2-1, Cell 1 is the serving cell, and Cell 2 and Cell 3 are the aggresso cells. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 and Cell 3 is according to Annex C.3.3, respectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Table 9.5.4.2-1: RI Test (TDD)

Parameter		Unit	Cell 1	Cell 2	Cell 3
Bandwidth		MHz	10	10	10
PDSCH transmissio	n mode		3	As defined in Note 1	As defined in Note 1
Uplink downlink conf	nuration		1	1	1
Special subframe con			4	4	4
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3	-3	-3
anodaton	σ	dB	0	N/A	N/A
Propagation conditi			2×2 EPA5 (Note	2×2 EPA5	2x2 EPA5
antenna configur CodeBookSubsetRe bitmap			2) 01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	(Note 2) As defined in Note 1	(Note 2) As defined in Note 1
	N_{oc1}	dB[mW/15k Hz]	-98 (Note 3)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dB[mW/15k Hz]	-98 (Note 4)	N/A	N/A
	N_{oc3}	dB[mW/15k Hz]	-93 (Note 5)	N/A	N/A
\hat{E}_s/N_{oc2}		dB	Reference Value in Table 9.5.4.2-2 for each test	12	10
$\hat{I}_{or}^{(j)}$	$\hat{I}_{or}^{(j)}$		Reference Value in Table 9.5.4.2-2 for each test	-86	-88
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift between	een Cells	Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (No	te 6)		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Measur Subframe Pattern (I			0000000001 0000000001	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		0000000001 0000000001	N/A	N/A
(Note 8)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
Number of control symbols	OFDM		3	Note 9	Note 9
Maximum number o transmissions			1	N/A	N/A
Reporting mod			PUCCH 1-0	N/A	N/A
Physical channel for 0 and RI reportir	C _{CSI,0} CQI		PUCCH format 2	N/A	N/A
Physical channel for C _{CSI,1} CQI and RI reporting			PUSCH (Note 14)	N/A	N/A
PUCCH Report Type for CQI			4	N/A	N/A
PUCCH Report Type for RI			3	N/A	N/A
Reporting periodicity		ms	N _{pd} = 10	N/A	N/A
ACK/NACK feedback mode			Multiplexing	N/A	N/A
cqi-pmi-Configuratio			8	N/A	N/A
ri-Configuration			5	N/A	N/A
cqi-pmi-Configuratio			9	N/A	N/A
ri-Configuration			0 Normal	N/A	N/A
Cyclic prefix			Normal	Normal	Normal

- Note 1: Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern OP.5 TDD as defined in Annex A.5.2.5.
- Note 2: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
- Note 3: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
- Note 4: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
- Note 5: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
- Note 6: ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
- Note 7: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
- Note 8: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
- Note 9: The number of control OFDM symbols is not available for ABS and is 3 for the subframe indicated by "0" of ABS pattern.
- Note 10: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
- Note 11: Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
- Note 12: The number of the CRS ports in Cell1. Cell2 and Cell 3 is the same.
- Note 13: SIB-1 will not be transmitted in Cell2 and Cell 3 in this test.
- Note 14: To avoid collisions between RI/CQI reports and HARQ-ACK it is necessary to report them on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic RI/CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Table 9.5.4.2-2: Minimum requirement (TDD)

	Test 1	Test 2	Test 3
\hat{E}_s/N_{oc2} for Cell 1 (dB)	4	20	20
$\hat{I}_{or}^{(j)}$ for Cell 1 (dB[mW/15kHz])	-94	-78	-78
Antenna correlation	High for Cell 1, low for Cell 2 and Cell 3	Low for Cell 1, Cell 2 and Cell 3	High for Cell 1, low for Cell 2 and Cell 3
74	N/A	1.05	0.9
72	1.05	N/A	N/A
UE Category	≥2	≥2	≥2

9.5.5 Minimum requirement (with CSI process)

Each CSI process is associated with a CSI-RS resource and a CSI-IM resource as shown in Table 9.5.5-1.

For UE supports one CSI process, CSI process 0 is configured for Test 1 and Test 2, but CSI process 1 is not configured for Test 2. The corresponding γ requirements for Test 1 and Test 2 shall be fulfilled. The requirement on reported RI for CSI process 1 in Test 2 is not applicable.

For UE supports multiple CSI processes, CSI process 0 is configured for Test 1 and CSI processes 0 and 1 are configured for Test 2. The corresponding γ requirements for Test 1 and Test 2 shall be fulfilled, and also the requirement on reported RI for CSI process 1 in Test 2.

Table 9.5.5-1: Configuration of CSI processes

	CSI process 0	CSI process 1
CSI-RS resource	CSI-RS signal 0	CSI-RS signal 1
CSI-IM resource	CSI-IM resource 0	CSI-IM resource 1

9.5.5.1 FDD

The minimum performance requirement in Table 9.5.5.1-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;
- c) For Test 2, the RI reported for CSI process 1 shall be the same as the most recent RI reported for CSI process 0 if UE is configured with multiple CSI processes.

For the parameters specified in Table 9.5.5.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.5.1-2.

Table 9.5.5.1-1: RI Test (FDD)

			Tes	ct 1	To	st 2
Para	meter	Unit	TP1	TP2	TP1 TP2	
Bandwidth		MHz		MHz	10 MHz	
Transmission mode			10	10	10	10
$ ho_{\scriptscriptstyle A}$		dB		0	()
Downlink power	$ ho_{\scriptscriptstyle B}$	dB		0	()
allocation	P_c	dB	0	0	0	0
	σ	dB		0	()
SNR		dB	0	0	20	20
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-98	-78	-78
$N_{oc}^{(j)}$		dB[mW/15kHz]	-6	98	-9	98
Propagation channe	el		EPA 5 Low	EPA 5 Low	EPA 5 Low	EPA 5 High
Antenna configuration	on		2x2	2x2	2x2	2x2
Beamforming Mode				Section B.4.3	•	Section B.4.3
Timing offset between		us		0)
Frequency offset be Cell-specific referen		Hz		o ports 0		o ports 0
	ice signais		Antenna ports		Antenna ports	
CSI-RS signal 0			15,16	N/A	15,16	N/A
CSI-RS 0 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		5/1	N/A	5/1	N/A
CSI-RS 0 configurat	tion		0	N/A	0	N/A
CSI-RS signal 1			N/A	Antenna ports 15,16	N/A	Antenna ports 15,16
CSI-RS 1 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		N/A	5/1	N/A	5/1
CSI-RS 1 configurat	tion		N/A	3	N/A	3
Zero-power CSI-RS 0 configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap			N/A	1 / 10000010000 00000	N/A	1] / 10000010000 00000
Zero-power CSI-RS I _{CSI-RS} / ZeroPowerC	CSI-RS bitmap		1 / 00110000000 00000	N/A	1 / 00110000000 00000	N/A
CSI-IM 0 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		5/1	N/A	5/1	N/A
CSI-IM 0 configurati	on		2	N/A	2	N/A
CSI-IM 1 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		N/A	5/1	N/A	5/1
CSI-IM 1 configurati	on		N/A	6	N/A	6
RI configuration			Fixed RI=2	N/A	Fixed RI=1	N/A
- Til Gormigaradori			and follow RI	1471	and follow RI	
Physical channel for	r CQI/PMI reporting		PUSCH (Note 6)	N/A	PUSCH (Note 6)	PUSCH (Note 6)
PUCCH Report Typ	e for CQI/PMI		2	N/A	2	2
Physical channel for	r RI reporting		PUCCH	N/A	PUCCH	PUCCH
PUCCH Report Typ			Format 2	N/A	Format 2	Format 2
т оссттерон тур	CSI-RS		CSI-RS 0	N/A N/A	CSI-RS 0	3 N/A
	CSI-IM		CSI-IM 0	N/A	CSI-IM 0	N/A
	Reporting mode		PUCCH 1-1	N/A	PUCCH 1-1	N/A
CSI process 0	Reporting periodicity	ms	$N_{pd} = 5$	N/A	$N_{\rm pd} = 5$	N/A
(Note 7)	CQI delay	ms	8	N/A	10	N/A
	cqi-pmi- ConfigurationIndex		6	N/A	6	N/A
	ri-ConfigIndex		1	N/A	1	N/A
	CSI-RS		N/A	N/A	N/A	CSI-RS 1
CSI process 1	CSI-IM		N/A	N/A	N/A	CSI-IM 1
(Note 7, Note 9)	Reporting mode		N/A	N/A	N/A	PUCCH 1-1
,	Reporting periodicity	ms	N/A	N/A	N/A	$N_{pd} = 5$

CQI delay	ms	N/A	N/A	N/A	10
cqi-pmi- ConfigurationIndex		N/A	N/A	N/A	4
ri-ConfigIndex		N/A	N/A	N/A	1
CSI process for PDSCH scheduling		CSI pro	ocess 0	CSI pro	ocess 0
Cell ID		0	6	0	6
Quasi-co-located CSI-RS		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1
Quasi-co-located CRS		Same Cell ID	Same Cell ID	Same Cell ID	Same Cell ID
Quasi-co-located CN3		as Cell 1	as Cell 2	as Cell 1	as Cell 2
PMI for subframe 2, 3, 4, 7, 8 and 9		010000 for fixed RI = 2 010011 for UE reported RI	100000	000011 for fixed RI = 1 010011 for UE reported RI	N/A
PMI for subframe 1 and 6		100000	100000	100000	N/A
Max number of HARQ transmissions		1	N/A	1	N/A

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: 3 symbols allocated to PDCCH
- Note 3: Reference measurement channel RC.13 FDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 2, 3, 4, 7, 8 and 9 from TP1.
- Note 4: TM10 OCNG as specified in A.5.1.8 is transmitted on subframe 1 and 6 from TP1.
- Note 5: TM10 OCNG as specified in A.5.1.8 is transmitted on subframe 1, 2, 3, 4, 6, 7, 8 and 9 from TP2 for Test 1; TP2 is blanked for Test 2.
- Note 6: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#0 and #5.
- Note 7: If UE supports multiple CSI processes, CSI process 0 is configured as 'RI-reference CSI process' for CSI process 1.
- Note 8: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#1 and #6 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#0 and #5.
- Note 9: If UE supports one CSI process, CSI process 1 is not configured in Test 2.

Table 9.5.5.1-2: Minimum requirement (FDD)

	Test 1	Test 2
71	N/A	1.0
72	1.0	N/A
UE Category	≥2	≥2

9.5.5.2 TDD

The minimum performance requirement in Table 9.5.5.2-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;
- c) For Test 2, the RI reported for CSI process 1 shall be the same as the most recent RI reported for CSI process 0 if UE is configured with multiple CSI processes.

For the parameters specified in Table 9.5.5.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.5.2-2.

Table 9.5.5.2-1: RI Test (TDD)

Parameter		l lm!s	Test 1		Test 2	
Para	meter	Unit	TP1	TP2	TP1	TP2
Bandwidth		MHz		ИHz		ИHz
Transmission mode	T		10 10		10 10	
$ ho_{\scriptscriptstyle A}$		dB	0		0	
Downlink power	Downlink power $\rho_{\scriptscriptstyle B}$		()	()
allocation	P_c	dB	0	0	0	0
	σ	dB	()	()
Uplink downlink conf	·		2	2	2	2
Special subframe co	nfiguration		4	4	4	4
SNR		dB	0	0	20	20
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-98	-78	-78
$N_{oc}^{(j)}$		dB[mW/15kHz]	-9	98	-9	98
Propagation channe			EPA 5 Low	EPA 5 Low	EPA 5 Low	EPA 5 High
Antenna configuration	on		2x2	2x2	2x2	2x2
Beamforming Model	TD		· · · · · · · · · · · · · · · · · · ·	Section B.4.3		Section B.4.3
Timing offset between Frequency offset between		us Hz		<u>) </u>))
Cell-specific reference		ПД	Antenna	·	Antenna	
	ce signais		Antenna ports		Antenna ports	
CSI-RS signal 0	and subfaces offers		15,16	N/A	15,16	N/A
$T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		5/3	N/A	5/3	N/A
CSI-RS 0 configurat	ion		0	N/A	0	N/A
CSI-RS signal 1			N/A	Antenna ports 15,16	N/A	Antenna ports 15,16
CSI-RS 1 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		N/A	5/3	N/A	5/3
CSI-RS 1 configurat	ion		N/A	3	N/A	3
Zero-power CSI-RS I _{CSI-RS} / ZeroPowerC			N/A	3 / 10000010000 00000	N/A	3 / 10000010000 00000
Zero-power CSI-RS I _{CSI-RS} / ZeroPowerC	SI-RS bitmap		3 / 00110000000 00000	N/A	3 / 00110000000 00000	N/A
CSI-IM 0 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		5/3	N/A	5/3	N/A
CSI-IM 0 configuration			2	N/A	2	N/A
CSI-IM 1 periodicity $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	and subframe offset		N/A	5/3	N/A	5/3
CSI-IM 1 configuration	on		N/A	6	N/A	6
RI configuration			Fixed RI=2 and follow RI	N/A	Fixed RI=1 and follow RI	N/A
-	CSI-RS		CSI-RS 0	N/A	CSI-RS 0	N/A
	CSI-IM		CSI-IM 0	N/A	CSI-IM 0	N/A
CSI process 0	Reporting mode		PUSCH 3-1	N/A	PUSCH 3-1	N/A
(Note 6, 7)	Reporting Interval	ms	5	N/A	5	N/A
	CQI delay	ms	11	N/A	11	N/A
	CSI-RS		N/A	N/A	N/A	CSI-RS 1
CSI process 1	CSI-IM		N/A	N/A	N/A	CSI-IM 1
(Note 6, 7, 8)	Reporting mode		N/A	N/A	N/A	PUSCH 3-1
Reporting Interval		ms	N/A	N/A	N/A N/A	5 11
CSI process for PDSCH scheduling		ms	N/A CSI pro	N/A ocess 0		ocess 0
Cell ID			0	6	0 0	6
Quasi-co-located CS	SI-RS		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1
Quasi-co-located CF			Same Cell ID	Same Cell ID	Same Cell ID	Same Cell ID
			as Cell 1	as Cell 2	as Cell 1	as Cell 2
PMI for subframe 4 a	and 9		010000 for	100000	000011 for	N/A

	fixed RI = 2		fixed RI = 1	
	010011 for UE		010011 for UE	
	reported RI		reported RI	
PMI for subframe 3 and 8	100000	100000	100000	N/A
Max number of HARQ transmissions	1	N/A	1	N/A
ACK/NACK feedback mode	Multiplexing	N/A	Multiplexing	N/A

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: 3 symbols allocated to PDCCH
- Note 3: Reference measurement channel RC.13 TDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 4 and 9 from TP1.
- Note 4: TM10 OCNG as specified in A.5.2.8 is transmitted on subframe 3 and 8 from TP1.
- Note 5: TM10 OCNG as specified in A.5.2.8 is transmitted on subframe 3, 4, 8 and 9 from TP2 for Test 1; TP2 is blanked for Test
- Note 6: Reported wideband CQI and PMI are used and sub-band CQI is discarded.
- Note 7: If UE supports multiple CSI processes, CSI process 0 is configured as 'RI-reference CSI process' for CSI process 1.
- Note 8: If UE supports one CSI process, CSI process 1 is not configured in Test 2.
- Note 9: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3and #8 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#7 and #2.

Table 9.5.5.2-2: Minimum requirement (TDD)

	Test 1	Test 2
24	N/A	1.0
72	1.0	N/A
UE Category	≥2	≥2

9.6 Additional requirements for carrier aggregation

This clause includes requirements for the reporting of channel state information (CSI) with the UE configured for carrier aggregation. The purpose is to verify that the channel state for each cell is correctly reported with multiple cells configured for periodic reporting.

9.6.1 Periodic reporting on multiple cells (Cell-Specific Reference Symbols)

9.6.1.1 FDD

The following requirements apply to UE Category ≥3. For CA with 2 DL CC, for the parameters specified in Table 9.6.1.1-1 and Table 9.6.1.1-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell reported shall be such that

wideband CQI_{Pcell} – wideband $CQI_{Scell} \ge 2$

Table 9.6.1.1-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 2 DL CA)

Parameter		Unit	Pcell	Scell	
PDSCH transmission mode			1		
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0		
allocation	$ ho_{\scriptscriptstyle B}$	dB		0	
Propagation condition antenna configura			AWGN (1 x 2)		
SNR		dB	10	4	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88 -94		
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	
Physical channel fo reporting	r CQI		PUCCH Format 2		
PUCCH Report Type			4		
Reporting periodicity		ms	$N_{pd} = 10$		
cqi-pmi-ConfigurationIndex			11	16 (shift of 5 ms relative to Pcell)	

Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Table 9.6.1.1-2: PUCCH 1-0 static test (FDD, 2 DL CA)

Test nu	Test number Bandwidth combination			
1		10MHz for both cells		
2		20MHz for both cells		
3		5MHz for both cells		
4		5MHz for PCell and 10MHz for SCell		
5 5MHz for PCell and 15MHz for SCell		5MHz for PCell and 15MHz for SCell		
Note 1:	The app	olicability of requirements for different CA configurations and		
		andwidth combination sets is defined in 9.1.1.2. The test coverage for		
	differen	different number of component carriers is defined in 9.1.1.3.		
Note 2:	Note 2: If all the cells which can be configured as PCell have the same			
	bandwid	dth, randomly choose one as PCell.		

The following requirements for 3DL CA apply to UE Category ≥5. For CA with 3 DL CC, for the parameters specified in Table 9.6.1.1-3 and Table 9.6.1.1-4, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell 1 and SCell2 reported shall be such that

wideband
$$CQI_{PCell}$$
 – wideband $CQI_{SCell1} \ge 2$

wideband
$$CQI_{SCell1}$$
 – wideband $CQI_{SCell2} \ge 2$

for more than 90% of the time.

The following requirements for 4DL CA apply to UE Category ≥8. For CA with 4 DL CC, for the parameters specified in Table 9.6.1.1-3 and Table 9.6.1.1-5, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell 1 and SCell2, and SCell 3 reported shall be such that

wideband
$$CQI_{PCell}$$
 – wideband $CQI_{SCell1} \ge 2$

wideband CQI_{SCell1} – wideband $CQI_{SCell2} \ge 2$

wideband CQI_{SCell1} – wideband $CQI_{SCell3} \ge 2$

Table 9.6.1.1-3: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 3 and 4 DL CA)

Parameter		Unit	Pcell	Scell1	Scell2, 3	
PDSCH transmission mode			1			
Downlink power $ ho_{\scriptscriptstyle A}$		dB		0		
allocation	$ ho_{\scriptscriptstyle B}$	dB			0	
Propagation condit antenna configur				AWGN (1 x 2)		
SNR		dB	12	6	0	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	·] -86 -92 -98		-98	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98	
Physical channel f reporting	or CQI		PUCCH Format 2			
PUCCH Report	Туре		4			
Reporting periodicity		ms	$N_{pd} = 20$			
cqi-pmi-Configurati	onIndex		21	26 (shift of 5 ms relative to Pcell)	31 for Scell2 (shift of 10 ms relative to Pcell), 36 for Scell3 (shift of 15ms relative to Pcell)	

Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Table 9.6.1.1-4: PUCCH 1-0 static test (FDD, 3 DL CA)

Test number	Bandwidth combination (MHz)		
1	3x20		
2	20+20+15		
3	20+20+10		
4	20+15+15		
5	20+15+10		
6	20+10+10		
7	15+15+10		
8	20+10+5		
9	20+15+5		
configurat defined in	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2. The test coverage for different number of component carriers is defined in 9.1.1.3.		
Note 2: If more the choose of all the celes the same PCell. Ra	If more than one cell can be configured as PCell, choose one with the smallest bandwidth as PCell. If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell. Randomly associate the other cells to SCell 1 and SCell 2.		

Table 9.6.1.1-5: PUCCH 1-0 static test (FDD, 4 DL CA)

Test number		Bandwidth combination (MHz)	
1		4x20	
	2	20+20+20+10	
	3	20+20+10+10	
Note 1:	The applic	cability of requirements for different CA	
		ions and bandwidth combination sets is 9.1.1.2. The test coverage for different	
	number of	component carriers is defined in 9.1.1.3.	
Note 2:	If more than one cell can be configured as PCell, choose one with the smallest bandwidth as PCell. If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell. Randomly associate the other cells to SCell		
	1, SCell 2 and SCell3.		

The following requirements for 5DL CA apply to UE Category 8 and ≥11. For CA with 5 DL CC, for the parameters specified in Table 9.6.1.1-6 and Table 9.6.1.1-7, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell 1 and SCell 3, and SCell 1 and SCell 4 reported shall be such that

$$\begin{split} & \text{wideband } CQI_{PCell} - \text{wideband } CQI_{SCell1} \geq [2] \\ & \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell2} \geq [2] \\ & \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell3} \geq [2] \end{split}$$

wideband CQI_{SCell1} – wideband $CQI_{SCell4} \ge [2]$

for more than 90% of the time.

Table 9.6.1.1-6: Parameters for PUCCH 1-0 static test on multiple cells (FDD, 5 DL CA)

Parameter	Parameter		Pcell	Scell1	Scell2, 3, 4		
PDSCH transmission mode				1			
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0			
allocation	$ ho_{\scriptscriptstyle B}$	dB		0			
Propagation condition antenna configuration				AWGN (1 x 2)			
SNR		dB	12	6	0		
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-86	-92	-98		
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98		
Physical channel for CQI reporting			PUCCH Format 2				
PUCCH Report Type	!		4				
Reporting periodicity		ms		٨	$V_{\rm pd} = 40$		
cqi-pmi-ConfigurationIndex			41	46 (shift of 5 ms relative to Pcell)	51 for Scell 2 (shift of 10 ms relative to Pcell), 56 for Scell 3 (shift of 15ms relative to Pcell), 61 for Scell4 (shift of 20ms relative to Pcell)		
Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.							

Table 9.6.1.1-7: PUCCH 1-0 static test (FDD, 5 DL CA)

Test number	Bandwidth combination (MHz)		
1	5x20		
	licability of requirements for different CA		
configur	ations and bandwidth combination sets is		
	in 9.1.1.2. The test coverage for different		
number	of component carriers is defined in 9.1.1.3.		
Note 2: If more	han one cell can be configured as PCell,		
choose	one with the smallest bandwidth as PCell. If		
all the c	ells which can be configured as PCell have		
	the same bandwidth, randomly choose one as		
PCell. R	andomly associate the other cells to SCell1,		
SCell2,	SCell2, SCell3 and SCell4.		

9.6.1.2 TDD

The following requirements apply to UE Category \geq 3. For CA with 2 DL CC, for the parameters specified in Table 9.6.1.2-1 and Table 9.6.1.2-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of Pcell and Scell reported shall be such that

wideband CQI_{Pcell} – wideband $CQI_{Scell} \ge 2$

for more than 90% of the time.

Table 9.6.1.2-1: PUCCH 1-0 static test on multiple cells (TDD, 2 DL CA)

Parameter		Unit	Pcell	Scell
PDSCH transmission mode				1
Uplink downlink conf				2
Special subfrar configuration			4	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0
allocation	$ ho_{\scriptscriptstyle B}$	dB		0
Propagation condition and antenna configuration			AWGI	N (1 x 2)
SNR		dB	10	4
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-94
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98
Physical channel for CQI reporting			PUCCH	l Format 2
PUCCH Report Type			4	
Reporting periodicity		ms	$N_{\rm pd} = 10$	
cqi-pmi-ConfigurationIndex			8	13 (shift of 5 ms relative to Pcell)

Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Table 9.6.1.2-2: PUCCH 1-0 static test (TDD, 2 DL CA)

Test no	Test number Bandwidth combination	
1		20MHz for both cells
2)	15MHz for PCell and 20MHz for SCell
Note 1:	and bar coverag in 9.1.1	•
Note 2:	If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell.	

The following requirements for 3DL CA apply to UE Category ≥5. For CA with 3 DL CC, for the parameters specified in Table 9.6.1.2-3 and Table 9.6.1.2-4, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell 1 and SCell2 reported shall be such that

 $wideband \ CQI_{PCell} - wideband \ CQI_{SCell1} \geq 2$

wideband CQI_{SCell1} – wideband $CQI_{SCell2} \ge 2$

Table 9.6.1.2-3: PUCCH 1-0 static test on multiple cells (TDD, 3 DL CA)

Parameter	Parameter		Pcell	Scell1	Scell2	
PDSCH transmission mode			1			
Uplink downlink conf	iguration		2			
Special subfra configuration				4		
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0		
allocation	$ ho_{\scriptscriptstyle B}$	dB		0		
	Propagation condition and antenna configuration			AWGN (1 x 2)		
SNR		dB	12	6	0	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-86	-92	-98	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98	
Physical channel f reporting	Physical channel for CQI reporting			PUCCH Format 2		
PUCCH Report	Туре		4			
Reporting period	dicity	ms	$N_{\rm pd} = 20$			
cqi-pmi-ConfigurationIndex			18	23 (shift of 5 ms relative to Pcell)	28 (shift of 10 ms relative to Pcell)	
· · · · · · · · · · · · · · · · · · ·			DSCH for user data is n OP.1 TDD as descr			

Table 9.6.1.2-4: PUCCH 1-0 static test (TDD, 3 DL CA)

Test	number	Bandwidth combination (MHz)	
	1	3x20	
	2	20+20+15	
Note 1:	The applica	ability of requirements for different CA	
	configurations and bandwidth combination sets is defined in 9.1.1.2. The test coverage for different number of component carriers is defined in 9.1.1.3		
Note 2:	choose one all the cells the same b	n one cell can be configured as PCell, e with the smallest bandwidth as PCell. If which can be configured as PCell have eandwidth, randomly choose one as domly associate the other cells to SCell 1 2.	

9.6.1.3 TDD-FDD CA with FDD PCell

The following requirements apply to UE Category \geq 3. For TDD-FDD CA with FDD PCell with 2 DL CC, for the parameters specified in Table 9.6.1.3-1 and Table 9.6.1.3-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell reported shall be such that

wideband CQI_{PCell} – wideband $CQI_{SCell} \ge 2$

Table 9.6.1.3-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 2 DL CA)

Parameter	Parameter		PCell	SCell
PDSCH transmission mode				1
Uplink downlink con	figuration		N/A	2
Special subfra configuration			N/A	4
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0
allocation	$ ho_{\scriptscriptstyle B}$	dB		0
Propagation condition and antenna configuration			AWO	GN (1 x 2)
SNR		dB	10	4
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-94
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98
Physical channel for CQI reporting			PUCC	CH Format 2
PUCCH Report Type			4	
Reporting periodicity		ms	$N_{\rm pd} = 10$	
cqi-pmi-ConfigurationIndex			9	14 (shift of 5 ms relative to Pcell)
Nata di O si wala ala	114	! +- DD00!! N- DD0	011 (bodulad for the LIC with one

Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Table 9.6.1.3-2: PUCCH 1-0 static test (TDD-FDD CA with FDD PCell, 2 DL CA)

Test number Band		Bandwidth combination		
1		20MHz for FDD cell and 20MHz for TDD cell		
2 10MHz for FDD cell and 20MHz for TDD cell		10MHz for FDD cell and 20MHz for TDD cell		
3 15MHz for FDD cell and 20MHz for TDD cell		15MHz for FDD cell and 20MHz for TDD cell		
Note 1:	The app	applicability of requirements for different CA configurations and		
	bandwid	andwidth combination sets is defined in 9.1.1.2A. The test coverage		
	for different number of component carriers is defined in 9.1.1.3.			

The following requirements for 3DL CA apply to UE Category \geq 5. For TDD-FDD CA with FDD PCell with 3 DL CC, for the parameters specified in Table 9.6.1.3-3 and Table 9.6.1.3-4, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2 reported shall be such that

wideband
$$CQI_{PCell}$$
 – wideband $CQI_{SCell1} \ge 2$

wideband CQI_{SCell1} – wideband $CQI_{SCell2} \ge 2$

for more than 90% of the time.

The following requirements for 4DL CA apply to UE Cateogry \geq 8. For TDD-FDD CA with FDD PCell with 4 DL CC, for the parameters specified in Table 9.6.1.3-3 and Table 9.6.1.3-5, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell1 and SCell3 reported shall be such that

wideband
$$CQI_{PCell}$$
 – wideband $CQI_{SCell1} \ge 2$

wideband CQI_{SCell1} – wideband $CQI_{SCell2} \ge 2$

wideband CQI_{SCell1} – wideband $CQI_{SCell3} \ge 2$

Table 9.6.1.3-3: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 3 and 4 DL CA)

Parameter		Unit	PCell	SCell1	SCell2, SCell3
PDSCH transmission mode				1	
Uplink downlink configuration			N/A	2 if Scell1 is TDD Cell N/A if Scell1 is FDD Cell	2
Special subframe configuration			N/A	4 if Scell1 is TDD Cell N/A if Scell1 is FDD Cell	4
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0	
allocation	$ ho_{\scriptscriptstyle B}$	dB		0	
Propagation condition and antenna configuration			AWGN (1 x 2)		
SNR		dB	12	6	0
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-86	-92	-98
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
Physical channel for CQI reporting			PUCCH Format 2		
PUCCH Report Type				4	
Reporting periodicity		ms	$N_{\rm pd} = 20$		
cqi-pmi-ConfigurationIndex			19	24 (shift of 5 ms relative to Pcell)	29 for SCell 2 (shift of 10 ms relative to Pcell), 34 for SCell 3 (shift of 15ms relative to PCell)

dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Table 9.6.1.3-4: PUCCH 1-0 static test (TDD-FDD CA with FDD PCell, 3 DL CA)

Test number		Bandwidth combination (MHz)	
1		20MHz for FDD cell and 2x20MHz for TDD cell	
	2	15MHz for FDD cell and 2x20MHz for TDD cell	
	3	10MHz for FDD cell and 2x20MHz for TDD cell	
	4	2x20MHz for FDD cell and 20MHz for TDD cell	
	5	20+15MHz for FDD cell and 20MHz for TDD cell	
6		20+10MHz for FDD cell and 20MHz for TDD cell	
Note 1:	The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2A. The test coverage for different number of component carriers is defined in 9.1.1.3.		
Note 2:	·		

Table 9.6.1.3-5: PUCCH 1-0 static test (TDD-FDD CA with FDD PCell, 4 DL CA)

Test number		Bandwidth combination (MHz)		
1		20MHz for FDD cell and 3x20MHz for TDD cell		
	2	2x20MHz for FDD cell and 2x20MHz for TDD cell		
	3	20+15MHz for FDD cell and 2x20MHz for TDD cell		
	4	2x15MHz for FDD cell and 2x20MHz for TDD cell		
5		2x20+15MHz for FDD cell and 20MHz for TDD cell		
6		2x15+20MHz for FDD cell and 20MHz for TDD cell		
Note 1:	Note 1: The applicability of requirements for different CA configurations and bandwid combination sets is defined in 9.1.1.2A. The test coverage for different numb of component carriers is defined in 9.1.1.3.			
Note 2: If more than one cell can be configured as PCell, choose one with the smalled bandwidth as PCell. If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell. Randomly associate the other cells to SCell 1, SCell 2 and SCell3.				

The following requirements for 5DL CA apply to UE Category 8 and \geq 11. For TDD-FDD CA with FDD PCell with 5 DL CC, for the parameters specified in Table 9.6.1.3-3 and Table 9.6.1.3-6, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2, SCell1 and SCell3, and SCell 1 and SCell 4 reported shall be such that

$$\begin{split} & \text{wideband } CQI_{PCell} - \text{wideband } CQI_{SCell1} \geq [2] \\ & \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell2} \geq [2] \\ & \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell3} \geq [2] \\ & \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell4} \geq [2] \end{split}$$

for more than 90% of the time.

Table 9.6.1.3-6: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with FDD PCell, 5 DL CA)

Parameter		Unit	PCell	SCell1	SCell2, SCell3		
PDSCH transmission			1				
Uplink downlink configuration			2 if Scell1 is TDD Cell N/A N/A if Scell1 is FDD Cell		2		
Special subframe configuration			4 if Scell1 is TDD Cell N/A N/A if Scell1 is FDD Cell		4		
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0			
allocation	$ ho_{\scriptscriptstyle B}$	dB		0			
Propagation condition antenna configuration		AWGN (1 x 2)					
SNR		dB	12	6	0		
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-86	-92	-98		
$N_{oc}^{(j)}$	$N_{oc}^{(j)}$		-98	-98	-98		
Physical channel for reporting	CQI			PUCCH F	ormat 2		
PUCCH Report Type				4			
Reporting periodicity		ms		$N_{pd} =$			
cqi-pmi-ConfigurationIndex			39	54 (shift of 5 ms relative to Pcell)	59 for SCell 2 (shift of 10 ms relative to Pcell), 64 for SCell 3 (shift of 15 ms relative to Pcell), 69 for SCell 4 (shift of 20 ms relative to Pcell)		
Note 1: 3 symbols							

Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Table 9.6.1.3-7: PUCCH 1-0 static test (TDD-FDD CA with FDD PCell, 5 DL CA)

Test number	Bandwidth combination (MHz)
1	15MHz+2×20MHz for FDD cell and 2x20MHz for TDD cell
2	2x15MHz+20MHz for FDD cell and 2x20MHz for TDD cell
	uirements for different CA configurations and bandwidth ned in 9.1.1.2A. The test coverage for different number of lefined in 9.1.1.3.

9.6.1.4 TDD-FDD CA with TDD PCell

The following requirements apply to UE Category ≥3. For TDD-FDD CA with TDD PCell with 2 DL CC, for the parameters specified in Table 9.6.1.4-1 and Table 9.6.1.4-2, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell reported shall be such that

wideband CQI_{PCell} – wideband $CQI_{SCell} \ge 2$

for more than 90% of the time.

Table 9.6.1.4-1: Parameters for PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 2 DL CA)

Parameter		Unit	PCell	SCell	
PDSCH transmission mode				1	
Uplink downlink con	figuration		2	N/A	
Special subfra configuration			4	N/A	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0		
allocation	$ ho_{\scriptscriptstyle B}$	dB	0		
Propagation condition and antenna configuration			AWG	GN (1 x 2)	
SNR		dB	10	4	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-94	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	
Physical channel for CQI reporting			PUCC	H Format 2	
PUCCH Report	Туре		4		
Reporting perior	dicity	ms	N,	_{od} = 10	
cqi-pmi-ConfigurationIndex			8 13 (shift of 5 ms re to Pcell)		
Note 1: 3 symbols	are allocate	ed to PDCCH. No PDSC	CH for user data is scl	neduled for the UE with one	

Table 9.6.1.4-2: PUCCH 1-0 static test (TDD-FDD CA with TDD PCell, 2 DL CA)

sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Test number		Bandwidth combination	
1		20MHz for TDD cell and 20MHz for FDD cell	
2		20MHz for TDD cell and 10MHz for FDD cell	
3		20MHz for TDD cell and 15MHz for FDD cell	
Note 1:	The app	olicability of requirements for different CA configurations and	
bandwidth combination sets is defined in 9.1.1.2A. The test coverage			
for different number of component carriers is defined in 9.1.1.3.			

The following requirements for 3DL CA apply to UE Category \geq 5. For TDD-FDD CA with TDD PCell with 3 DL CC, for the parameters specified in Table 9.6.1.4-3 and Table 9.6.1.4-4, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2 reported shall be such that

 $\label{eq:continuous} wideband \ CQI_{PCell} - wideband \ CQI_{SCell1} \geq 2$ $\label{eq:cql} wideband \ CQI_{SCell2} - wideband \ CQI_{SCell2} \geq 2$

for more than 90% of the time.

The following requirements for 4DL CA apply to UE Cateogry \geq 8. For TDD-FDD CA with TDD PCell with 4 DL CC, for the parameters specified in Table 9.6.1.4-3 and Table 9.6.1.4-5, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2, and SCell1 and SCell3 reported shall be such that

$$\label{eq:continuous} \begin{split} \text{wideband } CQI_{PCell} - \text{wideband } CQI_{SCell1} \geq 2 \\ \\ \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell2} \geq 2 \\ \\ \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell3} \geq 2 \end{split}$$

for more than 90% of the time.

Table 9.6.1.4-3: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 3 and 4 DL CA)

Parameter		Unit	PCell	SCell1	SCell2, SCell3		
PDSCH transmissio	n mode			1			
Uplink downlink configuration			2	2 if Scell1 is TDD Cell N/A if Scell1 is FDD Cell	N/A		
Special subframe configuration			4	4 if Scell1 is TDD Cell N/A if Scell1 is FDD Cell	N/A		
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0			
allocation	$ ho_{\scriptscriptstyle B}$	dB	0				
Propagation conditi antenna configur			AWGN (1 x 2)				
SNR		dB	12	6	0		
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-86	-92	-98		
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98		
Physical channel for reporting	or CQI		PUCCH Format 2				
PUCCH Report	Гуре			4			
Reporting period	ms		$N_{pd} = 20$				
cqi-pmi-ConfigurationIndex			18	23 (shift of 5 ms relative to Pcell)	28 for SCell 2 (shift of 10 ms relative to Pcell), 33 for SCell 3 (shift of 15ms relative to PCell)		

Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Table 9.6.1.4-4: PUCCH 1-0 static test (TDD-FDD CA with TDD PCell, 3 DL CA)

	Test number	Bandwidth combination (MHz)			
1		2x20MHz for TDD cell and 20MHz for FDD cell			
	2	2x20MHz for TDD cell and 15MHz for FDD cell			
	3	2x20MHz for TDD cell and 10MHz for FDD cell			
	4	2x20MHz for FDD cell and 20MHz for TDD cell			
5		20+15MHz for FDD cell and 20MHz for TDD cell			
6		20+10MHz for FDD cell and 20MHz for TDD cell			
Note 1:	The applicability of requ	irements for different CA configurations and bandwidth			
	combination sets is defi	ned in 9.1.1.2A. The test coverage for different number			
	of component carriers is	s defined in 9.1.1.3.			
Note 2: If more than one cell can be configured as PCell, choose one with the small		n be configured as PCell, choose one with the smallest			
bandwidth as PCell. If all the cells which can be configured as PCell have th					
	same bandwidth, randomly choose one as PCell. Randomly associate the				
	other cells to SCell 1 ar	nd SCell 2.			

Table 9.6.1.4-5: PUCCH 1-0 static test (TDD-FDD CA with TDD PCell, 4 DL CA)

Test number		Bandwidth combination (MHz)		
1		3x20MHz for TDD cell and 20MHz for FDD cell		
	2	2x20MHz for FDD cell and 2x20MHz for TDD cell		
	3	20+15MHz for FDD cell and 2x20MHz for TDD cell		
4		2x15MHz for FDD cell and 2x20MHz for TDD cell		
5		2x20+15MHz for FDD cell and 20MHz for TDD cell		
6		2x15+20MHz for FDD cell and 20MHz for TDD cell		
Note 1:	The applicability of requ	uirements for different CA configurations and bandwidth		
	combination sets is defi	ned in 9.1.1.2A. The test coverage for different number		
	of component carriers is			
Note 2: If more than one cell can		n be configured as PCell, choose one with the smallest		
bandwidth as PCell. If all the cells which can be configured as PCell have the				
	same bandwidth, randomly choose one as PCell. Randomly associate the			
	other cells to SCell 1, S	Cell 2 and SCell3.		

The following requirements for 5DL CA apply to UE Category 8 and \geq 11. For TDD-FDD CA with TDD PCell with 5 DL CC, for the parameters specified in Table 9.6.1.4-3 and Table 9.6.1.4-6, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2 on each cell, the difference between the wideband CQI indices of PCell and SCell1 reported, and the difference between the wideband CQI indices of SCell1 and SCell2, SCell1 and SCell3 and SCell 1 and SCell 4 reported shall be such that

$$\begin{split} & \text{wideband } CQI_{PCell} - \text{wideband } CQI_{SCell1} \geq [2] \\ & \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell2} \geq [2] \\ & \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell3} \geq [2] \\ & \text{wideband } CQI_{SCell1} - \text{wideband } CQI_{SCell4} \geq [2] \end{split}$$

Table 9.6.1.4-6: PUCCH 1-0 static test on multiple cells (TDD-FDD CA with TDD PCell, 5 DL CA)

Parameter		Unit	PCell	SCell1	SCell2, SCell3, SCell4
PDSCH transmission	mode			1	
Uplink downlink configuration			N/A	2 if Scell1 is TDD Cell N/A if Scell1 is FDD Cell	2
Special subframe configuration			4 if Scell1 is TDD Cell N/A if Scell1 is FDD Cell		4
Downlink power	$\rho_{\scriptscriptstyle A}$	dB		0	
allocation	$ ho_{\scriptscriptstyle B}$	dB		0	
Propagation condition antenna configuration		AWGN (1 x 2)			
SNR		dB	12	6	0
$\hat{I}_{or}^{(j)}$	$\hat{I}_{or}^{(j)}$		-86	-92	-98
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98
Physical channel for reporting	CQI			PUCCH F	ormat 2
PUCCH Report Type				4	
Reporting periodicity		ms		$N_{pd} =$	
cqi-pmi-ConfigurationIndex			39	54 (shift of 5 ms relative to Pcell)	59 for SCell 2 (shift of 10 ms relative to Pcell), 64 for SCell 3 (shift of 15 ms relative to Pcell), 69 for SCell 4 (shift of 20 ms relative to Pcell)
Note 1: 3 symbols	are alloca	ated to PDCCH. No	PDSCH	for user data is scheduled	I for the UE with one sided

Table 9.6.1.4-7: PUCCH 1-0 static test (TDD-FDD CA with TDD PCell, 5 DL CA)

Test number		Bandwidth combination (MHz)			
	1	15MHz+2×20MHz for FDD cell and 2x20MHz for TDD cell			
	2	2×15MHz+20MHz for FDD cell and 2x20MHz for TDD cell			
Note 1:		nirements for different CA configurations and bandwidth ned in 9.1.1.2A. The test coverage for different number of efined in 9.1.1.3.			
Note 2:	If more than one cell can be configured as PCell, choose one with the smallest bandwidth as PCell. If all the cells which can be configured as PCell have the same bandwidth, randomly choose one as PCell. Randomly associate the other cells to SCell1, SCell2, SCell3 and SCell4.				

9.7 CSI reporting (Single receiver antenna)

dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

The number of receiver antennas N_{RX} assumed for the minimum performance requirement in this clause is 1.

9.7.1 CQI reporting definition under AWGN conditions

9.7.1.1 FDD and half-duplex FDD

The following requirements apply to UE DL Category 0. For the parameters specified in Table 9.7.1.1-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.16 FDD in Table A.4-1 shall be in the range of ± 1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

Table 9.7.1.1-1: PUCCH 1-0 static test (FDD and half-duplex FDD)

Parameter		Unit	Tes	Test 1 Test 2		
Bandwidth		MHz	10			
PDSCH transmission mode			1			
Devention and a	$ ho_{\scriptscriptstyle A}$	dB	C		0	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB		0		
	σ	dB			0	
Propagation condition and antenna configuration			AWGN (1 x 1)			
SNR (Note 2)		dB	0	1	6	7
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-97	-92	-91
$N_{oc}^{(j)}$	$N_{oc}^{(j)}$		-98 -98		98	
Max number of HARQ transmissions					1	
Physical channel for CQI reporting			PUCCH Format 2			
PUCCH Report Type					4	
Reporting periodicity		ms	$N_{pd} = 40$			
cqi-pmi-Configurati	onIndex	1.1.1.1.00.40		. T.I. A	41	

Note 1: Reference measurement channel RC.16 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.

Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

9.7.1.2 TDD

The following requirements apply to UE DL Category 0. For the parameters specified in Table 9.7.1.2-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to RC.16 TDD in Table A.4-1 shall be in the range of ± 1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI + 1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI – 1) shall be less than or equal to 0.1.

Parameter Unit Test 1 Test 2 Bandwidth MHz 10 PDSCH transmission mode 1 Uplink downlink configuration 2 Special subframe configuration 4 dB 0 $\rho_{\scriptscriptstyle A}$ Downlink power dB 0 $\rho_{\scriptscriptstyle B}$ allocation dB 0 σ Propagation condition and AWGN (1 x 1) antenna configuration SNR (Note 2) dB 0 -98 -97 -92 -91 $\hat{\boldsymbol{I}}^{(j)}$ dB[mW/15kHz] $N^{(j)}$ dB[mW/15kHz] -98 -98 Max number of HARQ 1 transmissions Physical channel for CQI PUSCH (Note 3) reporting PUCCH Report Type $N_{\rm pd} = 5$ Reporting periodicity ms cgi-pmi-ConfigurationIndex

Table 9.7.1.2-1: PUCCH 1-0 static test (TDD)

Note 1: Reference measurement channel RC.16 TDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.

Multiplexing

- Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
- Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.

9.7.2 CQI reporting under fading conditions

9.7.2.1 FDD and half-duplex FDD

ACK/NACK feedback mode

For the parameters specified in Table 9.7.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.7.2.1-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD and in each available downlink transmission instance for half-duplex FDD.

Table 9.7.2.1-1 Sub-band test for single antenna transmission (FDD and half-duplex FDD)

Parai	Parameter		Tes	Test 1 Test 2		st 2		
Band	lwidth	MHz		10 MHz				
Transmiss	Transmission mode		1 (port 0)					
Downlink	$ ho_{\scriptscriptstyle A}$	dB		0				
power	$ ho_{\scriptscriptstyle B}$	dB	0		0			
allocation	σ	dB			0			
SNR (Note 3)	dB	8 9 13 14			14		
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-90	-89	-85	-84		
N	$N_{oc}^{(j)}$		-98 -98		98			
D			Clause B.2.4 with $\tau_d = 0.45 \mu$		$0.45 \mu s$,			
Propagatio	on channel		$a = 1, f_D = 5 \text{ Hz}$					
Antenna co	onfiguration			1:	x 1			
Reportin	g interval	ms	8					
CQI	CQI delay		8					
Reporting mode				PUSCH 3-0				
Sub-band size		RB		6 (full size)				
Max number of HARQ transmissions				1				

Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)

Note 2: Reference measurement channel RC.16 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.

Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Table 9.7.2.1-2 Minimum requirement (FDD and half-duplex FDD)

	Test 1	Test 2
α[%]	2	2
β[%]	55	55
γ	1.1	1.1
UE DL Category	0	0

9.7.2.2 TDD

For the parameters specified in Table 9.7.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.7.2.2-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band:
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set S shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance for TDD.

Table 9.7.2.2-1 Sub-band test for single antenna transmission (TDD)

Parameter		Unit	Te	Test 1 Test 2			
Band	Bandwidth			10	MHz		
Transmission mode			1 (port 0)				
Downlink $ ho_{\scriptscriptstyle A}$		dB	0				
power ρ_B		dB			0		
allocation	σ	dB			0		
	downlink uration				2		
Special subframe configuration					4		
SNR (Note 3)	dB	8	9	13	14	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-90	-89	-85	-84	
N	$N_{oc}^{(j)}$		-98 -98		8		
Propagation	on channel		Clause B.2.4 with $ au_d = 0.45 \mu \text{s}, a = 1,$ $f_D = 5 \text{Hz}$				
Antenna co	onfiguration			1 x 1			
Reporting	g interval	ms		5			
CQI	delay	ms		10 or 11			
	Reporting mode			PUSCH 3-0			
Sub-band size		RB		6 (full size)			
Max number of HARQ transmissions			1				
	edback mode				olexing		
Note 1: If th	Note 1: If the UE reports in an available uplink reporting instance at subframe						

- Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)
- Note 2: Reference measurement channel RC.16 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
- Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.

Table 9.7.2.2-2 Minimum requirement (TDD)

	Test 1	Test 2
α[%]	2	2
β[%]	55	55
γ	1.1	1.1
UE DL Category	0	0

10 Performance requirement (MBMS)

10.1 FDD (Fixed Reference Channel)

The parameters specified in Table 10.1-1 are valid for all FDD tests unless otherwise stated. For the requirements defined in this section, the difference between CRS EPRE and the MBSFN RS EPRE should be set to 0 dB as the UE demodulation performance might be different when this condition is not met (e.g. in scenarios where power offsets are present, such as scenarios when reserved cells are present).

Unit **Parameter** Value Number of HARQ **Processes** None processes 15 kHz kHz Subcarrier spacing Allocated subframes per 6 subframes Radio Frame (Note 1) Number of OFDM 2 symbols for PDCCH Cyclic Prefix Extended For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, Note1:

Table 10.1-1: Common Test Parameters (FDD)

in line with TS 36.331.

10.1.1 Minimum requirement

The receive characteristic of MBMS is determined by the BLER. The requirement is valid for all RRC states for which the UE has capabilities for MBMS.

For the parameters specified in Table 10.1-1 and Table 10.1.1-1 and Annex A.3.8.1, the average downlink SNR shall be below the specified value for the BLER shown in Table 10.1.1-2.

Table 10.1.1-1: Test Parameters for Testing

Parameter	•	Unit	Test 1-4		
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	0		
	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)		
	σ	dB	0		
N_{oc} at antenna port		dBm/15kHz	-98		
Note 1: $P_{B} = 0$.					

Table 10.1.1-2: Minimum performance

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Referen	ce value	MBMS
number		Channel	Pattern	condition	Matrix and	BLER	SNR(dB)	UE
					antenna	(%)		Category
1	10 MHz	R.37 FDD	OP.4				4.1	≥1
			FDD					
2	10 MHz	R.38 FDD	OP.4				11.0	≥1
			FDD	MBSFN				
3	10 MHz	R.39 FDD	OP.4	channel	1x2 low	4	20.1	≥2
			FDD	model (Table	1XZ IOW	l		
	5.0MHz	R.39-1 FDD	OP.4	B.2.6-1)			20.5	1
			FDD					
4	1.4 MHz	R.40 FDD	OP.4				6.6	≥1
			FDD					

TDD (Fixed Reference Channel) 10.2

The parameters specified in Table 10.2-1 are valid for all TDD tests unless otherwise stated. For the requirements defined in this section, the difference between CRS EPRE and the MBSFN RS EPRE should be set to 0 dB as the UE demodulation performance might be different when this condition is not met (e.g. in scenarios where power offsets are present, such as scenarios when reserved cells are present).

Table 10.2-1: Common Test Parameters (TDD)

Parameter	Unit	Value				
Number of HARQ processes	Processes	None				
Subcarrier spacing	kHz	15 kHz				
Allocated subframes per Radio Frame (Note 1)		5 subframes				
Number of OFDM symbols for PDCCH		2				
Cyclic Prefix		Extended				
Note1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.						

10.2.1 Minimum requirement

The receive characteristic of MBMS is determined by the BLER. The requirement is valid for all RRC states for which the UE has capabilities for MBMS.

For the parameters specified in Table 10.2-1 and Table 10.2.1-1 and Annex A.3.8.2, the average downlink SNR shall be below the specified value for the BLER shown in Table 10.2.1-2.

Table 10.2.1-1: Test Parameters for Testing

Parameter		Unit	Test 1-4		
	$ ho_{\scriptscriptstyle A}$	dB	0		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)		
	σ	dB	0		
N_{oc} at antenna port		dBm/15kHz	-98		
Note 1: $P_B = 0$.					

Table 10.2.1-2: Minimum performance

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Referen	ce value	MBMS
number		Channel	Pattern	condition	Matrix and	BLER	SNR(dB)	UE
					antenna	(%)		Category
1	10 MHz	R.37 TDD	OP.4				3.4	≥1
			TDD					
2	10 MHz	R.38 TDD	OP.4				11.1	≥1
			TDD	MBSFN				
3a	10 MHz	R.39 TDD	OP.4	channel	1x2 low	4	20.1	≥2
			TDD	model (Table	IXZ IOW	ı		
3b	5MHz	R.39-1 TDD	OP.4	B.2.6-1)			20.5	1
			TDD					
4	1.4 MHz	R.40 TDD	OP.4				5.8	≥1
			TDD					

11 Performance requirement (ProSe Direct Discovery)

This clause contains the performance requirements for the Sidelink physical channels specified for ProSe Direct Discovery.

11.1 General

11.1.1 Applicability of requirements

The requirements in this clause are applicable to UEs that support ProSe Direct Discovery. Some of the tests defined in this clause are applicable only to UEs that additionally support transmission and reception of Sidelink synchronization signal (indicated using *disc-SLSS*). The test case applicability is in according to table 11.1.1-1 depending on UE capability.

Table 11.1.1-1: ProSe Direct Discovery test applicability

	ProSe Direct Discovery without support of SLSS	ProSe Direct Discovery with support of SLSS
FDD	11.2.1, 11.3.1, 11.5.1	11.3.1, 11.4.1, 11.5.1
TDD	11.2.2, 11.3.2, 11.5.2	11.2.2, 11.3.2, 11.5.2

For maximum Sidelink Processes test specified in clause 11.5, the UE is required to only meet the test for the maximum channel bandwidth over the ProSe operating bands supported by the UE.

11.1.2 Reference DRX configuration

Table 11.1.2-1: Reference DRX configuration

Parameter	Value	Comments			
onDurationTimer	psf1				
drx-InactivityTimer	psf1				
drx-RetransmissionTimer	psf1				
longDRX-CycleStartOffset	sf2560, 0				
shortDRX	disabled				
NOTE 1: For further information see clause 6.3.2 in TS 36.331.					

11.2 Demodulation of PSDCH (single link performance)

The purpose of the requirements in this subclause is to verify the PSDCH demodulation performance with a single active PSDCH link under different operating scenarios and channel conditions.

The active cell(s), when present, are specified in the test parameters specific to the test.

11.2.1 FDD

The minimum requirements are specified in Table 11.2.1-2 with the test parameters specified in Table 11.2.1-1. The receiver UE under test is associated with Cell 1.

Table 11.2.1-1: Test Parameters

P	Parameter			Test 1
Discovery resource pool configuration				As specified in Table A.7.1.1-1 (Configuration #1-FDD)
DRX configuration				As specified in Table 11.1.2-1
$N_{\it oc}$ at antenna port	(NOTE 3)		dBm/15kHz	-98
Active cell(s)				Cell 1 (Serving cell)
Cyclic prefix				Normal
	Cell ID			0
Cell 1	Downlink	$ ho_{\scriptscriptstyle A}$	dB	0
	power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)
		σ	dB	0
	OCNG Pattern (NOTE 2)			OP.1 FDD
	Propagation c	Propagation channel		AWGN
	Antenna confi	Antenna configuration		1x2
	RSRP	RSRP		-92
Active Sidelink UE(s)				Sidelink UE 1
	Sidelink Trans	missions		PSDCH
	PSDCH RB al	PSDCH RB allocation		PRB pairs {2i2i+1}, where i is chosen randomly uniformly from [0,11] in each discovery period.
Cidalial: LIE 4	Time offset (N	OTE 4)	μs	+1
Sidelink UE 1	· · · · · · · · · · · · · · · · · · ·	Frequency offset (NOTE		+200
	Propagation C	hannel		EPA5
		Antenna configuration		1x2 Low

NOTE 1: $P_{\scriptscriptstyle B}=0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.

NOTE 3: Applicable to both DL channel and ProSe Direct Discovery Subframes on UL.

NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 11.2.1-2: Minimum performance

Test num.	Sidelink UE	Band-width	Reference channel	Reference value	
				BLER of PSDCH (%)	SNR (dB)
1	1	5 MHz	D.1 FDD	30	4.6

11.2.2 **TDD**

The minimum requirements are specified in Table 11.2.2-2 with the test parameters specified in Table 11.2.2-1. The receiver UE under test is associated with Cell 1.

Table 11.2.2-1: Test Parameters

Parameter			Unit	Test 1
Discovery resource pool configuration				As specified in Table A.7.1.2-1 (Configuration #1-TDD)
DRX configuration				As specified in Table 11.1.2-1
$N_{\it oc}$ at antenna port	(NOTE 5)		dBm/15kHz	-98
Active cell(s)				Cell 1 (Serving cell)
	Cyclic prefix			Normal
	Uplink downlink configuration (NOT	E 3)		0
	Special subframe			4
	Cell ID			0
Cell 1	Downlink A	\mathcal{O}_A	dB	0
	power	\mathcal{O}_B	dB	0 (NOTE 1)
	allocation σ		dB	0
	OCNG Pattern NOT	E 2		OP.1 TDD
	Propagation chann	nel		AWGN
	Antenna configura	tion		1x2
	RSRP		dBm/15kHz	-92
Active Sidelink UE(s	s)			Sidelink UE 1
	Sidelink Transmiss	sions		PSDCH
Sidelink UE 1	RB allocation			PRB pairs {2i2i+1}, where i is chosen randomly uniformly from [0,11] in each discovery period.
	Time offset (NOTE	6)	μs	+1
	Frequency offset (I		Hz	+200
	Propagation Chan	nel		EPA5
	Antenna configura			1x2 Low

NOTE 1: $P_B = 0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.

NOTE 3: As specified in Table 4.2-2 in TS 36.211 [4].

NOTE 4: As specified in Table 4.2-1 in TS 36.211 [4].

NOTE 5: Applicable to both DL subframes and UL subframes configured for ProSe Direct Discovery.

NOTE 6: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 7: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 11.2.2-2: Minimum performance

Test num.	Sidelink UE	Band-width	Reference channel	Reference value		
				BLER of PSDCH (%)	SNR (dB)	
1	1	5 MHz	D.1 TDD	30	4.6	

11.3 Power imbalance performance with two links

The purpose of this test is to check the demodulation performance when receiving PSDCH transmissions from two Sidelink UEs with power imbalance in one subframe.

11.3.1 FDD

The minimum requirements are specified in Table 11.3.1-2 with the test parameters specified in Table 11.3.1-1. The receiver UE under test is associated with Cell 1. The Sidelink UE 1 and 2 are synchronized to Cell 1 and transmit PSDCH on adjacent RBs.

Table 11.3.1-1: Test Parameters

Parameter			Unit	Test 1
Discovery resource pool configuration				As specified in Table A.7.1.1-1
				(Configuration #1-FDD)
DRX configuration				As specified in Table 11.1.2-1
$N_{\it oc}$ at antenna port	(NOTE 3)		dBm/15kHz	-98
Active cell(s)				Cell 1 (Serving cell)
, ,	Cyclic prefix			Normal
	Cell ID			0
	Danielink name	$\rho_{\scriptscriptstyle A}$	dB	0
	Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)
Cell 1		σ	dB	0
	OCNG Pattern (N	OTE 2)		OP.1 FDD
	Propagation channel			AWGN
		Antenna configuration		1x2
	RSRP		dBm/15kHz	-92
Active Sidelink UE(s)			Sidelink UE 1, Sidelink UE 2
	Sidelink Transmissions			PSDCH
	PSDCH RB allocation			PRB pairs {45}
Sidelink UE 1	Time offset (NOTE 3)		μs	0
SIDEIIIK DE I	Frequency offset	(NOTE 4)	Hz	0
	Propagation Char	nnel		AWGN
	Antenna configura	ation		1x2 Low
	Sidelink Transmis			PSDCH
Sidelink UE 2	PSDCH RB alloca			PRB pairs {67}
	Time offset (w.r.t.	Cell 1 DL)	μs	0
	Frequency offset 1 UL)	(w.r.t. Cell	Hz	0
	Propagation Char	nnel		AWGN
	Antenna configuration			1x2 Low

NOTE 1: $P_{\scriptscriptstyle B}=0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs. NOTE 3: Applicable to both DL channel and ProSe Direct Discovery Subframes on UL.

NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 11.3.1-2: Minimum performance

Test	Band-	Sidelink	Reference	Reference va	lue			
num.	width	UE	channel	BLER of PSDCH (%)	SNR (dB)			
4	5	1	D.1 FDD	(NOTE 1)	24.3			
'	MHz	2	D.1 FDD	30	6.9			
NOTE	NOTE 1: There is no BLER requirement for Sidelink UE 1.							

11.3.2 **TDD**

The minimum requirements are specified in Table 11.3.2-2 with the test parameters specified in Table 11.3.2-1. The receiver UE under test is associated with Cell 1. The Sidelink UE 1 and 2 are synchronized to Cell 1 and transmit PSDCH on adjacent RBs.

Table 11.3.2-1: Test Parameters

Pa	arameter	Unit	Test 1
Discovery resource p	ool configuration		As specified in Table A.7.1.2-1
<u> </u>	oor corniguration		(Configuration #1-TDD)
DRX configuration			As specified in Table 11.1.2-1
$N_{\it oc}$ at antenna port (NOTE 5)	dBm/15kHz	-98
Active cell(s)			Cell 1 (Serving cell)
	Cyclic prefix		Normal
	Uplink downlink configuration (NOTE	3)	0
	Special subframe configuration (NOTE	4)	4
	Cell ID		0
Cell 1	Downlink $\rho_{\scriptscriptstyle A}$	dB	0
	power $ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)
	allocation σ	dB	0
	OCNG Pattern NOTE 2		OP.1 TDD
	Propagation channel		AWGN
	Antenna configuratio	n	1x2
	RSRP	dBm/15kHz	-92
Active Sidelink UE(s)			Sidelink UE 1, Sidelink UE 2
	Sidelink Transmissio	ns	PSDCH
	PSDCH RB allocation	n	PRB pairs {45}
	Time offset (NOTE 6) μs	0
Sidelink UE 1	Frequency offset (NC 7)	DTE Hz	0
	Propagation Channe	l l	AWGN
	Antenna configuratio		1x2 Low
	Sidelink Transmissio	ns	PSDCH
	RB allocation		PRB pairs {67}
	Time offset (NOTE 6) μs	0
Sidelink UE 2	Frequency offset (NC 7)	DTE Hz	0
	Propagation Channe	I I	AWGN
	Antenna configuratio		1x2 Low

NOTE 1: $P_{\scriptscriptstyle B}=0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.

NOTE 3: As specified in Table 4.2-2 in TS 36.211 [4]. NOTE 4: As specified in Table 4.2-1 in TS 36.211 [4].

NOTE 5: Applicable to both DL subframes and UL subframes configured for ProSe Direct Discovery.

NOTE 6: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 7: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 11.3.2-2: Minimum performance

Test	Band-	Sidelink	Reference	Reference va	lue		
num.	width	UE	channel	BLER of PSDCH (%)	SNR (dB)		
1	5	1	D.1 TDD	(NOTE 1)	24.3		
l	MHz	2	D.1 TDD	30	6.9		
NOTE	NOTE 1: There is no BLER requirement for Sidelink UE 1.						

11.4 Multiple timing reference test

The purpose of this test is to check the demodulation performance when receiving from two Sidelink UEs that follow different timing references and transmitting on different resources (non-overlapping in time).

11.4.1 **FDD**

The test parameters are specified in Table 11.4.1-1. Sidelink UE 2 and the receiver UE under test are associated with Cell 1. Sidelink UE 1 and 3 are associated with another cell and use a different timing, and UE 1 acts as a synchronization reference. The minimum requirements are specified in Table 11.4.1-2.

Table 11.4.1-1: Test Parameters

Р	arameter	Unit	Test 1
Discovery resource p	ool configuration		As specified in Table A.7.1.1-2
DRX configuration			(Configuration #2-FDD) As specified in Table 11.1.2-1
N_{ac} at antenna port	(NOTE 2)	dBm/15kHz	-98
00	(NOTE 3)	UDIII/ IOKHZ	
Active cell(s)	Cyclic prefix		Cell 1 (Serving cell) Normal
	Cell ID		0
	Downlink $\rho_{\scriptscriptstyle A}$	dB	0
	power $\rho_{\scriptscriptstyle R}$	dB	0 (NOTE 1)
Cell 1	allocation σ	dB	0
	OCNG Pattern NOTE 2		OP.1 FDD
	Propagation channel		AWGN
	Antenna configuration		1x2
	RSRP	dBm/15kHz	-92
Active Sidelink UE(s)			Sidelink UEs 1, 2, 3
	Sidelink Transmissions		SLSS
	networkControlledSyncTx		ON
	slssid		30
	Time offset (NOTE 4)	ms	+3.51
Sidelink UE 1	Frequency offset (NOTE 5)	Hz	-100
	Propagation channel		EPA5
	Antenna configuration		1x2 Low
	\widehat{E}_{s} of SLSS at antenna	dBm/15kHz	-82
	port		
	Sidelink Transmissions		PSDCH
	Resource pool used for transmissions		discRxPool(0)
	RB allocation		PRB pairs {2i2i+1}, where i is chosen randomly uniformly from [0,11] in each discovery period.
Sidelink UE 2	Time offset (NOTE 4)	μs	+1
	Frequency offset (NOTE 5)	Hz	+200
	Propagation Channel	+	EPA5
	Antenna configuration	†	1x2 Low
	Sidelink Transmissions	†	PSDCH
	Resource pool used for transmissions		discRxPool(1)
	RB allocation		PRB pairs {2i2i+1}, where i is chosen randomly uniformly from [0,11] in each discovery period.
Sidelink UE 3	Time offset (NOTE 4)	μs	3511
	Frequency offset (NOTE 5)	Hz	+300
	Propagation Channel		EPA5
	Antenna configuration	†	1x2 Low
NOTE 1: D = 0	1torina configuration	1	IAL LOW

NOTE 1: $P_B = 0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.

NOTE 3: Applicable to both DL channel and ProSe Direct Discovery Subframes on UL.

NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE. NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 11.4.1-2: Minimum performance

Test num.	Band-width	Sidelink UE	Reference channel	Reference value		
				BLER of PSDCH (%)NOTE 1	SNR (dB)	
1	5 MHz	2	D.1 FDD	30	4.6	
I	1 5 IVIH2		D.1 FDD	30	4.6	
NOTE 4 TI	-	- (; = DoD D;	// 000 /	\ (1 10 1 1 1 1 1 1 1		

NOTE 1: The BLER is measured after 5 D2D Discovery periods (1600 frames) of lead time during which the test UE detects and synchronizes to Sidelink UE 1 SLSS.

11.5 Maximum Sidelink processes test

The purpose of this test is to verify the maximum number of Sidelink processes supported by the UE as reported using UE capability signalling (*discSupportedProc*).

The UE is required to meet only the test for the maximum channel bandwidth over the ProSe operating bands supported by the UE.

11.5.1 FDD

The test parameters are specified in Table 11.5.1-1. Multiple discovery resource pools are interleaved. Each Sidelink UE transmits in one of the resource pools with 3 retransmissions. The minimum requirements are specified in Table 11.5.1-2.

Table 11.5.1-1: Test Parameters

	Parameter		Unit	Test 1-7	
Discovery resource pool configuration			As specified in Table A.7.1.1-3 (Configuration #3-FDD) with parameters BW _{Channel} , NPools = Number of configured		
			resource pools (as specified in Table 11.5.1-2), and N = discSupportedProc		
DRX configura	ition			As specified in Table 11.1.2-1	
Active cell(s)				Cell 1 (Serving cell)	
	Cyclic prefix			Normal	
	Cell ID			0	
	Downlink	$ ho_{\scriptscriptstyle A}$	dB	0	
	power	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)	
Cell 1	allocation	σ	dB	0	
	OCNG Patterr	OCNG Pattern NOTE 2		OP.1 FDD	
	Propagation channel			Static propagation condition No external noise sources are applied	
	Antenna confi	Antenna configuration		1x2	
	RSRP		dBm/15kHz	-85	
Active Sidelink	(UE(s)			Sidelink UE i, i = 0,, discSupportedProc-1	
	Sidelink Transmissions	3		PSDCH (D.1 FDD)	
	Resource pool index (NOTE 3)			$\left\lfloor rac{i}{N_{\mathit{MAX}_\mathit{SF}}} ight floor$	
Sidelink UE i	PSDCH RB al (NOTE 3)	location		PRB pairs {2*(i % N _{MAX_SF}), 2*(i % N _{MAX_SF})+1}	
	Time offset (N	OTE 4)	μs	0	
	Frequency off (NOTE 4)	set	Hz	0	
	Propagation C	hannel		Static propagation condition No external noise sources are applied	
	Antenna confi	guration		1x2 Low	
NOTE 1: D .	0				

NOTE 1: $P_B = 0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs..

NOTE 3: N_{MAX_SF} represents the maximum number of Sidelink UEs transmitting in one subframe. N_{MAX_SF} = 12 (5)

MHz), 25 (10MHz), 37 (15MHz), 50 (10MHz).

NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 11.5.1-2: Minimum performance

Test num.	Bandwidth	discSupportedProc	Number of configured resource pools	\hat{E}_{s} at antenna port (dBm/15kHz)	Reference value for Sidelink UE i=0discSupportedProc- 1 Fraction of maximum throughput (%)
1	5 MHz	50	5	-85	95
2	10 MHz	50	2	-85	95
3	15 MHz	50	2	-85	95
4	20 MHz	50	1	-85	95
5	10 MHz	400	16	-85	95
6	15 MHz	400	11	-85	95
7	20 MHz	400	8	-85	95

11.5.2 TDD

The test parameters are specified in Table 11.5.2-1. Multiple discovery resource pools are interleaved. Each Sidelink UE transmits in one of the resource pools with 3 retransmissions. The minimum requirements are specified in Table 11.5.2-2.

Table 11.5.2-1: Test Parameters

	Parameter		Unit	Test 1-7	
Discovery resource pool configuration			As specified in Table A.7.1.2-2 (Configuration #2-TDD) with parameters BW _{Channel} , NPools = Number of configured resource pools (as specified in Table 11.5.2-2), and N = discSupportedProc		
DRX configuration	n			As specified in Table 11.1.2-1	
Active cell(s)				Cell 1 (Serving cell)	
	Cyclic prefix			Normal	
	Uplink downlin configuration (3)			0	
	Special subframe configuration (NOTE 4)			4	
	Cell ID			0	
Cell 1	Downlink	$ ho_{\scriptscriptstyle A}$	dB	0	
	power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)	
6		σ	dB	0	
	OCNG Pattern NOTE 2			OP.1 TDD	
F	Propagation channel			Static propagation condition No external noise sources are applied	
	Antenna configuration			1x2	
	RSRP		dBm/15kHz	-85	
Active Sidelink UI				Sidelink UE i, i = 0,, discSupportedProc-1	
1 3	Sidelink Transmissions	i		PSDCH (D.1 TDD)	
	PSDCH Resource pool (NOTE 5)			$\left\lfloor rac{i}{N_{\mathit{MAX}}_{\mathit{SF}}} ight floor$	
Otala Balla LIE : I	PSDCH RB all (NOTE 5)	ocation		PRB pairs {2*(i % N _{MAX_SF}),2*(i % N _{MAX_SF})+1}	
	Time offset (N	OTE 6)	μs	0	
	Frequency offs (NOTE 7)	set	Hz	0	
F	Propagation C	hannel		Static propagation condition No external noise sources are applied	
NOTE 4	Antenna confiç	guration		1x2 Low	

NOTE 1: $P_{\scriptscriptstyle B}=0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs. NOTE 3: As specified in Table 4.2-2 in TS 36.211 [4].

NOTE 4: As specified in Table 4.2-1 in TS 36.211 [4].

NOTE 5: N_{MAX_SF} represents the maximum number of Sidelink UEs transmitting in one subframe. N_{MAX_SF} = 12 (5 MHz), 25 (10MHz), 37 (15MHz), 50 (10MHz).

NOTE 6: Transport of Sidelink UEs visib propert to Cell 1 downlink timing at the tested UE.

NOTE 7: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 11.5.2-2: Minimum performance

			Number of	$\hat{E}_{arsigma}$ at	Reference value
Test num.	Bandwidth	discSupportedProc	configured resource pools	antenna port (dBm/15kHz	Fraction of maximum throughput (%) for Sidelink UE i=0discSupportedProc-1
1	5 MHz	50	5	-85	95
2	10 MHz	50	2	-85	95
3	15 MHz	50	2	-85	95
4	20 MHz	50	1	-85	95
5	10 MHz	400	16	-85	95
6	15 MHz	400	11	-85	95
7	20 MHz	400	8	-85	95

12 Performance requirement (ProSe Direct Communication)

This clause contains the performance requirements for the Sidelink physical channels specified for ProSe Direct Communication in TS 36.211 [4].

12.1 General

12.1.1 Applicability of requirements

The requirements in this clause are applicable to UEs that support ProSe Direct Communication. Test cases defined for 5MHz channel bandwidth are applicable to UEs that support ProSe Direct Communication on only Band 31.

12.1.2 Reference DRX configuration

Table 12.1.2-1: Reference DRX configuration

Parameter	Value	Comments				
onDurationTimer	psf1					
drx-InactivityTimer	psf1					
drx-RetransmissionTimer	psf1					
longDRX-CycleStartOffset	sf2560, 0					
shortDRX	disabled					
NOTE 1: For further information see clause 6.3.2 in TS 36.331.						

12.2 Demodulation of PSSCH

The purpose of the requirements in this subclause is to verify the PSSCH demodulation performance with a single active PSSCH link.

12.2.1 FDD

The minimum requirements are specified in Table 12.2.1-2 with the test parameters specified in Table 12.2.1-1. This test specifies an out-of-coverge scenario where Sidelink UE 1 is the synchronization reference only and Sidelink UE 2 transmits PSCCH and PSSCH.

Table 12.2.1-1: Test Parameters

Parameter		Unit	Test 1	
Communication resource pool			As specified in Table A.7.2.1-1	
configuration			(Configuration #1-FDD)	
DRX configuration			As specified in Table 12.1.2-1	
N_{oc} at antenna port (NOTE 1)		dBm/15 kHz	-98	
Active cell(s)	Active cell(s)		None	
	Sidelink Transmissions		SLSS + PSBCH	
	networkControlledSyn cTx		ON	
	slssid		30	
Sidelink UE 1	inCoverage (in MIB- SL)		TRUE	
	syncOffsetIndicator		Set same as syncOffsetIndicator1 in Configuration #1-FDD	
	Propagation channel		EPA5	
	Antenna configuration		1x2 Low	
	$\widehat{E}_{\scriptscriptstyle s}$ at antenna port	dBm/15 kHz	-85	
	Sidelink Transmissions		PSCCH + PSSCH	
	PSCCH RMC		5MHz: CC.3 FDD 10 MHz: CC.4 FDD	
	PSCCH subframe allocation		As defined by TS 36.213 with $n_{\it PSCCH}$ chosen randomly	
	PSCCH RB allocation		(uniformly) in $[0, \lfloor M_{RB}^{PSCCH} - RP / 2 \rfloor L_{PSCCH} - 1]$ every sc-period	
	\widehat{E}_s of PSCCH at	dBm/15	-85	
	antenna port	kHz		
Sidelink UE 2	PSSCH RMC		As specificied in Table 12.2.1-2	
Sidelink UE 2	PSSCH subframe allocation		As per time repetition pattern specified in PSCCH	
	PSSCH RB allocation		First transmission: Chosen randomly (uniformly) among the allowed RBs as per TS36.213 HARQ retransmission: As per frequency hopping indicated in PSCCH and specified in TS36.213	
	Time offset (NOTE 2)	μs	+1	
	Frequency offset (NOTE 3)	Hz	+200	
	Propagation Channel		EVA70	
	Antenna configuration	tion 1x2 Low		

NOTE 1: Applicable to both DL channel and ProSe Direct Communication Subframes on UL.

NOTE 2: Time offset of Sidelink UE 2 receive signal timing with respect to Sidelink UE 1 receive signal timing at the tested UE.

NOTE 3: Frequency offset of Sidelink UE 2 with respect to Sidelink UE 1 transmit frequency.

Table 12.2.1-2: Minimum performance

Test	Sidelink	Band-	PSSCH Reference channel	Reference value		
num.	UE	width		Fraction of maximum throughput (%) (NOTE 1)	SNR (dB) of PSSCH	
1 2	2	10 MHz	CD.1 FDD	70	-3.4	
	2	5 MHz		70	-3.3	

NOTE 1: The throughput is measured after [40] radio frames of lead time during which the test UE detects and synchronizes to Sidelink UE 1.

12.3 Demodulation of PSCCH

The purpose of the requirements in this subclause is to verify the PSCCH demodulation performance with a single active PSSCH link.

12.3.1 FDD

The minimum requirements are specified in Table 12.3.1-2 with the test parameters specified in Table 12.3.1-1. This test specifies an out-of-coverage scenario where Sidelink UE 1 is the synchronization reference only and Sidelink UE 2 transmits PSCCH and PSSCH.

Table 12.3.1-1: Test Parameters

Parameter		Unit	Test 1
Communication resource pool			As specified in Table A.7.2.1-1
configuration			(Configuration #1-FDD)
DRX configuration	on		As specified in Table 12.1.2-1
$N_{\it oc}$ at antenna	port (NOTE 1)	dBm/15 kHz	-98
Active cell(s)			None
	Sidelink Transmissions		SLSS + PSBCH
	networkControlledSyn cTx		ON
	slssid		30
Sidelink UE 1	inCoverage (in MIB- SL)		TRUE
	syncOffsetIndicator		Set same as syncOffsetIndicator1 in Configuration #1-FDD
	Propagation channel		EPA5
	Antenna configuration		1x2 Low
	$\widehat{E}_{\scriptscriptstyle s}$ at antenna port	dBm/15 kHz	-85
	Sidelink Transmissions		PSCCH + PSSCH
	PSCCH RMC		As specified in Table 12.3.1-2
	PSCCH subframe allocation		As defined by TS 36.213 with $n_{\it PSCCH}$ chosen randomly
	PSCCH RB allocation		(uniformly) in $[0, \lfloor M_{RB}^{PSCCH} _{RP} / 2 \rfloor L_{PSCCH} - 1]$ every sc-period
	PSSCH RMC		CD.1 FDD
Sidelink UE 2	PSSCH subframe allocation		As per time repetition pattern specified in PSCCH
Sidellink de 2	PSSCH RB allocation		First transmission: Chosen randomly (uniformly) among the allowed RBs as per TS36.213 HARQ retransmission: As per frequency hopping indicated in PSCCH and specified in TS36.213
	Time offset (NOTE 2)	μs	+1
	Frequency offset (NOTE 3)	Hz	+200
	Propagation Channel		EVA70
	Antenna configuration		1x2 Low

NOTE 1: Applicable to both DL channel and ProSe Direct Communication Subframes on UL.

NOTE 2: Time offset of Sidelink UE 2 receive signal timing with respect to Sidelink UE 1 receive signal timing at the tested UE.

NOTE 3: Frequency offset of Sidelink UE 2 with respect to Sidelink UE 1 transmit frequency.

Table 12.3.1-2: Minimum performance

	Test	Sidelink	Band-	PSCCH Reference	Reference value	9
	num. UE width		width	channel	Probability of missed PSCCH (%) (NOTE 1)	SNR (dB) of PSCCH
Г	1	2	10 MHz	CC.4 FDD	1	4.7
	ı	2	5 MHz	CC.3 FDD	1	4.8

NOTE 1: The probability is measured after [40] radio frames of lead time during which the test UE detects and synchronizes to Sidelink UE 1.

12.4 Demodulation of PSBCH

The purpose of the requirements in this subclause is to verify the PSBCH demodulation performance with a single active link.

12.4.1 FDD

The minimum requirements are specified in Table 12.4.1-2 with the test parameters specified in Table 12.4.1-1.

Table 12.4.1-1: Test Parameters

	Parameter	Unit	Test 1
Communication res	ource pool configuration		As specified in Table A.7.2.1-1 (Configuration #1-FDD)
DRX configuration			As specified in Table 12.1.2-1
$N_{\it oc}$ at antenna por	t	dBm/15kHz	-98
Active cell(s)	Active cell(s)		None
	Sidelink Transmissions		SLSS + PSBCH (CP.1 FDD)
	networkControlledSyncTx		ON
	slssid		30
Sidelink UE 1	inCoverage (in MIB-SL)		TRUE
Sidelifik OE 1	syncOffsetIndicator		Set same as syncOffsetIndicator1 in Configuration #1-FDD
	Propagation channel		EPA5
	Antenna configuration		1x2 Low

Table 12.4.1-2: Minimum performance

Test	Sidelink	Band-	Reference	Reference value		
num.	UE	width	channel	Probability of missed PSBCH (%) (NOTE 1)	SNR (dB)	
1	1	10 MHz	PSBCH	1	4.4	
1	1 5 MHz		(CP.1 FDD)	I	4.4	

NOTE 1: The probability is measured after [40] radio frames of lead time during which the test UE detects and synchronizes to Sidelink UE 1.

12.5 Power imbalance performance with two links

The purpose of this test is to check the demodulation performance when receiving PSSCH transmissions from two Sidelink UEs with power imbalance in one subframe.

12.5.1 FDD

The test parameters in Table 12.5.1-1 specifies an in-coverage scenario where Sidelink UE 1 and 2 are synchronized to Cell 1 and transmit PSSCH on adjacent RBs. The minimum requirements are specified in Table 12.5.1-2.

Table 12.5.1-1: Test Parameters

Parameter			Unit	Test 1
Communication resource pool configuration				As specified in Table A.7.2.1-2
·				(Configuration #2-FDD)
DRX configuration				As specified in Table 11.1.2-1
$N_{\it oc}$ at antenna por	t (Note 3)		dBm/15kHz	-98
Active cell(s)				Cell 1 (Serving cell)
	Cyclic prefix			Normal
	Cell ID			0
	Davinlink navyar	$ ho_{\scriptscriptstyle A}$	dB	0
	Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)
Cell 1		σ	dB	0
	OCNG Pattern (N	ote 2)		OP.1 FDD
	Propagation chan			AWGN
	Antenna configura	ation		1x2
	RSRP		dBm/15kHz	-92
Active Sidelink UE(s	s)			Sidelink UE 1, Sidelink UE 2
	Sidelink Transmis	sions		PSCCH + PSSCH
	PSCCH RMC			5 MHz: CC.1 FDD
				10 MHz: CC.2 FDD
	PSCCH subframe allocation			$n_{PSCCH}=0$ (as defined in TS 36.213)
	PSCCH RB alloca	PSCCH RB allocation		PSCCH (The state of the state
	\hat{E}_s of PSCCH at antenna		dBm/15kHz	-85
Sidelink UE 1	PSSCH RMC			As specified in Table 12.5.1-2
				As specified in Table 12.3.1-2 As per time repetition pattern specified in PSCCH
	PSSCH subframe allocation PSSCH RB allocation			PRB pairs {4, 5}
	Time offset (NOTE 4)		μs	0
	Frequency offset (NOTE 5)		μs Hz	0
	Propagation Channel		112	AWGN
	Antenna configuration			1x2 Low
	Sidelink Transmis			PSCCH + PSSCH
				5 MHz: CC.1 FDD
	PSCCH RMC			10 MHz: CC.2 FDD
	PSCCH subframe	allocation		
	PSCCH RB alloca			$n_{\it PSCCH} = 2 $ (as defined in TS 36.213)
	\widehat{E}_s of PSCCH at	antenna	dBm/15kHz	-85
Sidelink UE 2	port		abili, fold iz	55
OIGHIIN OL Z	PSSCH RMC			As specified in Table 12.5.1-2
	PSSCH subframe	allocation		As per time repetition pattern specified in PSCCH
	PSSCH RB alloca			PRB pairs {6, 7}
	Time offset (NOTI		μs	0
	Frequency offset		Hz	0
	Propagation Char			AWGN
	Antenna configuration			

NOTE 1: $P_B = 0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.

NOTE 3: Applicable to both DL channel and ProSe Direct Communication Subframes on UL.

NOTE 4: The power of PSCCH is set high to ensure reliable reception of PSCCH.

NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 12.5.1-2: Minimum performance

Test	Band-	Sidelink	PSSCH Reference	Reference v	alue		
num.	width	UE	channel	Fraction of maximum throughput (%)	SNR (dB) of PSSCH		
4	5 / 10	1	CD.5 FDD	(NOTE 1)	24.35		
'	MHz	2	CD.5 FDD	70	2.4		
NOTE	NOTE 1: There is no throughput requirement for Sidelink UE 1.						

12.6 Multiple timing reference test

The puporse of this test is to check the PSSCH demodulation performance when receiving from two Sidelink UEs that follow different timing references and transmitting on different resources (non-overalapping in time).

12.6.1 FDD

The test parameters are specified in Table 12.6.1-1. Sidelink UE 2 and the receiver UE under test are associated with Cell 1. Sidelink UE 1 and Sidelink UE 3 are associated with another cell and use a different timing, and Sidelink UE 1 acts as a synchronization reference only. The minimum requirements are specified in Table 12.6.1-2.

Table 12.6.1-1: Test Parameters

Parameter			Unit	Test 1
Communication resor	urce pool configurat	tion		As specified in Table A.7.2.1-3 (Configuration #3-FDD)
DRX configuration				As specified in Table 11.1.2-1
N_{oc} at antenna port	(Note 3)		dBm/15kHz	-98
Active cell(s)				Cell 1 (Serving cell)
	Cyclic prefix			Normal
	Cell ID	1		0
	Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	0
	Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)
Cell 1		σ	dB	0
	OCNG Pattern NO	IE 2		OP.1 FDD
	Propagation chan			AWGN
	Antenna configura	ation	dD == /4.514.1=	1x2
Active Sidelink UE(s)	RSRP		dBm/15kHz	-92 Sidelink UE 1, Sidelink UE 2, Sidelink UE 3
Active Sidellink OL(3)	Sidelink Transmis	sions		SLSS + PSBCH
	networkControlled			ON
	slssid	,		30
	inCoverage (in MI	B-SL)		TRUE
Sidelink UE 1	syncOffsetIndicate	or		Set same as syncOffsetIndicator in Configuration #3-FDD
OldCillik OL 1	Time offset (NOT		ms	+12.51 ms
	Frequency offset		Hz	-100 Hz
	Propagation chan			EPA5
	Antenna configura			1x2 Low
	\widehat{E}_{s} at antenna po	ort	dBm/15kHz	-85
	Sidelink Transmissions			PSCCH + PSSCH
	Resource pool			commRxPool(0)
	PSCCH RMC			5MHz: CC.1 FDD 10 MHz: CC.2 FDD (NOTE 5)
	PSCCH subframe allocation			As defined by TS 36.213 with $n_{\it PSCCH}$ chosen
	PSCCH RB allocation			randomly (uniformly) in $[0,\!\lfloor M_{\scriptscriptstyle RB}^{\scriptscriptstyle PSCCH}-^{\scriptscriptstyle RP}/2 floor L_{\scriptscriptstyle PSCCH}-1]$ every sc-period
Sidelink UE 2	\hat{E}_s of PSCCH at antenna port		dBm/15kHz	-85
	PSSCH RMC			As specified in Table 12.6.1-2
	PSSCH subframe	allocation		As per time repetition pattern specified in PSCCH
	PSSCH RB allocation			First transmission: Chosen randomly (uniformly) among the allowed RBs as per TS36.213 HARQ retransmission: As per frequency hopping indicated in PSCCH and specified in TS36.213
	Time offset (NOT	E 4, 5)		indicated in PSCCH and specified in TS36.213 PSCCH: +1μsPSSCH: +1μs – 288T _s
	Frequency offset		Hz	+200
	Propagation Char			EVA70
	Antenna configura	ation		1x2 Low
	Sidelink Transmis	sions		PSCCH + PSSCH
	Resource pool			commRxPool(1)
	PSCCH RMC			5MHz: CC.5 FDD 10 MHz: CC.6 FDD
	PSCCH subframe	allocation		As defined by TS 36.213 with $n_{\scriptscriptstyle PSCCH}$ chosen
Sidelink UE 3	PSCCH RB alloca	ation		randomly (uniformly) in $[0, \lfloor M_{RB}^{PSCCH} - ^{RP}/2 \rfloor L_{PSCCH} - 1]$ every sc-period
	\widehat{E}_s of PSCCH at	antenna	dBm/15kHz	-85
	PSSCH RMC			As specified in Table 12.6.1-2

PSSCH subframe allocation		As per time repetition pattern specified in PSCCH
PSSCH RB allocation		First transmission: Chosen randomly (uniformly) among the allowed RBs as per TS36.213 HARQ retransmission: As per frequency hopping indicated in PSCCH and specified in TS36.213
Time offset (NOTE 5)	ms	+12.509
Frequency offset (NOTE 6)	Hz	+300
Propagation Channel		EVA70
Antenna configuration		1x2 Low

NOTE 1: $P_B = 0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.

NOTE 3: Applicable to both DL channel and ProSe Direct Communication Subframes on UL.

NOTE 4: Timing advance indication in PSSCH is set as 18 (= $288T_s$) in this test. PSSCH timing is advanced with respect

to PSCCH timing by the quantity (i.e., PSSCH timing shall be $+1\mu s - 288T_s$ in this test).

NOTE 5: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 6: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 12.6.1-2: Minimum performance

	Band-	Sidelink PSSCH		Reference value		
Test num.	width	UE	Reference channel	Fraction of maximum throughput (%) (NOTE 1)	SNR (dB)	
	10 MHz	2	CD.4 FDD	70	3.0	
1	10 MHZ	3	CD.2 FDD	70	2.8	
l l	E MILI-	2	CD.3 FDD	70	2.9	
	5 MHz	3	CD.2 FDD	70	2.8	

NOTE 1: The throughput is measured after [40] radio frames of lead time during which the test UE detects and synchronizes to Sidelink UE 1.

12.7 Maximum Sidelink processes test

The purpose of this test is to verify the maximum number of Sidelink processes and the maximum number of bits per TTI supported by the UE.

12.7.1 FDD

The test parameters are specified in Table 12.7.1-1. Multiple communication resource pools are interleaved. Each active Sidelink UE transmits in one of the resource pools with 3 retransmissions. The minimum requirements are specified in Table 12.7.1-2.

Table 12.7.1-1: Test Parameters

Parameter			Unit	Test 1
Communication resource pool configuration				As specified in Table A.7.2.1-4
1 0				(Configuration #4-FDD)
DRX configuration				As specified in Table 11.1.2-1
Active cell(s)				Cell 1 (Serving cell)
	Cyclic prefix			Normal
	Cell ID			0
	Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0
	allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (NOTE 1)
Cell 1		σ	dB	0
	OCNG Pattern (N	ote 2)		OP.1 FDD
	Propagation chan	nel		Static propagation condition
	1 Topagation Chan	1161		No external noise sources are applied
	Antenna configuration			1x2
	RSRP		dBm/15kHz	-85
Active Sidelink UE(s)				Sidelink UE i, 0 ≤ i ≤ 15
	Sidelink Transmis	sions		PSCCH + PSSCH
	Resource pool			$commRxPool(\left\lfloor rac{i}{8} ight floor)$
	PSCCH RMC			5MHz: CC.1 FDD with I _{TRP} =i%8 (NOTE 3) 10 MHz: CC.2 FDD with I _{TRP} = i%8 (NOTE 3)
Sidelink UE i,	PSCCH subframe allocation			As defined by TS 36.213 with $n_{\rm PSCCH}$ = i
0 ≤ i ≤ 15	PSCCH RB alloca	ation		
	PSSCH RMC			As specified in Table 12.7.1-2
	PSSCH subframe			As per time repetition pattern specified in PSCCH
	PSSCH RB alloca			Fully allocated
	Time offset (NOT		μs	0
	Frequency offset	(NOTE 5)	Hz	0
	Propagation Char	nnel		Static propagation condition No external noise sources are applied
	Antenna configura		1	1x2 Low

NOTE 1: $P_B = 0$.

NOTE 2: OCNG is used to fully allocate the available resource blocks to virtual UEs.

 $I_{TRP} = 1$ corresponds to a time repetition pattern of (0,1,0,0,0,0,0,0), etc.

NOTE 4: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 5: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 12.7.1-2: Minimum performance

Test	Bandwidth	PSCCH Reference	$\hat{E}_{\scriptscriptstyle s}$ at	Reference value for Sidelink UE i=015	
num.	Bandwidth	channel	antenna port (dBm/15kHz)	Fraction of maximum throughput (%)	
1	10 MHz	CD.7 FDD	-85	95	
'	5 MHz	CD.6 FDD	-85	95	

12.8 Sustained downlink data rate with active Sidelink

The purpose of this test is to verify the downlink data rate is not impacted when Sidelink resource are also configured. The test parameters are in Table 12.8.1-1. Cell 1 is the serving cell and UE 1 and UE 2 are transmitters of Prose Direct Communication. The test UE is expected to receive all PDSCH transmissions, and prioritize the transmission of ACK/NACK over the reception of UE 2's PSSCH.

The test cases apply to UE categories and bandwidth combinations with maximum aggregated bandwidth as specified in Table 12.8.1-2. The minimum requirements are specified in Table 12.8.1-3. The TB success rate in the cellular link shall be sustained during at least 300 frames.

Table 12.8.1-1: Test parameters for sustained downlink data rate (FDD 64QAM) with active Sidelink

F	Parameter	Unit	Test 1, 2, 3A
Communication resource pool configuration			As specified in Table A.7.2.1-5
·			(Configuration #5-FDD)
Active cell(s)			Cell 1 (Serving cell)
Cell 1	Cell 1 Test parameters		As specified in clause 8.7.1: Table 8.7.1-1 and Test
	•		1, 2, 3A in Table 8.7.1-2
Active Sidelink UE(s)			Sidelink UE 1, Sidelink UE 2
	Sidelink Transmissions		PSCCH + PSSCH
	PSCCH RMC		10 MHz: CC.2 FDD with I _{TRP} =0 (NOTE 1)
	PSCCH subframe allocation		As defined by TS 36.213 with $n_{PSCCH} = 0$
	PSCCH RB allocation		
	PSSCH RMC		10 MHz: CD.7 FDD
	PSSCH subframe allocation		As per time repetition pattern specified in PSCCH
Sidelink UE 1	PSSCH RB allocation		Fully allocated
	Time offset (NOTE 3)	μs	0
	Frequency offset (NOTE 4)	Hz	0
	Propagation Channel		Static propagation condition
			No external noise sources are applied
	Antenna configuration		1x2 Low
	$\widehat{E}_{\scriptscriptstyle s}$ at antenna port	dBm/15kHz	-85
	Sidelink Transmissions		PSCCH (NOTE 2)
	PSCCH RMC		10 MHz: CC.2 FDD with I _{TRP} =1 (NOTE 1)
	PSCCH subframe allocation		As defined by TS 36.213 with $n_{PSCCH} = 1$
	PSCCH RB allocation		As defined by 13 30.213 with $n_{PSCCH} = 1$
	Time offset (NOTE 3)	μs	0
Sidelink UE 2	Frequency offset (NOTE 4)	Hz	0
	Propagation Channel		Static propagation condition No external noise sources are applied
	Antenna configuration		1x2 Low
	\hat{E}_{s} at antenna port	dBm/15kHz	-85

NOTE 1: For $N_{TRP} = 8$ (FDD) and trpt-Subset = 001, $I_{TRP} = 0$ corresponds to a time repetition pattern of (1,0,0,0,0,0,0,0), $I_{TRP} = 1$ corresponds to a time repetition pattern of (0,1,0,0,0,0,0,0).

NOTE 2: Sidelink UE 2 transmits PSCCH but not PSSCH.

NOTE 3: Time offset of Sidelink UE receive signal with respect to Cell 1 downlink timing at the tested UE.

NOTE 4: Frequency offset of Sidelink UE with respect to Cell 1 uplink frequency.

Table 12.8.1-2: Test cases for sustained data rate

CA config	Maximum supported Bandwidth/ Bandwidth combination (MHz)	Cat. 1	Cat. 2	Cat. 3	Cat. 4	Cat. 6,7	Cat. 9,10	Cat 11, 12
Single carrier	10	1	2	3A	3A	3A	3A	3A

Table 12.8.1-3: Minimum requirements (FDD 64QAM) with active Sidelink

Test	Bandwidth (MHz)	Number of bits of a DL-SCH transport block received within a TTI	Measurement channel	Reference value PDSCH TB success rate (%)
1	10	10296	R.31-1 FDD (NOTE 2)	95
2	10	25456	R.31-2 FDD (NOTE 2)	95
3A	10	36696 (NOTE 1)	R.31-3A FDD (NOTE 2)	85
-	.	e 5. tern is changed as per the		-

PDSCH scheduling subframe bitmap = {01110111 11110111 11110111 11111110}.

Annex A (normative): Measurement channels

A.1 General

The throughput values defined in the measurement channels specified in Annex A, are calculated and are valid per datastream (codeword). For multi-stream (more than one codeword) transmissions, the throughput referenced in the minimum requirements is the sum of throughputs of all datastreams (codewords).

The UE category entry in the definition of the reference measurement channel in Annex A is only informative and reveals the UE categories, which can support the corresponding measurement channel. Whether the measurement channel is used for testing a certain UE category or not is specified in the individual minimum requirements.

A.2 UL reference measurement channels

A.2.1 General

A.2.1.1 Applicability and common parameters

The following sections define the UL signal applicable to the Transmitter Characteristics (clause 6) and for the Receiver Characteristics (clause 7) where the UL signal is relevant.

The Reference channels in this section assume transmission of PUSCH and Demodulation Reference signal only. The following conditions apply:

- 1 HARQ transmission
- Cyclic Prefix normal
- PUSCH hopping off
- Link adaptation off
- Demodulation Reference signal as per TS 36.211 [4] subclause 5.5.2.1.2.

Where ACK/NACK is transmitted, it is assumed to be multiplexed on PUSCH as per TS 36.212 [5] subclause 5.2.2.6.

- ACK/NACK 1 bit
- ACK/NACK mapping adjacent to Demodulation Reference symbol
- ACK/NACK resources punctured into data
- Max number of resources for ACK/NACK: 4 SC-FDMA symbols per subframe
- No CQI transmitted, no RI transmitted

A.2.1.2 Determination of payload size

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{RB}

- 1. Calculate the number of channel bits $N_{\rm ch}$ that can be transmitted during the first transmission of a given sub-frame.
- 2. Find A such that the resulting coding rate is as close to R as possible, that is,

$$\min |R - (A + 24*(N_{CB} + 1))/N_{ch}|, where N_{CB} = \begin{cases} 0, & \text{if } C = 1\\ C, & \text{if } C > 1 \end{cases}$$

subject to

- a) A is a valid TB size according to section 7.1.7 of TS 36.213 [6] assuming an allocation of N_{RB} resource blocks
- b) C is the number of Code Blocks calculated according to section 5.1.2 of TS 36.212 [5].
- c) For RMC-s, which at the nominal target coding rate do not cover all the possible UE categories for the given modulation, reduce the target coding rate gradually (within the same modulation), until the maximal possible number of UE categories is covered.
- 3. If there is more than one A that minimises the equation above, then the larger value is chosen per default and the chosen code rate should not exceed 0.93.

A.2.1.3 Overview of UL reference measurement channels

In Table A.2.1.3-1 are listed the UL reference measurement channels specified in annexes A.2.2 and A.2.3 of this release of TS 36.101. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation's parameters as to be used for requirements are annexes A.2.2 and A.2.3 as appropriate.

Table A.2.1.3-1: Overview of UL reference measurement channels

Duplex	Table	Name	BW	Mod	TCR	RB	RB Off set	UE Cat eg	Notes
FDD, Ful	I RB allocation, QP	SK							
FDD	Table A.2.2.1.1-1		1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.2.2.1.1-1		3	QPSK	1/3	15		≥ 1	
FDD	Table A.2.2.1.1-1		5	QPSK	1/3	25		≥ 1	
FDD	Table A.2.2.1.1-1		10	QPSK	1/3	50		≥ 1	
FDD	Table A.2.2.1.1-1		15	QPSK	1/5	75		≥ 1	
FDD	Table A.2.2.1.1-1		20	QPSK	1/6	100		≥ 1	
FDD / HD-FDD	Table A.2.2.1.1-1a		1.4	QPSK	1/3	6		0	
FDD / HD-FDD	Table A.2.2.1.1-1a		3	QPSK	1/5	15		0	
FDD / HD-FDD	Table A.2.2.1.1-1a		5	QPSK	1/8	25		0	
FDD / HD-FDD	Table A.2.2.1.1-1a		10	QPSK	[1/10	[36]		0	
FDD / HD-FDD	Table A.2.2.1.1-1a		15	QPSK	[1/10	[36]		0	
FDD / HD-FDD	Table A.2.2.1.1-1a		20	QPSK	[1/10	[36]		0	
	I RB allocation, 16-	QAM							
FDD	Table A.2.2.1.2-1		1.4	16QAM	3/4	6		≥ 1	
FDD	Table A.2.2.1.2-1		3	16QAM	1/2	15		≥ 1	
FDD	Table A.2.2.1.2-1		5	16QAM	1/3	25		≥ 1	
FDD	Table A.2.2.1.2-1		10	16QAM	3/4	50		≥ 2	
FDD	Table A.2.2.1.2-1		15	16QAM	1/2	75		≥ 2	
FDD	Table A.2.2.1.2-1		20	16QAM	1/3	100		≥ 2	
FDD / HD-FDD	Table A.2.2.1.2-1a		1.4	16QAM	1/3	5		0	
FDD / HD-FDD	Table A.2.2.1.2-1a		3	16QAM	1/3	5		0	
FDD / HD-FDD	Table A.2.2.1.2-1a		5	16QAM	1/3	5		0	
FDD / HD-FDD	Table A.2.2.1.2-1a		10	16QAM	1/3	5		0	
FDD / HD-FDD	Table A.2.2.1.2-1a		15	16QAM	1/3	5		0	
FDD / HD-FDD	Table A.2.2.1.2-1a		20	16QAM	1/3	5		0	
FDD, Ful	I RB allocation, 64-	QAM							
FDD	Table A.2.2.1.3-1		1.4	64QAM	3/4	6		≥ 1	
FDD	Table A.2.2.1.3-1		3	64QAM	3/4	15		≥ 1	
FDD	Table A.2.2.1.3-1		5	64QAM	2/5	25		≥ 1	
FDD	Table A.2.2.1.3-1		10	64QAM	3/4	50		≥ 2	
FDD	Table A.2.2.1.3-1		15	64QAM	3/4	75		≥ 2	
FDD	Table A.2.2.1.3-1	2001/	20	64QAM	1/2	100		≥ 2	
	tial RB allocation, (JPSK		0.0017	1		I	l	
FDD	Table A.2.2.2.1-1		1.4 - 20	QPSK	1/3	1		≥ 1	
FDD	Table A.2.2.2.1-1		1.4 - 20	QPSK	1/3	2		≥ 1	
FDD	Table A.2.2.2.1-1		1.4 - 20	QPSK	1/3	3		≥ 1	
FDD	Table A.2.2.2.1-1		1.4 - 20	QPSK	1/3	4		≥ 1	
FDD	Table A.2.2.2.1-1		1.4 - 20	QPSK	1/3	5		≥ 1	
FDD	Table A.2.2.2.1-1		3 - 20	QPSK	1/3	6		≥ 1	
FDD	Table A.2.2.2.1-1		3 - 20	QPSK	1/3	8		≥ 1	

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FDD	Table A.2.2.2.1-1	3 - 20	QPSK	1/3	9		≥ 1	
FDD	Table A.2.2.2.1-1	3 - 20	QPSK	1/3	10		≥ 1	
FDD	Table A.2.2.2.1-1	3 - 20	QPSK	1/3	12		≥ 1	
FDD	Table A.2.2.2.1-1	5 - 20	QPSK	1/3	15		≥ 1	
FDD	Table A.2.2.2.1-1	5 - 20	QPSK	1/3	16		≥ 1	
FDD	Table A.2.2.2.1-1	5 - 20	QPSK	1/3	18		≥ 1	
FDD	Table A.2.2.2.1-1	5 - 20	QPSK	1/3	20		≥ 1	
FDD	Table A.2.2.2.1-1	5 - 20	QPSK	1/3	24		≥ 1	
FDD	Table A.2.2.2.1-1	10 - 20	QPSK	1/3	25		≥ 1	
FDD	Table A.2.2.2.1-1	10 - 20	QPSK	1/3	27		≥ 1	
FDD	Table A.2.2.2.1-1	10 - 20	QPSK	1/3	30		≥ 1	
FDD	Table A.2.2.2.1-1	10 - 20	QPSK	1/3	32		≥ 1	
FDD	Table A.2.2.2.1-1	10 - 20	QPSK	1/3	36		≥ 1	
FDD	Table A.2.2.2.1-1	10 - 20	QPSK	1/3	40		≥ 1	
FDD	Table A.2.2.2.1-1	10 - 20	QPSK	1/3	45		≥ 1	
FDD	Table A.2.2.2.1-1	10 - 20	QPSK	1/3	48		≥ 1	
FDD	Table A.2.2.2.1-1	15 - 20	QPSK	1/3	50		≥ 1	
FDD	Table A.2.2.2.1-1	15 - 20	QPSK	1/3	54		≥ 1	
FDD	Table A.2.2.2.1-1	15 - 20	QPSK	1/4	60		≥ 1	
FDD	Table A.2.2.2.1-1	15 - 20	QPSK	1/4	64		≥ 1	
FDD	Table A.2.2.2.1-1	15 - 20	QPSK	1/4	72		≥ 1	
FDD	Table A.2.2.2.1-1	20	QPSK	1/5	75		≥ 1	
FDD	Table A.2.2.2.1-1	20	QPSK	1/5	80		≥ 1	
FDD	Table A.2.2.2.1-1	20	QPSK	1/5	81		≥ 1	
FDD	Table A.2.2.2.1-1	20	QPSK	1/6	90		≥ 1	
FDD	Table A.2.2.2.1-1	20	QPSK	1/6	96		≥ 1	
FDD / HD-FDD	Table A.2.2.2.1-1a	1.4 - 20	QPSK	1/3	1		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	1.4 - 20	QPSK	1/3	2		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	1.4 - 20	QPSK	1/3	3		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	1.4 - 20	QPSK	1/3	4		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	1.4 - 20	QPSK	1/3	5		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	3-20	QPSK	1/3	6		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	3-20	QPSK	1/3	8		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	3-20	QPSK	1/3	9		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	3-20	QPSK	1/3	10		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	3-20	QPSK	1/4	12		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	5-20	QPSK	1/5	15		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	5-20	QPSK	1/5	16		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	5-20	QPSK	1/6	18		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	5-20	QPSK	1/6	20		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	5-20	QPSK	1/8	24		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	10-20	QPSK	1/8	25		0	
FDD / HD-FDD	Table A.2.2.2.1-1a	10-20	QPSK	1/8	27		0	

FDD /	Table A.2.2.2.1-1a		10-20	QPSK	1/10	30		0	
HD-FDD Bort		IC OAM	10 20	Qi Oit	1710	00		· ·	
1	tial RB allocation,	IO-QAW	1.4.20	16001	2/4	1	l	> 1	
FDD FDD	Table A.2.2.2.1		1.4 - 20	16QAM	3/4	2		≥ 1	
-	Table A.2.2.2.1		1.4 - 20	16QAM	3/4			≥ 1	
FDD	Table A.2.2.2.1		1.4 - 20	16QAM	3/4	3		≥ 1	
FDD	Table A.2.2.2.1		1.4 - 20	16QAM	3/4	4		≥ 1	
FDD	Table A.2.2.2.1		1.4 - 20	16QAM	3/4	5		≥ 1	
FDD	Table A.2.2.2.2-1		3 - 20	16QAM	3/4	6		≥ 1	
FDD	Table A.2.2.2.1		3 - 20	16QAM	3/4	8		≥ 1	
FDD	Table A.2.2.2.1		3 - 20	16QAM	3/4	9		≥ 1	
FDD	Table A.2.2.2.2-1		3 - 20	16QAM	3/4	10		≥ 1	
FDD	Table A.2.2.2.2-1		3 - 20	16QAM	3/4	12		≥ 1	
FDD	Table A.2.2.2.2-1		5 - 20	16QAM	1/2	15		≥ 1	
FDD	Table A.2.2.2.2-1		5 - 20	16QAM	1/2	16		≥ 1	
FDD	Table A.2.2.2.2-1		5 - 20	16QAM	1/2	18		≥ 1	
FDD	Table A.2.2.2.2-1		5 - 20	16QAM	1/3	20		≥ 1	
FDD	Table A.2.2.2.2-1		5 - 20	16QAM	1/3	24		≥ 1	
FDD	Table A.2.2.2.2-1		10 - 20	16QAM	1/3	25		≥ 1	
FDD	Table A.2.2.2.2-1		10 - 20	16QAM	1/3	27		≥ 1	
FDD	Table A.2.2.2.2-1		10 - 20	16QAM	3/4	30		≥ 2	
FDD	Table A.2.2.2.2-1		10 - 20	16QAM	3/4	32		≥ 2	
FDD	Table A.2.2.2.1		10 - 20	16QAM	3/4	36		≥ 2	
FDD	Table A.2.2.2.2-1		10 - 20	16QAM	3/4	40		≥ 2	
FDD	Table A.2.2.2.2-1		10 - 20	16QAM	3/4	45		≥ 2	
FDD	Table A.2.2.2.2-1		10 - 20	16QAM	3/4	48		≥ 2	
FDD	Table A.2.2.2.2-1		15 - 20	16QAM	3/4	50		≥ 2	
FDD	Table A.2.2.2.2-1		15 - 20	16QAM	3/4	54		≥ 2	
FDD	Table A.2.2.2.2-1		15 - 20	16QAM	2/3	60		≥ 2	
FDD	Table A.2.2.2.2-1		15 - 20	16QAM	2/3	64		≥ 2	
FDD	Table A.2.2.2.2-1		15 - 20	16QAM	1/2	72		≥ 2	
FDD	Table A.2.2.2.2-1		20	16QAM	1/2	75		≥ 2	
FDD	Table A.2.2.2.2-1		20	16QAM	1/2	80		≥ 2	
FDD	Table A.2.2.2.1		20	16QAM	1/2	81		≥ 2	
FDD	Table A.2.2.2.2-1		20	16QAM	2/5	90		≥ 2	
FDD	Table A.2.2.2.2-1		20	16QAM	2/5	96		≥ 2	
FDD /			1.4 - 20						
HD-FDD /	Table A.2.2.2.1a		1.4 - 20	16QAM	3/4	1		0	
HD-FDD	Table A.2.2.2.2-1a		1.4 - 20	16QAM	3/4	2		0	
FDD / HD-FDD	Table A.2.2.2-1a		1.4 - 20	16QAM	2/5	4		0	
FDD, Part	tial RB allocation, 6	64-QAM							
FDD	Table A.2.2.2.3-1		1.4 - 20	64QAM	3/4	1		≥ 1	
FDD	Table A.2.2.2.3-1		1.4 - 20	64QAM	3/4	2		≥ 1	
FDD	Table A.2.2.2.3-1		1.4 - 20	64QAM	3/4	3		≥ 1	
FDD	Table A.2.2.2.3-1		1.4 - 20	64QAM	3/4	4		≥ 1	
FDD	Table A.2.2.2.3-1		1.4 - 20	64QAM	3/4	5		≥ 1	
FDD	Table A.2.2.2.3-1		3 - 20	64QAM	3/4	6		≥ 1	
FDD	Table A.2.2.2.3-1		3 - 20	64QAM	3/4	8		≥ 1	
FDD	Table A.2.2.2.3-1		3 - 20	64QAM	3/4	9		≥ 1	

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FDD	Table A.2.2.2.3-1		3 - 20	64QAM	3/4	10		≥ 1	
FDD	Table A.2.2.2.3-1		3 - 20	64QAM	3/4	12		≥ 1	
FDD	Table A.2.2.2.3-1		5 - 20	64QAM	3/4	15		≥ 1	
FDD	Table A.2.2.2.3-1		5 - 20	64QAM	2/3	16		≥ 1	
FDD	Table A.2.2.2.3-1		5 - 20	64QAM	1/2	18		≥ 1	
FDD	Table A.2.2.2.3-1		5 - 20	64QAM	1/2	20		≥ 1	
FDD	Table A.2.2.2.3-1		5 - 20	64QAM	2/5	24		≥ 1	
FDD	Table A.2.2.2.3-1		10 - 20	64QAM	2/5	25		≥ 1	
FDD	Table A.2.2.2.3-1		10 - 20	64QAM	2/5	27		≥ 1	
FDD	Table A.2.2.2.3-1		10 - 20	64QAM	1/3	30		≥ 1	
FDD	Table A.2.2.2.3-1		10 - 20	64QAM	1/3	32		≥ 1	
FDD	Table A.2.2.2.3-1		10 - 20	64QAM	3/4	36		≥ 2	
FDD	Table A.2.2.2.3-1		10 - 20	64QAM	3/4	40		≥ 2	
FDD	Table A.2.2.2.3-1		10 - 20	64QAM	3/4	45		≥ 2	
FDD	Table A.2.2.2.3-1		10 - 20	64QAM	3/4	48		≥ 2	
FDD	Table A.2.2.2.3-1		15 - 20	64QAM	3/4	50		≥ 2	
FDD	Table A.2.2.2.3-1		15 - 20	64QAM	3/4	54		≥ 2	
FDD	Table A.2.2.2.3-1		15 - 20	64QAM	3/4	60		≥ 2	
FDD	Table A.2.2.2.3-1		15 - 20	64QAM	3/4	64		≥ 2	
FDD	Table A.2.2.2.3-1		15 - 20	64QAM	3/4	72		≥ 2	
FDD	Table A.2.2.2.3-1		20	64QAM	3/4	75		≥ 2	
FDD	Table A.2.2.2.3-1		20	64QAM	2/3	80		≥ 2	
FDD	Table A.2.2.2.3-1		20	64QAM	2/3	81		≥ 2	
FDD	Table A.2.2.2.3-1		20	64QAM	1/2	90		≥ 2	
FDD	Table A.2.2.2.3-1		20	64QAM	1/2	96		≥ 2	
TDD, Ful	II RB allocation, QP	SK			•				
TDD	Table A.2.3.1.1-1		1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.2.3.1.1-1		3	QPSK	1/3	15		≥ 1	
TDD	Table A.2.3.1.1-1		5	QPSK	1/3	25		≥ 1	
TDD	Table A.2.3.1.1-1		10	QPSK	1/3	50		≥ 1	
TDD	Table A.2.3.1.1-1		15	QPSK	1/5	75		≥ 1	
TDD	Table A.2.3.1.1-1		20	QPSK	1/6	100		≥ 1	
TDD	Table A.2.3.1.1-1a		1.4	QPSK	1/3	6		0	
TDD	Table A.2.3.1.1-1a		3	QPSK	1/5	15		0	
TDD	Table A.2.3.1.1-1a		5	QPSK	1/8	25		0	
TDD	Table A.2.3.1.1-1a		10	QPSK	[1/10	[36]		0	
TDD	Table A.2.3.1.1-1a		15	QPSK	[1/10	[36]		0	
TDD	Table A.2.3.1.1-1a		20	QPSK	[1/10 1	[36]		0	
TDD, Fu	II RB allocation, 16-	QAM							
TDD	Table A.2.3.1.2-1		1.4	16QAM	3/4	6		≥ 1	
TDD	Table A.2.3.1.2-1		3	16QAM	1/2	15		≥ 1	
TDD	Table A.2.3.1.2-1		5	16QAM	1/3	25		≥ 1	
TDD	Table A.2.3.1.2-1		10	16QAM	3/4	50		≥ 2	
TDD	Table A.2.3.1.2-1		15	16QAM	1/2	75		≥ 2	
TDD	Table A.2.3.1.2-1		20	16QAM	1/3	100		≥ 2	
TDD	Table A.2.3.1.2-1a		1.4	16QAM	1/3	5		0	
TDD	Table A.2.3.1.2-1a		3	16QAM	1/3	5		0	
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				1				
TDD	Table A.2.3.1.2-1a		5	16QAM	1/3	5	0	
TDD	Table A.2.3.1.2-1a		10	16QAM	1/3	5	0	
TDD	Table A.2.3.1.2-1a		15	16QAM	1/3	5	0	
TDD	Table A.2.3.1.2-1a		20	16QAM	1/3	5	0	
TDD, Ful	I RB allocation, 64-	QAM						
TDD	Table A.2.3.1.3-1		1.4	64QAM	3/4	6	≥ 1	
TDD	Table A.2.3.1.3-1		3	64QAM	3/4	15	≥ 1	
TDD	Table A.2.3.1.3-1		5	64QAM	2/5	25	≥ 1	
TDD	Table A.2.3.1.3-1		10	64QAM	3/4	50	≥ 2	
TDD	Table A.2.3.1.3-1		15	64QAM	3/4	75	≥ 2	
TDD	Table A.2.3.1.3-1		20	64QAM	1/2	100	≥ 2	
TDD, Pai	rtial RB allocation,	QPSK						
TDD	Table A.2.3.2.1-1		1.4 - 20	QPSK	1/3	1	≥ 1	
TDD	Table A.2.3.2.1-1		1.4 - 20	QPSK	1/3	2	≥ 1	
TDD	Table A.2.3.2.1-1		1.4 - 20	QPSK	1/3	3	≥ 1	
TDD	Table A.2.3.2.1-1		1.4 - 20	QPSK	1/3	4	≥ 1	
TDD	Table A.2.3.2.1-1		1.4 - 20	QPSK	1/3	5	≥ 1	
TDD	Table A.2.3.2.1-1		3 - 20	QPSK	1/3	6	≥ 1	
TDD	Table A.2.3.2.1-1		3 - 20	QPSK	1/3	8	≥ 1	
TDD	Table A.2.3.2.1-1		3 - 20	QPSK	1/3	9	≥ 1	
TDD	Table A.2.3.2.1-1		3 - 20	QPSK	1/3	10	≥ 1	
TDD	Table A.2.3.2.1-1		3 - 20	QPSK	1/3	12	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/3	15	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/3	16	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/3	18	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/3	20	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/3	24	≥ 1	
TDD	Table A.2.3.2.1-1		10 - 20	QPSK	1/3	25	≥ 1	
TDD	Table A.2.3.2.1-1		10 - 20	QPSK	1/3	27	≥ 1	
TDD	Table A.2.3.2.1-1		10 - 20	QPSK	1/3	30	≥ 1	
TDD	Table A.2.3.2.1-1		10 - 20	QPSK	1/3	32	≥ 1	
TDD	Table A.2.3.2.1-1		10 - 20	QPSK	1/3	36	≥ 1	
TDD	Table A.2.3.2.1-1		10 - 20	QPSK	1/3	40	≥ 1	
TDD	Table A.2.3.2.1-1		10 - 20	QPSK	1/3	45	≥ 1	
TDD	Table A.2.3.2.1-1		10 - 20	QPSK	1/3	48	≥ 1	
TDD	Table A.2.3.2.1-1		15 - 20	QPSK	1/3	50	≥ 1	
TDD	Table A.2.3.2.1-1		15 - 20	QPSK	1/3	54	≥ 1	
TDD	Table A.2.3.2.1-1		15 - 20	QPSK	1/4	60	≥ 1	
TDD	Table A.2.3.2.1-1		15 - 20	QPSK	1/4	64	≥ 1	
TDD	Table A.2.3.2.1-1		15 - 20	QPSK	1/4	72	≥ 1	
TDD	Table A.2.3.2.1-1		20	QPSK	1/5	75	≥ 1	
TDD	Table A.2.3.2.1-1		20	QPSK	1/5	80	≥ 1	
TDD	Table A.2.3.2.1-1		20	QPSK	1/5	81	≥ 1	
TDD	Table A.2.3.2.1-1		20	QPSK	1/6	90	≥ 1	
TDD	Table A.2.3.2.1-1		20	QPSK	1/6	96	≥ 1	
TDD	Table A.2.3.2.1-1a		1.4 - 20	QPSK	1/3	1	0	
TDD	Table A.2.3.2.1-1a		1.4 - 20	QPSK	1/3	2	0	
TDD	Table A.2.3.2.1-1a		1.4 - 20	QPSK	1/3	3	0	

	<u> </u>						
TDD	Table A.2.3.2.1-1a	1.4 - 20	QPSK	1/3	4	0	
TDD	Table A.2.3.2.1-1a	1.4 - 20	QPSK	1/3	5	0	
TDD	Table A.2.3.2.1-1a	3-20	QPSK	1/3	6	0	
TDD	Table A.2.3.2.1-1a	3-20	QPSK	1/3	8	0	
TDD	Table A.2.3.2.1-1a	3-20	QPSK	1/3	9	0	
TDD	Table A.2.3.2.1-1a	3-20	QPSK	1/3	10	0	
TDD	Table A.2.3.2.1-1a	3-20	QPSK	1/4	12	0	
TDD	Table A.2.3.2.1-1a	5-20	QPSK	1/5	15	0	
TDD	Table A.2.3.2.1-1a	5-20	QPSK	1/5	16	0	
TDD	Table A.2.3.2.1-1a	5-20	QPSK	1/6	18	0	
TDD	Table A.2.3.2.1-1a	5-20	QPSK	1/6	20	0	
TDD	Table A.2.3.2.1-1a	5-20	QPSK	1/8	24	0	
TDD	Table A.2.3.2.1-1a	10-20	QPSK	1/8	25	0	
TDD	Table A.2.3.2.1-1a	10-20	QPSK	1/8	27	0	
TDD	Table A.2.3.2.1-1a	10-20	QPSK	1/10	30	0	
TDD, Pai	rtial RB allocation, 16-QAM						
TDD	Table A.2.3.2.2-1	1.4 - 20	16QAM	3/4	1	≥ 1	
TDD	Table A.2.3.2.2-1	1.4 - 20	16QAM	3/4	2	≥ 1	
TDD	Table A.2.3.2.2-1	1.4 - 20	16QAM	3/4	3	≥ 1	
TDD	Table A.2.3.2.2-1	1.4 - 20	16QAM	3/4	4	≥ 1	
TDD	Table A.2.3.2.2-1	1.4 - 20	16QAM	3/4	5	≥ 1	
TDD	Table A.2.3.2.2-1	3 - 20	16QAM	3/4	6	≥ 1	
TDD	Table A.2.3.2.2-1	3 - 20	16QAM	3/4	8	≥ 1	
TDD	Table A.2.3.2.2-1	3 - 20	16QAM	3/4	9	≥ 1	
TDD	Table A.2.3.2.2-1	3 - 20	16QAM	3/4	10	≥ 1	
TDD	Table A.2.3.2.2-1	3 - 20	16QAM	3/4	12	<u>- ·</u> ≥ 1	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/2	15	<u> </u>	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/2	16	<u>- ·</u> ≥ 1	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/2	18	<u> </u>	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/3	20	≥ 1	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/3	24	≥ 1	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	1/3	25	<u>- ·</u> ≥ 1	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	1/3	27	≥ 1	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	30	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	32	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	36	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	40	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	45	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	48	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	3/4	50	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	3/4	54	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	2/3	60	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	2/3	64	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	1/2	72	≥ 2	
TDD	Table A.2.3.2.2-1	20	16QAM	1/2	75	≥ 2	
TDD	Table A.2.3.2.2-1	20	16QAM	1/2	80	≥ 2	
TDD	Table A.2.3.2.2-1	20	16QAM	1/2	81	≥ 2	
-							
TDD	Table A.2.3.2.2-1	20	16QAM	2/5	90	≥ 2	

TDD	Table A.2.3.2.2-1		20	16QAM	2/5	96	≥ 2	
TDD	Table A.2.3.2.2-1a		1.4 - 20	16QAM	3/4	1	0	
TDD	Table A.2.3.2.2-1a		1.4 - 20	16QAM	3/4	2	0	
TDD	Table A.2.3.2.2-1a		1.4 - 20	16QAM	2/5	4	0	
TDD, Pa	rtial RB allocation, 6	4-QAM						
TDD	Table A.2.3.2.3-1		1.4 - 20	64QAM	3/4	1	≥ 1	
TDD	Table A.2.3.2.3-1		1.4 - 20	64QAM	3/4	2	≥ 1	
TDD	Table A.2.3.2.3-1		1.4 - 20	64QAM	3/4	3	≥ 1	
TDD	Table A.2.3.2.3-1		1.4 - 20	64QAM	3/4	4	≥ 1	
TDD	Table A.2.3.2.3-1		1.4 - 20	64QAM	3/4	5	≥ 1	
TDD	Table A.2.3.2.3-1		3 - 20	64QAM	3/4	6	≥ 1	
TDD	Table A.2.3.2.3-1		3 - 20	64QAM	3/4	8	≥ 1	
TDD	Table A.2.3.2.3-1		3 - 20	64QAM	3/4	9	≥ 1	
TDD	Table A.2.3.2.3-1		3 - 20	64QAM	3/4	10	≥ 1	
TDD	Table A.2.3.2.3-1		3 - 20	64QAM	3/4	12	≥ 1	
TDD	Table A.2.3.2.3-1		5 - 20	64QAM	3/4	15	≥ 1	
TDD	Table A.2.3.2.3-1		5 - 20	64QAM	2/3	16	≥ 1	
TDD	Table A.2.3.2.3-1		5 - 20	64QAM	1/2	18	≥ 1	
TDD	Table A.2.3.2.3-1		5 - 20	64QAM	1/2	20	≥ 1	
TDD	Table A.2.3.2.3-1		5 - 20	64QAM	2/5	24	≥ 1	
TDD	Table A.2.3.2.3-1		10 - 20	64QAM	2/5	25	≥ 1	
TDD	Table A.2.3.2.3-1		10 - 20	64QAM	2/5	27	≥ 1	
TDD	Table A.2.3.2.3-1		10 - 20	64QAM	1/3	30	≥ 1	
TDD	Table A.2.3.2.3-1		10 - 20	64QAM	1/3	32	≥ 1	
TDD	Table A.2.3.2.3-1		10 - 20	64QAM	3/4	36	≥ 2	
TDD	Table A.2.3.2.3-1		10 - 20	64QAM	3/4	40	≥ 2	
TDD	Table A.2.3.2.3-1		10 - 20	64QAM	3/4	45	≥ 2	
TDD	Table A.2.3.2.3-1		10 - 20	64QAM	3/4	48	≥ 2	
TDD	Table A.2.3.2.3-1		15 - 20	64QAM	3/4	50	≥ 2	
TDD	Table A.2.3.2.3-1		15 - 20	64QAM	3/4	54	≥ 2	
TDD	Table A.2.3.2.3-1		15 - 20	64QAM	3/4	60	≥ 2	
TDD	Table A.2.3.2.3-1		15 - 20	64QAM	3/4	64	≥ 2	
TDD	Table A.2.3.2.3-1		15 - 20	64QAM	3/4	72	≥ 2	
TDD	Table A.2.3.2.3-1		20	64QAM	3/4	75	≥ 2	
TDD	Table A.2.3.2.3-1		20	64QAM	2/3	80	≥ 2	
TDD	Table A.2.3.2.3-1		20	64QAM	2/3	81	≥ 2	
TDD	Table A.2.3.2.3-1		20	64QAM	1/2	90	≥ 2	
TDD	Table A.2.3.2.3-1		20	64QAM	1/2	96	≥ 2	

A.2.2 Reference measurement channels for FDD

A.2.2.1 Full RB allocation

A.2.2.1.1 QPSK

Table A.2.2.1.1-1 Reference Channels for QPSK with full RB allocation

Parameter	Unit			Va	lue				
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks		6	15	25	50	75	100		
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12		
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK		
Target Coding rate		1/3	1/3	1/3	1/3	1/5	1/6		
Payload size	Bits	600	1544	2216	5160	4392	4584		
Transport block CRC	Bits	24	24	24	24	24	24		
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1		
Total number of bits per Sub-Frame	Bits	1728	4320	7200	14400	21600	28800		
Total symbols per Sub-Frame		864	2160	3600	7200	10800	14400		
UE Category ≥1 ≥1 ≥1 ≥1 ≥1 ≥1 ≥1									
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)									

Table A.2.2.1.1-1a Reference Channels for QPSK with full/maximum RB allocation for UE category 0

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	[36]	[36]	[36]
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/5	1/8	[1/10]	[1/10]	[1/10]
Payload size	Bits	600	872	904	[1000]	[1000]	[1000]
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	1728	4320	7200	[1036	[1036	[1036
					8]	8]	8]
Total symbols per Sub-Frame		864	2160	3600	[5184]	[5184]	[5184]
UE Category		0	0	0	0	0	0

NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled.

A.2.2.1.2 16-QAM

Table A.2.2.1.2-1 Reference Channels for 16-QAM with full RB allocation

Parameter	Unit			Va	lue											
Channel bandwidth	MHz	1.4	3	5	10	15	20									
Allocated resource blocks		6	15	25	50	75	100									
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12									
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM									
Target Coding rate		3/4	1/2	1/3	3/4	1/2	1/3									
Payload size	Bits	2600	4264	4968	21384	21384	19848									
Transport block CRC	Bits	24	24	24	24	24	24									
Number of code blocks per Sub-Frame (Note 1)		1	1	1	4	4	4									
Total number of bits per Sub-Frame	Bits	3456	8640	14400	28800	43200	57600									
Total symbols per Sub-Frame		864	2160	3600	7200	10800	14400									
UE Category		≥1	≥ 1	≥ 1	≥ 2	≥2	≥ 2									
Note 1: If more than one Code Block is Code Block (otherwise L = 0 B		n additional	CRC sequ	ence of L :	= 24 Bits is	attached t	Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each									

Table A.2.2.1.2-1a Reference Channels for 16-QAM with maximum RB allocation for UE category 0

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		5	5	5	5	5	5
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size	Bits	872	872	872	872	872	872
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	2880	2880	2880	2880	2880	2880
Total symbols per Sub-Frame		720	720	720	720	720	720
UE Category		0	0	0	0	0	0

NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled.

A.2.2.1.3 64-QAM

Table A.2.2.1.3-1: Reference Channels for 64-QAM with full RB allocation

Unit			Va	lue		
MHz	1.4	3	5	10	15	20
	6	15	25	50	75	100
	12	12	12	12	12	12
	64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
	3/4	3/4	2/5	3/4	3/4	1/2
Bits	3752	9528	9144	31704	46888	43816
Bits	24	24	24	24	24	24
	1	2	2	6	8	8
Bits	5184	12960	21600	43200	64800	86400
	864	2160	3600	7200	10800	14400
	≥ 1	≥ 1	≥1	≥ 2	≥2	≥ 2
	MHz Bits Bits	MHz 1.4 6 12 64QAM 3/4 Bits 3752 Bits 24 1 Bits 5184 864 ≥ 1	MHz 1.4 3 6 15 12 12 64QAM 64QAM 3/4 3/4 Bits 3752 9528 Bits 24 24 1 2 Bits 5184 12960 864 2160 ≥ 1 ≥ 1	MHz 1.4 3 5 6 15 25 12 12 12 64QAM 64QAM 64QAM 3/4 3/4 2/5 Bits 3752 9528 9144 Bits 24 24 24 1 2 2 Bits 5184 12960 21600 864 2160 3600 ≥ 1 ≥ 1 ≥ 1 ≥ 1	MHz 1.4 3 5 10 6 15 25 50 12 12 12 12 64QAM 64QAM 64QAM 64QAM 3/4 3/4 2/5 3/4 Bits 3752 9528 9144 31704 Bits 24 24 24 24 1 2 2 6 Bits 5184 12960 21600 43200 864 2160 3600 7200 ≥1 ≥1 ≥1 ≥2	MHz 1.4 3 5 10 15 6 15 25 50 75 12 12 12 12 12 64QAM 64QAM 64QAM 64QAM 64QAM 3/4 3/4 2/5 3/4 3/4 Bits 3752 9528 9144 31704 46888 Bits 24 24 24 24 24 1 2 2 6 8 Bits 5184 12960 21600 43200 64800 864 2160 3600 7200 10800 ≥ 1 ≥ 1 ≥ 1 ≥ 2 ≥ 2

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

A.2.2.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

A.2.2.2.1 QPSK

Table A.2.2.2.1-1 Reference Channels for QPSK with partial RB allocation

3-20 5-20 5-20 5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 20	Allocat ed RBs	OFDM Symbol s per Sub-	Mod'n	Target Coding rate	Payload size	Transp ort block CRC	Number of code blocks per Sub- Frame	Total number of bits per Sub-	Total symbols per Sub- Frame	UE Category
1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 3-20 3-20 3-20 3-20 5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 110-20 15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 20 20		Frame					(Note 1)	Frame		
1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 3-20 3-20 3-20 3-20 3-20 5-20 5-20 5-20 5-20 10-20					Bits	Bits		Bits		
1.4 - 20 1.4 - 20 1.4 - 20 1.4 - 20 3 - 20 3 - 20 3 - 20 3 - 20 5 - 20 5 - 20 5 - 20 10 - 20 10 - 20 10 - 20 10 - 20 10 - 20 10 - 20 10 - 20 15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 20 20		12	QPSK	1/3	72	24	1	288	144	≥ 1
1.4 - 20 1.4 - 20 3-20 3-20 3-20 3-20 3-20 3-20 5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 20		12	QPSK	1/3	176	24	1	576	288	≥ 1
1.4 - 20 3-20 3-20 3-20 3-20 3-20 3-20 3-20 5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 11-20 11-20 15 - 20 15 - 20 15 - 20 15 - 20 20		12	QPSK	1/3	256	24	1	864	432	≥ 1
3-20 3-20 3-20 3-20 3-20 3-20 3-20 3-20		12	QPSK	1/3	392	24	1	1152	576	≥ 1
3-20 3-20 3-20 3-20 3-20 3-20 5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 11-20 11-20 11-20 15 - 20 15 - 20 15 - 20 20 20		12	QPSK	1/3	424	24	1	1440	720	≥ 1
3-20 3-20 3-20 3-20 5-20 5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 11-20 11-20 11-20 11-20 15 - 20 15 - 20 15 - 20 20	6	12	QPSK	1/3	600	24	1	1728	864	≥ 1
3-20 3-20 5-20 5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 20 15 - 20 15 - 20 20	8	12	QPSK	1/3	808	24	1	2304	1152	≥ 1
3-20 5-20 5-20 5-20 5-20 5-20 5-20 10	9	12	QPSK	1/3	776	24	1	2592	1296	≥ 1
5-20 5-20 5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 20	10	12	QPSK	1/3	872	24	1	2880	1440	≥ 1
5-20 5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 20	12	12	QPSK	1/3	1224	24	1	3456	1728	≥ 1
5-20 5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 20 20	15	12	QPSK	1/3	1320	24	1	4320	2160	≥ 1
5-20 5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 20 20	16	12	QPSK	1/3	1384	24	1	4608	2304	≥ 1
5-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15-20 15-20 15-20 15-20 15-20 20 20	18	12	QPSK	1/3	1864	24	1	5184	2592	≥ 1
10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 20	20	12	QPSK	1/3	1736	24	1	5760	2880	≥ 1
10-20 10-20 10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 20	24	12	QPSK	1/3	2472	24	1	6912	3456	≥ 1
10-20 10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 20 20	25	12	QPSK	1/3	2216	24	1	7200	3600	≥ 1
10-20 10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 20	27	12	QPSK	1/3	2792	24	1	7776	3888	≥ 1
10-20 10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 20	30	12	QPSK	1/3	2664	24	1	8640	4320	≥ 1
10-20 10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 20 20	32	12	QPSK	1/3	2792	24	1	9216	4608	≥ 1
10-20 10-20 15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 20	36	12	QPSK	1/3	3752	24	1	10368	5184	≥ 1
10-20 15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 20 20	40	12	QPSK	1/3	4136	24	1	11520	5760	≥ 1
15 - 20 15 - 20 15 - 20 15 - 20 15 - 20 20 20	45	12	QPSK	1/3	4008	24	1	12960	6480	≥ 1
15 - 20 15 - 20 15 - 20 15 - 20 20 20	48	12	QPSK	1/3	4264	24	1	13824	6912	≥ 1
15 - 20 15 - 20 15 - 20 15 - 20 20 20	50	12	QPSK	1/3	5160	24	1	14400	7200	≥ 1
15 - 20 15 - 20 15 - 20 20 20		12	QPSK	1/3	4776	24	1	15552	7776	≥ 1
15 - 20 20 20		12	QPSK	1/4	4264	24	1	17280	8640	≥ 1
20 20	64	12	QPSK	1/4	4584	24	1	18432	9216	≥ 1
20 20	72	12	QPSK	1/4	5160	24	1	20736	10368	≥ 1
20	75	12	QPSK	1/5	4392	24	1	21600	10800	≥ 1
	80	12	QPSK	1/5	4776	24	1	23040	11520	≥ 1
	81	12	QPSK	1/5	4776	24	1	23328	11664	≥ 1
	90	12	QPSK	1/6	4008	24	1	25920	12960	≥ 1
	96	12	QPSK	1/6	4264	24	1	27648	13824	≥ 1

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise = 0 Bit)

Table A.2.2.2.1-1a Reference Channels for QPSK with partial RB allocation for UE category 0

Parame ter	Ch BW	Allocat ed RBs	DFT- OFDM Symbols per Sub- Frame	Mod'n	Target Coding rate	Payload size	Trans- port block CRC	Number of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame	Total symbols per Sub- Frame	UE Category
Unit	MHz					Bits	Bits		Bits		
	1.4 - 20	1	12	QPSK	1/3	72	24	1	288	144	0
	1.4 - 20	2	12	QPSK	1/3	176	24	1	576	288	0
	1.4 - 20	3	12	QPSK	1/3	256	24	1	864	432	0
	1.4 - 20	4	12	QPSK	1/3	392	24	1	1152	576	0
	1.4 - 20	5	12	QPSK	1/3	424	24	1	1440	720	0
	3-20	6	12	QPSK	1/3	600	24	1	1728	864	0
	3-20	8	12	QPSK	1/3	808	24	1	2304	1152	0
	3-20	9	12	QPSK	1/3	776	24	1	2592	1296	0
	3-20	10	12	QPSK	1/3	872	24	1	2880	1440	0
	3-20	12	12	QPSK	1/4	840	24	1	3456	1728	0
	5-20	15	12	QPSK	1/5	872	24	1	4320	2160	0
	5-20	16	12	QPSK	1/5	904	24	1	4608	2304	0
	5-20	18	12	QPSK	1/6	776	24	1	5184	2592	0
	5-20	20	12	QPSK	1/6	872	24	1	5760	2880	0
	5-20	24	12	QPSK	1/8	872	24	1	6912	3456	0
	10-20	25	12	QPSK	1/8	904	24	1	7200	3600	0
	10-20	27	12	QPSK	1/8	968	24	1	7776	3888	0
	10-20	30	12	QPSK	1/10	808	24	1	8640	4320	0

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled.

A.2.2.2.2 16-QAM

Table A.2.2.2-1 Reference Channels for 16-QAM with partial RB allocation

Parame ter	Ch BW	Allocat ed RBs	DFT- OFDM Symbols per Sub- Frame	Mod'n	Target Coding rate	Payload size	Trans- port block CRC	Number of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame	Total symbols per Sub- Frame	UE Category
Unit	MHz					Bits	Bits		Bits		
	1.4 - 20	1	12	16QAM	3/4	408	24	1	576	144	≥ 1
	1.4 - 20	2	12	16QAM	3/4	840	24	1	1152	288	≥ 1
	1.4 - 20	3	12	16QAM	3/4	1288	24	1	1728	432	≥ 1
	1.4 - 20	4	12	16QAM	3/4	1736	24	1	2304	576	≥ 1
	1.4 - 20	5	12	16QAM	3/4	2152	24	1	2880	720	≥ 1
	3-20	6	12	16QAM	3/4	2600	24	1	3456	864	≥ 1
	3-20	8	12	16QAM	3/4	3496	24	1	4608	1152	≥ 1
	3-20	9	12	16QAM	3/4	3880	24	1	5184	1296	≥ 1
	3-20	10	12	16QAM	3/4	4264	24	1	5760	1440	≥ 1
	3-20	12	12	16QAM	3/4	5160	24	1	6912	1728	≥ 1
	5-20	15	12	16QAM	1/2	4264	24	1	8640	2160	≥ 1
	5-20	16	12	16QAM	1/2	4584	24	1	9216	2304	≥ 1
	5-20	18	12	16QAM	1/2	5160	24	1	10368	2592	≥ 1
	5-20	20	12	16QAM	1/3	4008	24	1	11520	2880	≥ 1
	5-20	24	12	16QAM	1/3	4776	24	1	13824	3456	≥ 1
	10-20	25	12	16QAM	1/3	4968	24	1	14400	3600	≥ 1
	10-20	27	12	16QAM	1/3	4776	24	1	15552	3888	≥ 1
	10-20	30	12	16QAM	3/4	12960	24	3	17280	4320	≥ 2
	10-20	32	12	16QAM	3/4	13536	24	3	18432	4608	≥ 2
	10-20	36	12	16QAM	3/4	15264	24	3	20736	5184	≥ 2
	10-20	40	12	16QAM	3/4	16992	24	3	23040	5760	≥ 2
	10-20	45	12	16QAM	3/4	19080	24	4	25920	6480	≥ 2
	10-20	48	12	16QAM	3/4	20616	24	4	27648	6912	≥ 2
	15 - 20	50	12	16QAM	3/4	21384	24	4	28800	7200	≥ 2
	15 - 20	54	12	16QAM	3/4	22920	24	4	31104	7776	≥ 2
	15 - 20	60	12	16QAM	2/3	23688	24	4	34560	8640	≥ 2
	15 - 20	64	12	16QAM	2/3	25456	24	4	36864	9216	≥ 2
	15 - 20	72	12	16QAM	1/2	20616	24	4	41472	10368	≥ 2
	20	75	12	16QAM	1/2	21384	24	4	43200	10800	≥ 2
	20	80	12	16QAM	1/2	22920	24	4	46080	11520	≥ 2
	20	81	12	16QAM	1/2	22920	24	4	46656	11664	≥ 2
	20	90	12	16QAM	2/5	20616	24	4	51840	12960	≥ 2
	20	96	12	16QAM	2/5	22152	24	4	55296	13824	≥ 2

= 0 Bit)

Table A.2.2.2-1a Reference Channels for 16-QAM with partial RB allocation for UE category 0

Parame ter	Ch BW	Allocat ed RBs	DFT- OFDM Symbol s per Sub- Frame	Mod'n	Target Coding rate	Payload size	Transp ort block CRC	Numbe r of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame	Total symbol s per Sub- Frame	UE Catego ry
Unit	MHz					Bits	Bits		Bits		
	1.4 - 20	1	12	16QAM	3/4	408	24	1	576	144	0
	1.4 - 20	2	12	16QAM	3/4	840	24	1	1152	288	0
	1.4 - 20	4	12	16QAM	2/5	904	24	1	2304	576	0

If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block Note 1: (otherwise L = 0 Bit)

For HD-FDD UE, the uplink subframes are scheduled at the 4th, 5th, 6th, 12th, 13th, 14th, 20th, 21st, 22nd, 28th, 29th, 30th, 36th, 37th, and 38th subframes every 40ms. Information bit payload is available if uplink subframe is scheduled. Note 2:

A.2.2.2.3 64-QAM

Table A.2.2.3-1: Reference Channels for 64-QAM with partial RB allocation

Param eter	Ch BW	Alloca ted RBs	DFT- OFDM Symbol s per Sub- Frame	Mod'n	Target Codin g rate	Payloa d size	Trans- port block CRC	Numbe r of code blocks per Sub- Frame (Note 1)	Total numbe r of bits per Sub- Frame	Total symbol s per Sub- Frame	UE Categor y
Unit	MHz					Bits	Bits	,	Bits		
	1.4 - 20	1	12	64QAM	3/4	616	24	1	864	144	≥ 1
	1.4 - 20	2	12	64QAM	3/4	1256	24	1	1728	288	≥ 1
	1.4 - 20	3	12	64QAM	3/4	1864	24	1	2592	432	≥ 1
	1.4 - 20	4	12	64QAM	3/4	2536	24	1	3456	576	≥ 1
	1.4 - 20	5	12	64QAM	3/4	3112	24	1	4320	720	≥ 1
	3-20	6	12	64QAM	3/4	3752	24	1	5184	864	≥ 1
	3-20	8	12	64QAM	3/4	5160	24	1	6912	1152	≥ 1
	3-20	9	12	64QAM	3/4	5736	24	1	7776	1296	≥ 1
	3-20	10	12	64QAM	3/4	6200	24	2	8640	1440	≥ 1
	3-20	12	12	64QAM	3/4	7480	24	2	10368	1728	≥ 1
	5-20	15	12	64QAM	3/4	9528	24	2	12960	2160	≥ 1
	5-20	16	12	64QAM	2/3	9144	24	2	13824	2304	≥ 1
	5-20	18	12	64QAM	1/2	7736	24	2	15552	2592	≥ 1
	5-20	20	12	64QAM	1/2	8504	24	2	17280	2880	≥ 1
	5-20	24	12	64QAM	2/5	8760	24	2	20736	3456	≥ 1
	10-20	25	12	64QAM	2/5	9144	24	2	21600	3600	≥ 1
	10-20	27	12	64QAM	2/5	9912	24	2	23328	3888	≥ 1
	10-20	30	12	64QAM	1/3	9144	24	2	25920	4320	≥ 1
	10-20	32	12	64QAM	1/3	9912	24	2	27648	4608	≥ 1
	10-20	36	12	64QAM	3/4	22920	24	4	31104	5184	≥ 2
	10-20	40	12	64QAM	3/4	25456	24	5	34560	5760	≥ 2
	10-20	45	12	64QAM	3/4	28336	24	5	38880	6480	≥ 2
	10-20	48	12	64QAM	3/4	30576	24	5	41472	6912	≥ 2
	15 - 20	50	12	64QAM	3/4	31704	24	6	43200	7200	≥ 2
	15 - 20	54	12	64QAM	3/4	34008	24	6	46656	7776	≥ 2
	15 - 20	60	12	64QAM	3/4	37888	24	7	51840	8640	≥ 2
	15 - 20	64	12	64QAM	3/4	40576	24	7	55296	9216	≥ 2
	15 - 20	72	12	64QAM	3/4	45352	24	8	62208	10368	≥ 2
	20	75	12	64QAM	3/4	46888	24	8	64800	10800	≥ 2
	20	80	12	64QAM	2/3	45352	24	8	69120	11520	≥ 2
	20	81	12	64QAM	2/3	46888	24	8	69984	11664	≥ 2
	20	90	12	64QAM	1/2	39232	24	7	77760	12960	≥ 2
	20	96	12	64QAM	1/2	40576	24	7	82944	13824 ed to each (≥ 2

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

A.2.2.3 Void

Table A.2.2.3-1: Void

A.2.3 Reference measurement channels for TDD

For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL:2UL.

A.2.3.1 Full RB allocation

A.2.3.1.1 QPSK

Table A.2.3.1.1-1 Reference Channels for QPSK with full RB allocation

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5	1/6
Payload size							
For Sub-Frame 2,3,7,8	Bits	600	1544	2216	5160	4392	4584
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame							
(Note 1)							
For Sub-Frame 2,3,7,8		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	1728	4320	7200	14400	21600	28800
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		864	2160	3600	7200	10800	14400
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: As per Table 4.2-2 in TS 36.211 [4]

Table A.2.3.1.1-1a Reference Channels for QPSK with full/maximum RB allocation for UE category 0

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	[36]	[36]	[36]
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/5	1/8	[1/10]	[1/10]	[1/10]
Payload size							
For Sub-Frame 2,3,7,8	Bits	600	872	904	[1000]	[1000]	[1000]
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame							
(Note 1)							
For Sub-Frame 2,3,7,8		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	1728	4320	7200	[1036	[1036	[1036
					8]	8]	8]
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		864	2160	3600	[5184]	[5184]	[5184]
UE Category		0	0	0	0	0	0

NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 2: As per Table 4.2-2 in TS 36.211

A.2.3.1.2 16-QAM

Table A.2.3.1.2-1 Reference Channels for 16-QAM with full RB allocation

Parameter	Unit	Value							
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks		6	15	25	50	75	100		
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1		
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12		
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM		
Target Coding rate		3/4	1/2	1/3	3/4	1/2	1/3		
Payload size									
For Sub-Frame 2,3,7,8	Bits	2600	4264	4968	21384	21384	19848		
Transport block CRC	Bits	24	24	24	24	24	24		
Number of code blocks per Sub-Frame (Note 1)									
For Sub-Frame 2,3,7,8		1	1	1	4	4	4		
Total number of bits per Sub-Frame									
For Sub-Frame 2,3,7,8	Bits	3456	8640	14400	28800	43200	57600		
Total symbols per Sub-Frame									
For Sub-Frame 2,3,7,8		864	2160	3600	7200	10800	14400		
UE Category		≥ 1	≥1	≥ 1	≥ 2	≥ 2	≥2		

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: As per Table 4.2-2 in TS 36.211 [4]

Table A.2.3.1.2-1a Reference Channels for 16-QAM with maximum RB allocation for UE category 0

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		5	5	5	5	5	5
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		16QAM	16QAM	16QAM	16QAM	16QAM	16QAM
Target Coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Payload size							
For Sub-Frame 2,3,7,8	Bits	872	872	872	872	872	872
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame							
(Note 1)							
For Sub-Frame 2,3,7,8		1	1	1	1	1	1
Total number of bits per Sub-Frame							
For Sub-Frame 2,3,7,8	Bits	2880	2880	2880	2880	2880	2880
Total symbols per Sub-Frame							
For Sub-Frame 2,3,7,8		720	720	720	720	720	720
UE Category		0	0	0	0	0	0

NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 2: As per Table 4.2-2 in TS 36.211[4]

A.2.3.1.3 64-QAM

Table A.2.3.1.3-1 Reference Channels for 64-QAM with full RB allocation

Parameter	Unit	Value						
Channel bandwidth	MHz	1.4	3	5	10	15	20	
Allocated resource blocks		6	15	25	50	75	100	
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1	
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12	
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM	
Target Coding rate		3/4	3/4	2/5	3/4	3/4	1/2	
Payload size								
For Sub-Frame 2,3,7,8	Bits	3752	9528	9144	31704	46888	43816	
Transport block CRC	Bits	24	24	24	24	24	24	
Number of code blocks per Sub-Frame (Note 1)								
For Sub-Frame 2,3,7,8		1	2	2	6	8	8	
Total number of bits per Sub-Frame								
For Sub-Frame 2,3,7,8	Bits	5184	12960	21600	43200	64800	86400	
Total symbols per Sub-Frame								
For Sub-Frame 2,3,7,8		864	2160	3600	7200	10800	14400	
UE Category	•	≥ 1	≥ 1	≥ 1	≥ 2	≥ 2	≥2	

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each

Code Block (otherwise L = 0 Bit)

Note 2: As per Table 4.2-2 in TS 36.211 [4]

A.2.3.2 Partial RB allocation

For each channel bandwidth, various partial RB allocations are specified. The number of allocated RBs is chosen according to values specified in the Tx and Rx requirements. The single allocated RB case is included.

The allocated RBs are contiguous and start from one end of the channel bandwidth. A single allocated RB is at one end of the channel bandwidth.

A.2.3.2.1 QPSK

Table A.2.3.2.1-1 Reference Channels for QPSK with partial RB allocation

Parame ter	Ch BW	Allocat ed RBs	UDL Configu ration (Note 2)	DFT- OFDM Symbol s per Sub- Frame	Mod'n	Target Coding rate	Payloa d size for Sub- Frame 2, 3, 7, 8	Transp ort block CRC	Number of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame for Sub- Frame 2, 3, 7, 8	Total symbol s per Sub- Frame for Sub- Frame 2, 3, 7, 8	UE Categor y
Unit	MHz						Bits	Bits		Bits		
	1.4 - 20	1	1	12	QPSK	1/3	72	24	1	288	144	≥ 1
	1.4 - 20	2	1	12	QPSK	1/3	176	24	1	576	288	≥ 1
	1.4 - 20	3	1	12	QPSK	1/3	256	24	1	864	432	≥ 1
	1.4 - 20	4	1	12	QPSK	1/3	392	24	1	1152	576	≥ 1
	1.4 - 20	5	1	12	QPSK	1/3	424	24	1	1440	720	≥ 1
	3-20	6	1	12	QPSK	1/3	600	24	1	1728	864	≥ 1
	3-20	8	1	12	QPSK	1/3	808	24	1	2304	1152	≥ 1
	3-20	9	1	12	QPSK	1/3	776	24	1	2592	1296	≥ 1
	3-20	10	1	12	QPSK	1/3	872	24	1	2880	1440	≥ 1
	3-20 5-20	12 15	1	12 12	QPSK QPSK	1/3 1/3	1224 1320	24 24	1	3456 4320	1728 2160	≥ 1 ≥ 1
	5-20	16	1	12	QPSK	1/3	1384	24	1	4608	2304	≥ 1
	5-20	18	1	12	QPSK	1/3	1864	24	1	5184	2592	≥ 1
	5-20	20	1	12	QPSK	1/3	1736	24	1	5760	2880	≥ 1
	5-20	24	1	12	QPSK	1/3	2472	24	1	6912	3456	≥ 1
	10-20	25	1	12	QPSK	1/3	2216	24	1	7200	3600	≥ 1
	10-20	27	1	12	QPSK	1/3	2792	24	1	7776	3888	≥ 1
	10-20	30	1	12	QPSK	1/3	2664	24	1	8640	4320	≥ 1
	10-20	32	1	12	QPSK	1/3	2792	24	1	9216	4608	≥ 1
	10-20	36	1	12	QPSK	1/3	3752	24	1	10368	5184	≥ 1
	10-20	40	1	12	QPSK	1/3	4136	24	1	11520	5760	≥ 1
	10-20	45	1	12	QPSK	1/3	4008	24	1	12960	6480	≥ 1
	10-20	48	1	12	QPSK	1/3	4264	24	1	13824	6912	≥ 1
	15 - 20	50	1	12	QPSK	1/3	5160	24	1	14400	7200	≥ 1
-	15 - 20 15 - 20	54 60	1	12 12	QPSK QPSK	1/3 1/4	4776 4264	24 24	1	15552 17280	7776 8640	≥ 1 ≥ 1
	15 - 20	64	1	12	QPSK	1/4	4584	24	1	18432	9216	≥ 1
-	15 - 20	72	1	12	QPSK	1/4	5160	24	1	20736	10368	≥ 1
	20	75	1	12	QPSK	1/5	4392	24	1	21600	10800	≥ 1
	20	80	1	12	QPSK	1/5	4776	24	1	23040	11520	≥ 1
	20	81	1	12	QPSK	1/5	4776	24	1	23328	11664	≥ 1
	20	90	1	12	QPSK	1/6	4008	24	1	25920	12960	≥ 1
	20	96	1	12	QPSK	1/6	4264	24	1	27648	13824	≥ 1

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block

(otherwise L = 0 Bit)

Note 2: As per Table 4.2-2 in TS 36.211 [4]

Table A.2.3.2.1-1a Reference Channels for QPSK with partial RB allocation for UE category 0

Parame ter	Ch BW	Allocat ed RBs	UDL Config uration (Note 2)	DFT- OFDM Symbol s per Sub- Frame	Mod'n	Target Coding rate	Payloa d size for Sub- Frame 2, 3, 7, 8	Transp ort block CRC	Numbe r of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame for Sub- Frame 2, 3, 7, 8	Total symbol s per Sub- Frame for Sub- Frame 2, 3, 7, 8	UE Catego ry
Unit	MHz						Bits	Bits		Bits		
	1.4 - 20	1	1	12	QPSK	1/3	72	24	1	288	144	0
	1.4 - 20	2	1	12	QPSK	1/3	176	24	1	576	288	0
	1.4 - 20	3	1	12	QPSK	1/3	256	24	1	864	432	0
	1.4 - 20	4	1	12	QPSK	1/3	392	24	1	1152	576	0
	1.4 - 20	5	1	12	QPSK	1/3	424	24	1	1440	720	0
	3-20	6	1	12	QPSK	1/3	600	24	1	1728	864	0
	3-20	8	1	12	QPSK	1/3	808	24	1	2304	1152	0
	3-20	9	1	12	QPSK	1/3	776	24	1	2592	1296	0
	3-20	10	1	12	QPSK	1/3	872	24	1	2880	1440	0
	3-20	12	1	12	QPSK	1/4	840	24	1	3456	1728	0
	5-20	15	1	12	QPSK	1/5	872	24	1	4320	2160	0
	5-20	16	1	12	QPSK	1/5	904	24	1	4608	2304	0
	5-20	18	1	12	QPSK	1/6	776	24	1	5184	2592	0
	5-20	20	1	12	QPSK	1/6	872	24	1	5760	2880	0
	5-20	24	1	12	QPSK	1/8	872	24	1	6912	3456	0
	10-20	25	1	12	QPSK	1/8	904	24	1	7200	3600	0
	10-20	27	1	12	QPSK	1/8	968	24	1	7776	3888	0
	10-20	30	1	12	QPSK	1/10	808	24	1	8640	4320	0

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: As per Table 4.2-2 in TS 36.211 [4]

A.2.3.2.2 16-QAM

Table A.2.3.2.2-1 Reference Channels for 16QAM with partial RB allocation

Parame ter	Ch BW	Allocat ed RBs	UDL Configu ration (Note 2)	DFT- OFDM Symbol s per Sub- Frame	Mod'n	Target Coding rate	Payloa d size for Sub- Frame 2, 3, 7, 8	Transp ort block CRC	Number of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame for Sub- Frame 2, 3, 7, 8	Total symbol s per Sub- Frame for Sub- Frame 2, 3, 7, 8	UE Categor y
Unit	MHz						Bits	Bits		Bits		
	1.4 - 20	1	1	12	16QAM	3/4	408	24	1	576	144	≥ 1
	1.4 - 20	2	1	12	16QAM	3/4	840	24	1	1152	288	≥ 1
	1.4 - 20	3	1	12	16QAM	3/4	1288	24	1	1728	432	≥ 1
	1.4 - 20	4	1	12	16QAM	3/4	1736	24	1	2304	576	≥ 1
	1.4 - 20	5	1	12	16QAM	3/4	2152	24	1	2880	720	≥ 1
	3-20	6	1	12	16QAM	3/4	2600	24	1	3456	864	≥ 1
	3-20	8	1	12	16QAM	3/4	3496	24	1	4608	1152	≥ 1
	3-20	9	1	12	16QAM	3/4	3880	24	1	5184	1296	≥ 1
	3-20	10	1	12	16QAM	3/4	4264	24	1	5760	1440	≥ 1
	3-20	12	1	12	16QAM	3/4	5160	24	1	6912	1728	≥ 1
	5-20	15	1	12	16QAM	1/2	4264	24	1	8640	2160	≥ 1
	5-20	16	1	12	16QAM	1/2	4584	24	1	9216	2304	≥ 1
	5-20	18	1	12	16QAM	1/2	5160	24	1	10368	2592	≥ 1
	5-20	20	1	12	16QAM	1/3	4008	24	1	11520	2880	≥ 1
	5-20	24	1	12	16QAM	1/3	4776	24	1	13824	3456	≥ 1
	10-20	25	1	12	16QAM	1/3	4968	24	1	14400	3600	≥ 1
	10-20	27	1	12	16QAM	1/3	4776	24	1	15552	3888	≥ 1
	10-20	30	1	12	16QAM	3/4	12960	24	3	17280	4320	≥ 2
	10-20	32	1	12	16QAM	3/4	13536	24	3	18432	4608	≥ 2
	10-20	36	1	12	16QAM	3/4	15264	24	3	20736	5184	≥ 2
	10-20	40	1	12	16QAM	3/4	16992	24	3	23040	5760	≥ 2
	10-20	45	1	12	16QAM	3/4	19080	24	4	25920	6480	≥ 2
	10-20	48	1	12	16QAM	3/4	20616	24	4	27648	6912	≥ 2
	15 - 20	50	1	12	16QAM	3/4	21384	24	4	28800	7200	≥ 2
	15 - 20	54	1	12	16QAM	3/4	22920	24	4	31104	7776	≥ 2
	15 - 20	60	1	12	16QAM	2/3	23688	24	4	34560	8640	≥ 2
	15 - 20	64	1	12	16QAM	2/3	25456	24	4	36864	9216	≥ 2
	15 - 20	72	1	12	16QAM	1/2	20616	24	4	41472	10368	≥ 2
	20	75	1	12	16QAM	1/2	21384	24	4	43200	10800	≥ 2
	20	80	1	12	16QAM	1/2	22920	24	4	46080	11520	≥ 2
	20	81	1	12	16QAM	1/2	22920	24	4	46656	11664	≥ 2
	20	90	1	12	16QAM	2/5	20616	24	4	51840	12960	≥ 2
Note 1:	20	96	1 de Block is p	12	16QAM	2/5	22152	24	4	55296	13824	≥ 2

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 2: As per Table 4.2-2 in TS 36.211 [4]

Table A.2.3.2.2-1a Reference Channels for 16QAM with partial RB allocation UE category 0

Parame ter	Ch BW	Allocat ed RBs	UDL Config uration (Note 2)	DFT- OFDM Symbol s per Sub- Frame	Mod'n	Target Coding rate	Payloa d size for Sub- Frame 2, 3, 7, 8	Transp ort block CRC	Numbe r of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame for Sub- Frame 2, 3, 7, 8	Total symbol s per Sub- Frame for Sub- Frame 2, 3, 7, 8	UE Catego ry
Unit	MHz						Bits	Bits		Bits		
	1.4 - 20	1	1	12	16QAM	3/4	408	24	1	576	144	0
	1.4 - 20	2		12	16QAM	3/4	840	24	1	1152	288	0
	1.4 - 20	4		12	16QAM	2/5	904	24	1	2304	576	0

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: As per Table 4.2-2 in TS 36.211 [4]

A.2.3.2.3 64-QAM

Table A.2.3.2.3-1 Reference Channels for 64-QAM with partial RB allocation

Param eter	Ch BW	Alloca ted RBs	DFT- OFDM Symbol s per Sub- Frame	Mod'n	Target Codin g rate	Payloa d size	Trans- port block CRC	Numbe r of code blocks per Sub- Frame (Note 1)	Total numbe r of bits per Sub- Frame	Total symbol s per Sub- Frame	UE Categor y
Unit	MHz					Bits	Bits		Bits		
	1.4 - 20	1	12	64QAM	3/4	616	24	1	864	144	≥ 1
	1.4 - 20	2	12	64QAM	3/4	1256	24	1	1728	288	≥ 1
	1.4 - 20	3	12	64QAM	3/4	1864	24	1	2592	432	≥ 1
	1.4 - 20	4	12	64QAM	3/4	2536	24	1	3456	576	≥ 1
	1.4 - 20	5	12	64QAM	3/4	3112	24	1	4320	720	≥ 1
	3-20	6	12	64QAM	3/4	3752	24	1	5184	864	≥ 1
	3-20	8	12	64QAM	3/4	5160	24	1	6912	1152	≥ 1
	3-20	9	12	64QAM	3/4	5736	24	1	7776	1296	≥ 1
	3-20	10	12	64QAM	3/4	6200	24	2	8640	1440	≥ 1
	3-20	12	12	64QAM	3/4	7480	24	2	10368	1728	≥ 1
	5-20	15	12	64QAM	3/4	9528	24	2	12960	2160	≥ 1
	5-20	16	12	64QAM	2/3	9144	24	2	13824	2304	≥ 1
	5-20	18	12	64QAM	1/2	7736	24	2	15552	2592	≥ 1
	5-20	20	12	64QAM	1/2	8504	24	2	17280	2880	≥ 1
	5-20	24	12	64QAM	2/5	8760	24	2	20736	3456	≥ 1
	10-20	25	12	64QAM	2/5	9144	24	2	21600	3600	≥ 1
	10-20	27	12	64QAM	2/5	9912	24	2	23328	3888	≥ 1
	10-20	30	12	64QAM	1/3	9144	24	2	25920	4320	≥ 1
	10-20	32	12	64QAM	1/3	9912	24	2	27648	4608	≥ 1
	10-20	36	12	64QAM	3/4	22920	24	4	31104	5184	≥ 2
	10-20	40	12	64QAM	3/4	25456	24	5	34560	5760	≥ 2
	10-20	45	12	64QAM	3/4	28336	24	5	38880	6480	≥ 2
	10-20	48	12	64QAM	3/4	30576	24	5	41472	6912	≥ 2
	15 - 20	50	12	64QAM	3/4	31704	24	6	43200	7200	≥ 2
	15 - 20	54	12	64QAM	3/4	34008	24	6	46656	7776	≥ 2
	15 - 20	60	12	64QAM	3/4	37888	24	7	51840	8640	≥ 2
	15 - 20	64	12	64QAM	3/4	40576	24	7	55296	9216	≥ 2
	15 - 20	72	12	64QAM	3/4	45352	24	8	62208	10368	≥ 2
	20	75	12	64QAM	3/4	46888	24	8	64800	10800	≥ 2
	20	80	12	64QAM	2/3	45352	24	8	69120	11520	≥ 2
	20	81	12	64QAM	2/3	46888	24	8	69984	11664	≥ 2
	20	90	12	64QAM	1/2	39232	24	7	77760	12960	≥ 2
Nata 4:	20	96	12	64QAM	1/2	40576	24	7	82944	13824	≥ 2

Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 2: As per Table 4.2-2 in TS 36.211 [4].

A.2.3.3 Void

Table A.2.3.3-1: Void

A.3 DL reference measurement channels

A.3.1 General

The number of available channel bits varies across the sub-frames due to PBCH and PSS/SSS overhead. The payload size per sub-frame is varied in order to keep the code rate constant throughout a frame.

No user data is scheduled on subframes #5 in order to facilitate the transmission of system information blocks (SIB).

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{RR}

- 1. Calculate the number of channel bits N_{ch} that can be transmitted during the first transmission of a given sub-frame.
- 2. Find A such that the resulting coding rate is as close to R as possible, that is,

$$\min |R - (A + 24*(N_{CB} + 1))/N_{ch}|, where N_{CB} = \begin{cases} 0, & \text{if } C = 1\\ C, & \text{if } C > 1 \end{cases},$$

subject to

- a) A is a valid TB size according to section 7.1.7 of TS 36.213 [6] assuming an allocation of $N_{\rm RB}$ resource blocks.
- b) C is the number of Code Blocks calculated according to section 5.1.2 of TS 36.212 [5].
- 3. If there is more than one A that minimizes the equation above, then the larger value is chosen per default and the chosen code rate should not exceed 0.93.
- 4. For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL+DwPTS (12 OFDM symbol): 2UL

A.3.1.1 Overview of DL reference measurement channels

In Table A.3.1.1-1 are listed the DL reference measurement channels specified in annexes A.3.2 to A.3.10 of this release of TS 36.101. This table is informative and serves only to a better overview. The reference for the concrete reference measurement channels and corresponding implementation's parameters as to be used for requirements are annexes A.3.2 to A.3.10 as appropriate.

Table A.3.1.1-1: Overview of DL reference measurement channels

Duplex	Table	Name	BW	Mod	TCR	RB	RB Off set	UE Cat eg	Notes
FDD, Rece	eiver requirements								
FDD	Table A.3.2-1		1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.2-1		3	QPSK	1/3	15		≥ 1	
FDD	Table A.3.2-1		5	QPSK	1/3	25		≥ 1	
FDD	Table A.3.2-1		10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.2-1		15	QPSK	1/3	75		≥ 1	
FDD	Table A.3.2-1		20	QPSK	1/3	100		≥ 1	
FDD / HD-FDD	Table A.3.2-1a		1.4	QPSK	1/3	6		0	
FDD / HD-FDD	Table A.3.2-1a		3	QPSK	1/3	14		0	
FDD / HD-FDD	Table A.3.2-1a		5	QPSK	1/3	14		0	
FDD / HD-FDD	Table A.3.2-1a		10	QPSK	1/3	14		0	
FDD / HD-FDD	Table A.3.2-1a		15	QPSK	1/3	14		0	
FDD / HD-FDD	Table A.3.2-1a		20	QPSK	1/3	14		0	
TDD, Rece	eiver requirements								
TDD	Table A.3.2-2		1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.2-2		3	QPSK	1/3	15		≥ 1	
TDD	Table A.3.2-2		5	QPSK	1/3	25		≥ 1	
TDD	Table A.3.2-2		10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.2-2		15	QPSK	1/3	75		≥ 1	
TDD	Table A.3.2-2		20	QPSK	1/3	100		≥ 1	
TDD	Table A.3.2-2a		1.4	QPSK	1/3	6		0	
TDD	Table A.3.2-2a		3	QPSK	1/3	14		0	
TDD	Table A.3.2-2a		5	QPSK	1/3	14		0	
TDD	Table A.3.2-2a		10	QPSK	1/3	14		0	
TDD	Table A.3.2-2a		15	QPSK	1/3	14		0	
TDD	Table A.3.2-2a		20	QPSK	1/3	14		0	
	eiver requirements	, Maximum inp	T T	1	_		l	l	
FDD	Table A.3.2-3		1.4	64QAM	3/4	6		-	
FDD FDD	Table A.3.2-3		3 5	64QAM	3/4	15		-	
FDD	Table A.3.2-3 Table A.3.2-3		10	64QAM 64QAM	3/4	25 50		-	
FDD	Table A.3.2-3		15	64QAM	3/4	75		_	
FDD	Table A.3.2-3		20	64QAM	3/4	100		_	
	eiver requirements	Maximum inp							
FDD	Table A.3.2-3a		1.4	64QAM	3/4	6		_	
FDD	Table A.3.2-3a		3	64QAM	3/4	15		-	
FDD	Table A.3.2-3a		5	64QAM	3/4	18		-	
FDD	Table A.3.2-3a		10	64QAM	3/4	17		-	
FDD	Table A.3.2-3a		15	64QAM	3/4	17		-	
FDD	Table A.3.2-3a		20	64QAM	3/4	17		-	
FDD, Rece	eiver requirements	Maximum inp	ut level	for UE Cat	egories	2			
FDD	Table A.3.2-3b		1.4	64QAM	3/4	6		-	
FDD	Table A.3.2-3b		3	64QAM	3/4	15		-	

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FDD	Table A.3.2-3b		5	64QAM	3/4	25		-	
FDD	Table A.3.2-3b		10	64QAM	3/4	50		-	
FDD	Table A.3.2-3b		15	64QAM	3/4	75		ı	
FDD	Table A.3.2-3b		20	64QAM	3/4	83		-	
FDD, Rece	eiver requirements,	Maximum inpu	ut level f	or UE DL	Categor	ies 0			
FDD	Table A.3.2-3c		1.4	64QAM	3/4	2		-	
FDD	Table A.3.2-3c		3	64QAM	3/4	2		-	
FDD	Table A.3.2-3c		5	64QAM	3/4	2		-	
FDD	Table A.3.2-3c		10	64QAM	3/4	2		-	
FDD	Table A.3.2-3c		15	64QAM	3/4	2		-	
FDD	Table A.3.2-3c		20	64QAM	3/4	2		-	
TDD, Rece	eiver requirements,	Maximum inpu	ut level f	or UE Cat	egories	3-5			
TDD	Table A.3.2-4		1.4	64QAM	3/4	6		-	
TDD	Table A.3.2-4		3	64QAM	3/4	15		-	
TDD	Table A.3.2-4		5	64QAM	3/4	25		-	
TDD	Table A.3.2-4		10	64QAM	3/4	50		-	
TDD	Table A.3.2-4		15	64QAM	3/4	75		-	
TDD	Table A.3.2-4		20	64QAM	3/4	100		-	
TDD, Rece	eiver requirements,	Maximum inpu	ut level f	or UE Cat	egories	1			
TDD	Table A.3.2-4a		1.4	64QAM	3/4	6		-	
TDD	Table A.3.2-4a		3	64QAM	3/4	15		-	
TDD	Table A.3.2-4a		5	64QAM	3/4	18		-	
TDD	Table A.3.2-4a		10	64QAM	3/4	17		-	
TDD	Table A.3.2-4a		15	64QAM	3/4	17		-	
TDD	Table A.3.2-4a		20	64QAM	3/4	17		-	
TDD, Rece	eiver requirements,	Maximum inpu	ut level f	or UE Cat	egories	2			
TDD	Table A.3.2-4b		1.4	64QAM	3/4	6		-	
TDD	Table A.3.2-4b		3	64QAM	3/4	15		-	
TDD	Table A.3.2-4b		5	64QAM	3/4	25		-	
TDD	Table A.3.2-4b		10	64QAM	3/4	50		-	
TDD	Table A.3.2-4b		15	64QAM	3/4	75		-	
TDD	Table A.3.2-4b		20	64QAM	3/4	83		-	
TDD, Rece	eiver requirements,	Maximum inpu	ut level f	or UE DL	Categor	ies 0			
TDD	Table A.3.2-4c		1.4	64QAM	3/4	2		-	
TDD	Table A.3.2-4c		3	64QAM	3/4	2		-	
TDD	Table A.3.2-4c		5	64QAM	3/4	2		-	
TDD	Table A.3.2-4c		10	64QAM	3/4	2		-	
TDD	Table A.3.2-4c		15	64QAM	3/4	2		-	
TDD	Table A.3.2-4c		20	64QAM	3/4	2		-	
FDD, Reco 13,14	eiver requirements,	Maximum inpu	ut level f	or UE Cat	egories	11/12/	13/14/1	5 and	UE DL categories
FDD	Table A.3.2-5		1.4	256QAM	4/5	6		-	
FDD	Table A.3.2-5		3	256QAM	4/5	15		-	
FDD	Table A.3.2-5		5	256QAM	4/5	25		-	
FDD	Table A.3.2-5		10	256QAM	4/5	50		-	
FDD	Table A.3.2-5		15	256QAM	4/5	75		-	
FDD	Table A.3.2-5		20	256QAM	4/5	100		-	
	eiver requirements,	Maximum inpu	ut level f	or UE Cat	egories	11/12/	13/14/1	5 and	UE DL categories
13,14									

	1	T	ı	ı					
TDD	Table A.3.2-6		1.4	256QAM	4/5	6		-	
TDD	Table A.3.2-6		3	256QAM	4/5	15		-	
TDD	Table A.3.2-6		5	256QAM	4/5	25		ı	
TDD	Table A.3.2-6		10	256QAM	4/5	50		-	
TDD	Table A.3.2-6		15	256QAM	4/5	75		-	
TDD	Table A.3.2-6		20	256QAM	4/5	100		-	
FDD, PDS	SCH Performance, S	ingle-antenna	transmi	ssion (CRS	S)				
FDD	Table A.3.3.1-1	R.4 FDD	1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.3.1-1	R.42 FDD	20	QPSK	1/3	100		≥ 1	
FDD	Table A.3.3.1-1	R.42-1 FDD	3	QPSK	1/3	15		≥ 1	
FDD	Table A.3.3.1-1	R.42-2 FDD	5	QPSK	1/3	25		≥ 1	
FDD	Table A.3.3.1-1	R.42-3 FDD	15	QPSK	1/3	75		≥ 1	
FDD	Table A.3.3.1-1	R.2 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.1-2	R.3-1 FDD	5	16QAM	1/2	25		≥ 1	
FDD	Table A.3.3.1-2	R.3 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.1-3	R.5 FDD	3	64QAM	3/4	15		≥ 1	
FDD	Table A.3.3.1-3	R.6 FDD	5	64QAM	3/4	25		≥ 2	
FDD	Table A.3.3.1-3	R.7 FDD	10	64QAM	3/4	50		≥ 2	
FDD	Table A.3.3.1-3	R.8 FDD	15	64QAM	3/4	75		≥ 2	
FDD	Table A.3.3.1-3	R.9 FDD	20	64QAM	3/4	100		≥ 3	
FDD	Table A.3.3.1-3a	R.6-1 FDD	5	64QAM	3/4	18		≥ 1	
FDD	Table A.3.3.1-3a	R.7-1 FDD	10	64QAM	3/4	17		≥ 1	
FDD	Table A.3.3.1-3a	R.8-1 FDD	15	64QAM	3/4	17		≥ 1	
FDD	Table A.3.3.1-3a	R.9-1 FDD	20	64QAM	3/4	17		≥ 1	
FDD	Table A.3.3.1-3a	R.9-2 FDD	20	64QAM	3/4	83		≥ 2	
FDD	Table A.3.3.1-6	R.41 FDD	10	QPSK	1/10	50		≥ 1	
FDD, PDS	SCH Performance, S	ingle-antenna	transmi	ssion (CRS	S), Singl	e PRB	(Chan	nel ed	ge)
FDD	Table A.3.3.1-4	R.0 FDD	3	16QAM	1/2	1		≥ 1	
FDD	Table A.3.3.1-4	R.1 FDD	10 / 20	16QAM	1/2	1		≥ 1	
FDD, PDS	CH Performance, S	ingle-antenna	transmi	ssion (CRS	S), Singl	e PRB	(MBSI	FN Coi	nfiguration)
FDD	Table A.3.3.1-5	R.29 FDD	10	16QAM	1/2	1		≥ 1	-
FDD, PDS	CH Performance: C	arrier aggrega	tion witl	n power in	nbalance	9			
FDD	Table A.3.3.1-7	R.49 FDD	20	64QAM	0.84- 0.87	100		≥ 5	
FDD	Table A.3.3.1-7	R.49-1 FDD	10	64QAM	0.84- 0.87	50		≥2	
FDD	Table A.3.3.1-7	R.49-2 FDD	5	64QAM	0.84-	25		≥2	
					0.86				
	CH Performance, N		ı			ı	ports		
FDD	Table A.3.3.2.1-1	R.10 FDD	10	QPSK	1/3	50		≥1	
FDD	Table A.3.3.2.1-1	R.10-2 FDD	5	QPSK	1/3	25		≥ 1	
FDD	Table A.3.3.2.1-1	R.11 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.2.1-1	R.11-2 FDD	5	16QAM	1/2	25		≥ 1	
FDD	Table A.3.3.2.1-1	R.11-3 FDD	10	16QAM	1/2	40		≥ 1	
FDD	Table A.3.3.2.1-1	R.11-4 FDD	10	QPSK	1/2	50		≥ 1	
FDD	Table A.3.3.2.1-1	R.30 FDD	20	16QAM	1/2	100		≥ 2	
FDD	Table A.3.3.2.1-1	R.30-1 FDD	15	16QAM	1/2	75		≥ 2	
FDD									1
FDD	Table A.3.3.2.1-1 Table A.3.3.2.1-1	R.35 FDD R.35-1 FDD	10 20	64QAM 64QAM	1/2 0.39	50		≥ 2 4	

				1		1			
FDD	Table A.3.3.2.1-1	R.35-2 FDD	15	64QAM	0.39	75		≥ 2	
FDD	Table A.3.3.2.1-1	R.35-3 FDD	10	64QAM	0.39	50		≥ 2	
FDD	Table A.3.3.2.1-2	R.35-4 FDD	10	64QAM	0.47	50		≥ 2	
FDD	Table A.3.3.2.1-2	R.46 FDD	10	QPSK		50		≥ 1	
FDD	Table A.3.3.2.1-2	R.47 FDD	10	16QAM		50		≥ 1	
FDD	Table A.3.3.2.1-2	R.11-5 FDD	1.4	16QAM	1/2	6		≥ 1	
FDD	Table A.3.3.2.1-2	R.11-6 FDD	3	16QAM	1/2	15		≥ 1	
FDD	Table A.3.3.2.1-2	R.11-7 FDD	15	16QAM	1/2	75		≥ 2	
FDD	Table A.3.3.2.1-2	R.11-8 FDD	10	QPSK	3/5	50		≥ 2	
FDD	Table A.3.3.2.1-2	R.11-9 FDD	10	QPSK	0.58	50		≥ 1	
FDD	Table A.3.3.2.1-2	R.11-10 FDD	10	QPSK	0.67	50		≥ 1	
FDD	Table A.3.3.2.1-2	R.65 FDD	10	256QAM	0.6	50		11-	
								15	
FDD	Table A.3.3.2.1-3	R. 62 FDD	10	16QAM	1/2	3		0	
FDD	Table A.3.3.2.1-3	R.63 FDD	10	64QAM	1/2	1		0	
FDD, PDS	CH Performance, M	lulti-antenna tr	ansmiss	sion (CRS)	, Four a	ntenna	ports		
FDD	Table A.3.3.2.2-1	R.12 FDD	1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.3.2.2-1	R.13 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.2.2-1	R.14 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.2.2-1	R.14-1 FDD	10	16QAM	1/2	6		≥ 1	
FDD	Table A.3.3.2.2-1	R.14-2 FDD	10	16QAM	1/2	3		≥ 1	
FDD	Table A.3.3.2.2-1	R.14-3 FDD	20	16QAM	1/2	100		≥ 2	
FDD	Table A.3.3.2.2-1	R.36 FDD	10	64QAM	1/2	50		≥ 2	
FDD	Table A.3.3.2.2-1	R.14-4 FDD	1.4	16QAM	1/2	6		≥ 1	
FDD	Table A.3.3.2.2-1	R.14-5 FDD	3	16QAM	1/2	15		≥ 1	
FDD	Table A.3.3.2.2-1	R.14-6 FDD	5	16QAM	1/2	25		≥ 1	
FDD	Table A.3.3.2.2-1	R.14-7 FDD	15	16QAM	1/2	75		≥ 2	
FDD. PDS	CH Performance (U	E specific RS)		: CSI-RS					
FDD	Table A.3.3.3.0-1	R.70 FDD	10	QPSK	0.65	50		≥ 1	
FDD	Table A.3.3.3.0-1	R.71 FDD	10	16QAM	0.6	50		≥ 2	
	CH Performance (U								
FDD	Table A.3.3.3.1-1	R.51 FDD	10	16QAM	1/2	50		≥ 2	
						<u> </u>	. 0		
	CH Performance (U			-	-	1	ı Quas		l cated)
FDD	Table A.3.3.3.1-2	R.52 FDD	10	64QAM	1/2	50		≥2	
FDD	Table A.3.3.3.1-2	R.53 FDD	10	64QAM	1/2	50		≥ 2	
FDD	Table A.3.3.3.1-2	R.54 FDD	10	16QAM	1/2	50		≥ 2	
	CH Performance (U				ts (CSI-	RS)			
FDD	Table A.3.3.3.2-1	R.43 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.3.2-1	R.50 FDD	10	64QAM	1/2	50		≥ 2	
FDD	Table A.3.3.3.2-2	R.44 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.3.2-2	R.45 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.3.2-2	R.45-1 FDD	10	16QAM	1/2	39		≥ 1	
FDD	Table A.3.3.3.2-1	R.48 FDD	10	QPSK		50		≥ 1	
FDD	Table A.3.3.3.2-2	R.60 FDD	10	QPSK	1/2	50		≥ 1	
FDD	Table A.3.3.3.2-3	R.64 FDD	10	QPSK	1/3	6		0	
FDD	Table A.3.3.3.2-1	R.66 FDD	10	64QAM	-	50		11- 15	
FDD	Table A.3.3.3.2-1	R.69 FDD	10	QPSK	0.74- 0.8	50		≥ 1	
TDD, PDS	CH Performance, S	ingle-antenna	transmis	ssion (CRS		<u> </u>			

		1							T
TDD	Table A.3.4.1-1	R.4 TDD	1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.4.1-1	R.42 TDD	20	QPSK	1/3	100		≥ 1	
TDD	Table A.3.4.1-1	R.2 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.1-1	R.2A TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.1-1	R.42-1 TDD	3	QPSK	1/3	15		≥ 1	
TDD	Table A.3.4.1-1	R.42-2 TDD	5	QPSK	1/3	25		≥ 1	
TDD	Table A.3.4.1-1	R.42-3 TDD	15	QPSK	1/3	75		≥ 1	
TDD	Table A.3.4.1-2	R.3-1 TDD	5	16QAM	1/2	25		≥ 1	
TDD	Table A.3.4.1-2	R.3 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.1-3	R.5 TDD	3	64QAM	3/4	15		≥ 1	
TDD	Table A.3.4.1-3	R.6 TDD	5	64QAM	3/4	25		≥ 2	
TDD	Table A.3.4.1-3	R.7 TDD	10	64QAM	3/4	50		≥ 2	
TDD	Table A.3.4.1-3	R.8 TDD	15	64QAM	3/4	75		≥ 2	
TDD	Table A.3.4.1-3	R.9 TDD	20	64QAM	3/4	100		≥ 3	
TDD	Table A.3.4.1-3a	R.6-1 TDD	5	64QAM	3/4	18		≥ 1	
TDD	Table A.3.4.1-3a	R.7-1 TDD	10	64QAM	3/4	17		≥ 1	
TDD	Table A.3.4.1-3a	R.8-1 TDD	15	64QAM	3/4	17		≥ 1	
TDD	Table A.3.4.1-3a	R.9-1 TDD	20	64QAM	3/4	17		≥ 1	
TDD	Table A.3.4.1-3a	R.9-2 TDD	20	64QAM	3/4	83		≥ 2	
TDD	Table A.3.4.1-6	R.41 TDD	10	QPSK	1/10	50		≥ 1	
TDD, PDS	CH Performance, S	ingle-antenna	transmi	ssion (CRS	S), Singl	e PRB	(Chan	nel ed	ge)
TDD	Table A.3.4.1-4	R.0 TDD	3	16QAM	1/2	1		≥ 1	
TDD	Table A.3.4.1-4	R.1 TDD	10 / 20	16QAM	1/2	1		≥ 1	
TDD DDG		• • •	-	! (OD(O' O':I	o DDD	/MDOI	ENI Cor	oficuration)
I IUU, PUS	CH Performance, S	ingie-antenna '	transmi	ssion (CR	5), Singi	erko	(MR2)	-ia Coi	inquration)
TDD, PDS	Table A.3.4.1-5	R.29 TDD	10		5), Singi 1/2	1	(IMR2)	FIN COI ≥ 1	inguration)
TDD	Table A.3.4.1-5	R.29 TDD	10	16QAM	1/2	1	(MR2)		inguration)
TDD	1	R.29 TDD	10	16QAM	1/2 nbalance 0.81-	1	(MR2)		inguration)
TDD, PDS	Table A.3.4.1-5	R.29 TDD Carrier aggrega	10 tion witl	16QAM n power in	1/2 nbalance 0.81- 087 0.80-	1 e	(MR2)	≥ 1	inguration)
TDD, PDS TDD TDD	Table A.3.4.1-5 CCH Performance: C Table A.3.4.1-7	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD	10 tion witl 20 15	16QAM 1 power im 64QAM 64QAM	1/2 nbalance 0.81- 087 0.80- 0.86	1 9 100 75		≥ 1	inguration)
TDD, PDS TDD TDD	Table A.3.4.1-5 CCH Performance: C Table A.3.4.1-7 Table A.3.4.1-7	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD	10 tion witl 20 15	16QAM 1 power im 64QAM 64QAM	1/2 nbalance 0.81- 087 0.80- 0.86	1 9 100 75		≥ 1	inguration)
TDD TDD, PDS TDD TDD TDD, PDS	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 CH Performance, N	R.29 TDD carrier aggrega R.49 TDD R.49-1 TDD	10 tion with 20 15 ansmiss	16QAM 1 power im 64QAM 64QAM 6ion (CRS)	1/2 nbalance 0.81- 087 0.80- 0.86 , Two a	1 100 75		≥ 1 ≥ 5 ≥ 3	inguration)
TDD TDD, PDS TDD TDD TDD, PDS TDD	Table A.3.4.1-5 CCH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 CCH Performance, N Table A.3.4.2.1-1	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD Iulti-antenna tr R.10 TDD	10 tion with 20 15 ansmiss	16QAM n power in 64QAM 64QAM sion (CRS)	1/2 nbalance 0.81- 087 0.80- 0.86 , Two ai	1 100 75 ntenna 50		≥ 1 ≥ 5 ≥ 3	inguration)
TDD TDD, PDS TDD TDD TDD, PDS TDD TDD TDD	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 CH Performance, N Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD carrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11 TDD	10 tion with 20 15 ansmiss 10 10	16QAM 1 power im 64QAM 64QAM Sion (CRS) QPSK 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two at 1/3	100 75 ntenna 50 50		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2	inguration)
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD	Table A.3.4.1-5 CCH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 CCH Performance, N Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD Iulti-antenna tr R.10 TDD R.11 TDD R.11 TDD	10 tion with 20 15 ansmiss 10 10	16QAM n power in 64QAM 64QAM 64QAM GOPSK 16QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two ai 1/3 1/2 1/2	1 100 75 ntenna 50 50 50		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 2	inguration)
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD Iulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-2 TDD	10 tion with 20 15 ansmiss 10 10 10 5	16QAM 1 power im 64QAM 64QAM 64QAM GION (CRS) QPSK 16QAM 16QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two ai 1/3 1/2 1/2 1/2	1 100 75 ntenna 50 50 50 25		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 2 ≥ 1	inguration)
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 CH Performance, N Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD Iulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-2 TDD R.11-3 TDD	10 tion with 20 15 ansmiss 10 10 10 5 10	16QAM 1 power im 64QAM 64QAM 64QAM QPSK 16QAM 16QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two ai 1/3 1/2 1/2 1/2 1/2	100 75 ntenna 50 50 50 25 40		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 2 ≥ 1 ≥ 1	inguration)
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD Iulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-2 TDD R.11-3 TDD R.11-4 TDD	10 tion with 20 15 ansmiss 10 10 5 10	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM 16QAM 16QAM 16QAM 16QAM QPSK	1/2 nbalance 0.81- 087 0.80- 0.86 , Two ai 1/3 1/2 1/2 1/2 1/2 1/2	1 100 75 ntenna 50 50 25 40 50		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 2 ≥ 1 ≥ 1 ≥ 1	inguration)
TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 CH Performance, N Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD carrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-2 TDD R.11-3 TDD R.11-4 TDD R.30 TDD	10 tion with 20 15 ansmiss 10 10 10 5 10 20	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM 16QAM 16QAM 16QAM 16QAM QPSK 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two ai 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 100 50 50 25 40 100		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 1 ≥ 1 ≥ 1 ≥ 1 ≥ 2	
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD Iulti-antenna tr R.10 TDD R.11 TDD R.11-2 TDD R.11-3 TDD R.11-4 TDD R.30 TDD R.30-1 TDD	10 tion with 20 15 ansmiss 10 10 5 10 20 20	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM 16QAM 16QAM 16QAM QPSK 16QAM 16QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two ai 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 ntenna 50 50 25 40 50 100		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 2 ≥ 1 ≥ 1 ≥ 1 ≥ 2 ≥ 2	
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD carrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-2 TDD R.11-3 TDD R.11-4 TDD R.30 TDD R.30-1 TDD R.30-2 TDD	10 tion with 20 15 ansmiss 10 10 5 10 20 20 20	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two ai 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 100 50 50 25 40 100 100 100		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 1 ≥ 1 ≥ 1 ≥ 2 ≥ 3	
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD Carrier aggrega R.49 TDD R.49-1 TDD Iulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-3 TDD R.11-4 TDD R.30 TDD R.30-1 TDD R.30-2 TDD R.35 TDD	10 tion with 20 15 ansmiss 10 10 10 5 10 20 20 20 10	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 100 50 50 100 100 100 50		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 2 ≥ 1 ≥ 1 ≥ 2 ≥ 2 ≥ 3 ≥ 2	
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD carrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11-1 TDD R.11-2 TDD R.11-3 TDD R.11-4 TDD R.30-1 TDD R.30-2 TDD R.35-1 TDD R.35-1 TDD	10 tion witl 20 15 ansmiss 10 10 5 10 20 20 20 10 20	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two at 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 100 75 100 50 50 100 100 100 100		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 1 ≥ 1 ≥ 1 ≥ 2 ≥ 3 ≥ 2 4	
TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1	R.29 TDD carrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-3 TDD R.11-4 TDD R.30-1 TDD R.30-1 TDD R.30-2 TDD R.35-1 TDD R.35-2 TDD	10 tion with 20 15 ansmiss 10 10 10 5 10 20 20 10 20 10	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 64QAM 64QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two at 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 100 75 100 50 50 100 100 50 100 50		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 1 ≥ 1 ≥ 1 ≥ 1 ≥ 2 ≥ 1 ≥ 1	
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-2 Table A.3.4.2.1-2	R.29 TDD arrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-2 TDD R.11-3 TDD R.30-1 TDD R.30-1 TDD R.30-2 TDD R.35-1 TDD R.35-2 TDD R.46 TDD	10 tion with 20 15 ansmiss 10 10 10 5 10 20 20 20 10 20 10 10	16QAM 1 power in 64QAM 64QAM 64QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 , Two at 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 100 75 50 50 25 40 100 100 100 50 100 50		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 2 ≥ 1 ≥ 1 ≥ 2 ≥ 2 4 ≥ 2 ≥ 1	
TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-2 Table A.3.4.2.1-2	R.29 TDD arrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-3 TDD R.11-3 TDD R.30-1 TDD R.30-2 TDD R.35-1 TDD R.35-2 TDD R.46 TDD R.47 TDD	10 tion with 20 15 ansmiss 10 10 10 5 10 20 20 20 10 20 10 10 10 10	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 n Two ai 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 100 75 100 50 50 100 100 50 50 50		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 1 ≥ 1 ≥ 1 ≥ 2 ≥ 1 ≥ 1	
TDD TDD, PDS TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2	R.29 TDD arrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11 TDD R.11-1 TDD R.11-3 TDD R.30-1 TDD R.30-1 TDD R.30-2 TDD R.35-1 TDD R.35-2 TDD R.46 TDD R.47 TDD R.11-5 TDD	10 tion with 20 15 ansmiss 10 10 10 5 10 20 20 10 20 10 10 10 10 10 10 10 10 10	16QAM 1 power in 64QAM 64QAM 64QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	100 75 100 75 50 50 25 40 100 100 50 100 50 50 6		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 2 ≥ 1 ≥ 1 ≥ 2 2 2 3 ≥ 2 4 ≥ 2 ≥ 1 ≥ 1 ≥ 1 ≥ 1	
TDD TDD, PDS TDD TDD TDD TDD TDD TDD TDD TDD TDD T	Table A.3.4.1-5 CH Performance: C Table A.3.4.1-7 Table A.3.4.1-7 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-1 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2 Table A.3.4.2.1-2	R.29 TDD carrier aggrega R.49 TDD R.49-1 TDD lulti-antenna tr R.10 TDD R.11-1 TDD R.11-2 TDD R.11-3 TDD R.30 TDD R.30-1 TDD R.30-2 TDD R.35-1 TDD R.35-2 TDD R.46 TDD R.47 TDD R.11-5 TDD R.11-6 TDD	10 tion with 20 15 ansmiss 10 10 10 5 10 20 20 20 10 20 10 10 10 10 10 10 10 10 10 10 10 10 10	16QAM 1 power im 64QAM 64QAM 64QAM 16QAM	1/2 nbalance 0.81- 087 0.80- 0.86 n, Two ai 1/3 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2	1 100 75 100 50 100 50 50 6 15		≥ 1 ≥ 5 ≥ 3 ≥ 1 ≥ 2 ≥ 1 ≥ 1 ≥ 1 ≥ 2 ≥ 2 ≥ 1 ≥ 1	

	T =					T			
TDD	Table A.3.4.2.1-2	R.11-9 TDD	15	16QAM	1/2	75		≥ 2	
TDD	Table A.3.4.2.1-2	R.11-10 TDD	10	QPSK	3/5	50		≥ 2	
TDD	Table A.3.4.2.1-2	R.11-11 TDD	10	QPSK	0.48- 0.58	50		≥ 1	
TDD	Table A.3.4.2.1-2	R.11-12 TDD	10	QPSK	0.54- 0.66	50		≥ 1	
TDD	Table A.3.4.2.1-3	R.62 TDD	10	16QAM	1/2	3		0	
TDD	Table A.3.4.2.1-3	R.63 TDD	10	64QAM	1/2	1		0	
TDD	Table A.3.4.2.1-4	R.65 TDD	20	256QAM	0.6	100		11- 15	
TDD	Table A.3.4.2.1-5	R.67 TDD	10	16QAM	0.4	50		≥ 1	
TDD, PDS	SCH Performance, M	lulti-antenna tr	ansmiss	sion (CRS)	, Four a	ntenna	ports		
TDD	Table A.3.4.2.2-1	R.12 TDD	1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.4.2.2-1	R.13 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.2.2-1	R.14 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.2-1	R.14-1 TDD	10	16QAM	1/2	6		≥ 1	
TDD	Table A.3.4.2.2-1	R.14-2 TDD	10	16QAM	1/2	3		≥ 1	
TDD	Table A.3.4.2.2-1	R.43 TDD	20	16QAM	1/2	100		≥2	
TDD	Table A.3.4.2.2-1	R.36 TDD	10	64QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.2-1	R.43-1 TDD	1.4	16QAM	1/2	6		≥ 1	
TDD	Table A.3.4.2.2-1	R.43-2 TDD	3	16QAM	1/2	15		≥ 1	
TDD	Table A.3.4.2.2-1	R.43-3 TDD	5	16QAM	1/2	25		≥ 1	
TDD	Table A.3.4.2.2-1	R.43-4 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.2-1	R.43-5 TDD	15	16QAM	1/2	75		≥ 2	
TDD, PDS	SCH Performance, S	ingle antenna	port (DR	(S)					
TDD	Table A.3.4.3.1-1	R.25 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.3.1-1	R.26 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.1-1	R.26-1 TDD	5	16QAM	1/2	25		≥ 1	
TDD	Table A.3.4.3.1-1	R.27 TDD	10	64QAM	3/4	50		≥ 2	
TDD	Table A.3.4.3.1-1	R.27-1 TDD	10	64QAM	3/4	18		≥ 1	
TDD	Table A.3.4.3.1-1	R.28 TDD	10	16QAM	1/2	1		≥ 1	
TDD, PDS	CH Performance, T	wo antenna po	rts (DRS	S)					
TDD	Table A.3.4.3.2-1	R.31 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.3.2-1	R.32 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.2-1	R.32-1 TDD	5	16QAM	1/2	[25]		≥ 1	
TDD	Table A.3.4.3.2-1	R.33 TDD	10	64QAM	3/4	50		≥ 2	
TDD	Table A.3.4.3.2-1	R.33-1 TDD	10	64QAM	3/4	[18]		≥ 1	
TDD	Table A.3.4.3.2-1	R.34 TDD	10	64QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.2	R.70 TDD	10	QPSK	0.54- 0.65	50		≥ 1	
TDD	Table A.3.4.3.2	R.71 TDD	10	16QAM	0.5- 0.6	50		≥ 2	
TDD, PDS	CH Performance (U	E specific RS)	Two an	tenna port		RS)			
TDD	Table A.3.4.3.3-1	R.51 TDD	10	16QAM	1/2	50		≥ 2	
TDD, PDS	CH Performance (U	E specific RS)	Two an	tenna port	s (CSI-F	RS, noi	า Quas	i Co-lo	ocated)
TDD	Table A.3.4.3.3-2	R.52 TDD	10	64QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.3-2	R.53 TDD	10	64QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.3-2	R.54 TDD	10	16QAM	1/2	50		≥ 2	
TDD, PDS	CH Performance (U	JE specific RS)	Four an	tenna por	ts (CSI-	RS)			
TDD	Table A.3.4.3.4-1	R.44 TDD	10	64QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.4-1	R.48 TDD	10	QPSK		50		≥ 1	
TDD	Table A.3.4.3.4-2	R.60 TDD	10	QPSK	1/2	50		≥ 1	
	•	•		•					

TDD	Table A.3.4.3.4-2	R.61 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.4-2	R.61-1 TDD	10	16QAM	1/2	39		≥ 1	
TDD	Table A.3.4.3.4-3	R.64 TDD	10	QPSK	1/3	6		0	
TDD	Table A.3.4.3.4-1	R.66 TDD	20	256QAM		100		11-	
TDD	Table A.3.4.3.4-1	R.69 TDD	10	QPSK	0.61- 0.8	50		15 ≥ 1	
TDD, PDS	CH Performance (U	JE specific RS)	Eight a	ntenna po		RS)			
TDD	Table A.3.4.3.5-1	R.50 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.3.5-2	R.45 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.3.5-2	R.45-1 TDD	10	16QAM	1/2	39		≥ 1	
FDD, PDC	CH / PCFICH Perfo	rmance							
FDD	Table A.3.5.1-1	R.15 FDD	10	PDCCH					
FDD	Table A.3.5.1-1	R.15-1 FDD	10	PDCCH					
FDD	Table A.3.5.1-1	R.15-2 FDD	10	PDCCH					
FDD	Table A.3.5.1-1	R.16 FDD	10	PDCCH					
FDD	Table A.3.5.1-1	R.17 FDD	5	PDCCH					
TDD, PDC	CH / PCFICH Perfo	rmance							
TDD	Table A.3.5.2-1	R.15 TDD	10	PDCCH					
TDD	Table A.3.5.2-1	R.15-1 TDD	10	PDCCH					
TDD	Table A.3.5.2-1	R.15-2 TDD	10	PDCCH					
TDD	Table A.3.5.2-1	R.16 TDD	10	PDCCH					
TDD	Table A.3.5.2-1	R.17 TDD	5	PDCCH					
FDD / TDE	D, PHICH Performar	nce		T	T		l I		
TDD / FDD /	Table A.3.6-1	R.18	10	PHICH					
TDD	Table A.3.6-1	R.19	10	PHICH					
FDD	Table A.3.6.1	R.19-1	5	PHICH					
FDD / TDD	Table A.3.6-1	R.20	5	PHICH					
FDD / TDD	Table A.3.6-1	R.24	10	PHICH					
	D, PBCH Performan	се							
FDD / TDD	Table A.3.7-1	R.21	1.4	QPSK	40/ 1920				
FDD / TDD	Table A.3.7-1	R.22	1.4	QPSK	40/ 1920				
FDD / TDD	Table A.3.7-1	R.23	1.4	QPSK	40/ 1920				
	H Performance				1920				
FDD	Table A.3.8.1-1	R.40 FDD	1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.8.1-1	R.37 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.8.1-2	R.38 FDD	10	16QAM	1/2	50		≥ 1	
FDD	Table A.3.8.1-3	R.39-1 FDD	5	64QAM	2/3	25		≥ 1	
FDD	Table A.3.8.1-3	R.39 FDD	10	64QAM	2/3	50		≥ 2	
TDD, PMC	H Performance								
TDD	Table A.3.8.2-1	R.40 TDD	1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.3.8.2-1	R.37 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.8.2-2	R.38 TDD	10	16QAM	1/2	50		≥ 1	
TDD	Table A.3.8.2-3	R.39-1 TDD	5	64QAM	2/3	25		≥ 1	
TDD	Table A.3.8.2-3	R.39 TDD	10	64QAM	2/3	50		≥ 2	
FDD, Sust	tained data rate (CR	RS)							
FDD	Table A.3.9.1-1	R.31-1 FDD	10	64QAM	0.40			≥ 1	
FDD	Table A.3.9.1-1	R.31-2 FDD	10	64QAM	0.59-			≥ 2	

				1	0.64	1		
		D 04 0 EDD		212111	0.59-			
FDD	Table A.3.9.1-1	R.31-3 FDD	20	64QAM	0.62		≥ 2	
FDD	Table A.3.9.1-1	R.31-3A FDD	10	64QAM	0.85- 0.90		≥ 2	
FDD	Table A.3.9.1-1	R.31-3C FDD	15	64QAM	0.87- 0.91		≥ 3	
FDD	Table A.3.9.1-1	R.31-4 FDD	20	64QAM	0.87- 0.90		≥ 3	
FDD	Table A.3.9.1-1	R.31-4B FDD	15	64QAM	0.85- 0.88		≥ 4	
FDD	Table A.3.9.1-1	R.31-5 FDD	15	64QAM	0.85- 0.91		≥ 3	
FDD	Table A.3.9.1-2	R.31-6 FDD	15	64QAM	0.83- 0.85		≥ 2	
FDD	Table A.3.9.1-3	R.68 FDD	20	256QAM	0.74- 0.85		11- 12	
FDD	Table A.3.9.1-3	R.68-1 FDD	15	256QAM	0.74- 0.88		11- 12	
FDD	Table A.3.9.1-3	R.68-2 FDD	10	256QAM	0.74- 0.85		11- 12	
FDD	Table A.3.9.1-3	R.68-3 FDD	5	256QAM	0.77- 0.85		11- 12	
TDD, Sus	tained data rate (CF	RS)			0.00		12	
TDD	Table A.3.9.2-1	R.31-1 TDD	10	64QAM	0.40		≥ 1	
TDD	Table A.3.9.2-1	R.31-2 TDD	10	64QAM	0.59- 0.64		≥ 2	
TDD	Table A.3.9.2-1	R.31-3 TDD	20	64QAM	0.59- 0.62		≥ 2	
TDD	Table A.3.9.2-1	R.31-3A TDD	15	64QAM	0.87- 0.90		≥ 2	
TDD	Table A.3.9.2-1	R.31-4 TDD	20	64QAM	0.87- 0.90		≥ 3	
TDD	Table A.3.9.2-1	R.31-4A TDD	20	64QAM	0.87- 0.90		≥ 3	
TDD	Table A.3.9.2-1	R.31-5 TDD	15	64QAM	0.85- 0.88		≥ 3	
TDD	Table A.3.9.2-1	R.31-5A TDD	15	64QAM	0.85- 0.88		≥ 3	
TDD	Table A.3.9.2-2	R.68 TDD	20	256QAM			11- 12	
TDD	Table A.3.9.2-2	R.68-1 TDD	15	256QAM			11- 12	
TDD	Table A.3.9.2-2	R.68-2 TDD	10	256QAM			11- 12	
TDD	Table A.3.9.2-2	R.68-3 TDD	20	256QAM			11- 12	
TDD	Table A.3.9.2-2	R.68-4 TDD	15	256QAM			11- 12	
FDD, Sus	tained data rate tes		schedu	uling (CRS				
FDD	Table A.3.9.3-1	R.31E-1 FDD	10	64QAM	0.40- 0		≥ 1	
FDD	Table A.3.9.3-1	R.31E-2 FDD	10	64QAM	0.59- 0.66		≥ 2	
FDD	Table A.3.9.3-1	R.31E-3 FDD	20	64QAM	0.59- 0.63		≥ 2	
FDD	Table A.3.9.1-1	R.31E-3C FDD	15	64QAM	0.87- 0.92		≥ 3	
FDD	Table A.3.9.3-1	R.31E-3A	10	64QAM	0.85-		≥ 2	
FDD	Table A.3.9.3-1	R.31E-4 FDD	20	64QAM	0.92		≥ 3	
FDD	Table A.3.9.1-1	R.31E-4B FDD	15	64QAM	0.91		≥ 4	
TDD, Sus	Lained data rate tes		schedu	uling (CRS	0.90)			
TDD	Table A.3.9.4-1	R.31E-1 TDD	10	64QAM	0.40- 0.41		≥ 1	
TDD	Table A.3.9.4-1	R.31E-2	10	64QAM	0.59-		≥ 2	
		TDD			0.65			
TDD	Table A.3.9.4-1	R.31E-3	20	64QAM	0.59-		≥ 2	

		TDD			0.63					
TDD	Table A.3.9.4-1	R.31E-3A TDD	15	64QAM	0.87- 0.92			≥ 2		
TDD	Table A.3.9.4-1	R.31E-4 TDD	20	64QAM	0.87- 0.90			≥ 3		
FDD, ePDCCH performance										
FDD	Table A.3.10.1-1	R.55 FDD	10	EPDCC H						
FDD	Table A.3.10.1-1	R.56 FDD	10	EPDCC H						
FDD	Table A.3.10.1-1	R.57 FDD	10	EPDCC H						
FDD	Table A.3.10.1-1	R.58 FDD	10	EPDCC H						
FDD	Table A.3.10.1-1	R.59 FDD	10	EPDCC H						
TDD, ePD	CCH performance									
TDD	Table A.3.10.2-1	R.55 TDD	10	EPDCC H						
TDD	Table A.3.10.2-1	R.56 TDD	10	EPDCC H						
TDD	Table A.3.10.2-1	R.57 TDD	10	EPDCC H						
TDD	Table A.3.10.2-1	R.58 TDD	10	EPDCC H						
TDD	Table A.3.10.2-1	R.59 TDD	10	EPDCC H						

A.3.2 Reference measurement channel for receiver characteristics

Tables A.3.2-1 and A.3.2-2 are applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4 (Maximum input level).

Tables A.3.2-3, A.3.2-3a, A.3.2-3b, A.3.2-4, A.3.2-4a and A.3.2-4b are applicable for subclause 7.4 (Maximum input level).

Tables A.3.2-1 and A.3.2-2 also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

Table A.3.2-1 Fixed Reference Channel for Receiver Requirements (FDD)

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		9	9	9	9	9	9
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	1320	2216	4392	6712	8760
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	152	872	1800	4392	6712	8760
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	1	1	1	2	2
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	1	1	1	1	2	2
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	3780	6300	13800	20700	27600
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	528	2940	5460	12960	19860	26760
Max. Throughput averaged over 1 frame	kbps	341.6	1143.	1952.	3952.	6040.	7884
			2	8	8	8	
UE Category		≥ 1	≥ 1	≥ 1	≥1	≥1	≥ 1

² symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to Note 1: PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz
Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]
If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to

Note 2:

Note 3: each Code Block (otherwise L = 0 Bit)

Table A.3.2-1a Fixed Reference Channel for Receiver Requirements (FDD)

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	14	14	14	14	14
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		9	9	9	9	9	9
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3
Number of HARQ Processes	Processes	[8]	[8]	[8]	[8]	[8]	[8]
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	1000	1000	1000	1000	1000
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0 (Note 3)	Bits	152	840	840	904	904	904
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	1	1	1	1	1
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	1	1	1	1	1	1
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	3528	3528	3864	3864	3864
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0 (Note 3)	Bits	528	2688	2688	3024	3024	3024
Max. Throughput averaged over 1 frame	kbps	341.6	884	884	890.4	890.4	890.4
UE DL Category		0	0	0	0	0	0

- Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz
- Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211.
- Note 3: For Sub-Frame 0, it is assumed the 6PRBs are allocated in the centre of the channel where some REs of the same PRBs are occupied by PBCH and synchronization signals.
- Note 4: For HD-FDD UE, the downlink subframes are scheduled at the 0th, 1st, 2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled.

Table A.3.2-2 Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit			Va	lue		
Channel Bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3	3+2	3+2	3+2	3+2	3+2
Number of HARQ Processes	Processes	7	7	7	7	7	7
Maximum number of HARQ transmission		1	1	1	1	1	1
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Information Bit Payload per Sub-Frame	Bits						
For Sub-Frame 4, 9		408	1320	2216	4392	6712	8760
For Sub-Frame 1, 6		N/A	968	1544	3240	4968	6712
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		208	1064	1800	4392	6712	8760
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame							
(Note 4)							
For Sub-Frame 4, 9		1	1	1	1	2	2
For Sub-Frame 1, 6		N/A	1	1	1	1	2
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	1	1	1	2	2
Binary Channel Bits Per Sub-Frame	Bits						
For Sub-Frame 4, 9		1368	3780	6300	13800	20700	27600
For Sub-Frame 1, 6		N/A	3276	5556	11256	16956	22656
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		672	3084	5604	13104	20004	26904
Max. Throughput averaged over 1 frame	kbps	102.4	564	932	1965.	3007.	3970.
					6	2	4
UE Category	<u> </u>	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1

For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz Note 1: channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with

Note 2: insufficient PDCCH performance

Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]

If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to Note 4: each Code Block (otherwise L = 0 Bit).

Note 5: As per Table 4.2-2 in TS 36.211 [4]

Table A.3.2-2a Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit			Va	lue		
Channel Bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	14	14	14	14	14
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3	3+2	3+2	3+2	3+2	3+2
Number of HARQ Processes	Processes	[7]	[7]	[7]	[7]	[7]	[7]
Maximum number of HARQ transmission		1	1	1	1	1	1
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target coding rate		1/3	1/3	1/3	1/3	1/3	1/3
Information Bit Payload per Sub-Frame	Bits						
For Sub-Frame 4, 9		408	1000	1000	1000	1000	1000
For Sub-Frame 1, 6		N/A	872	872	872	872	872
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		208	1000	1000	1000	1000	1000
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame							
(Note 4)							
For Sub-Frame 4, 9		1	1	1	1	1	1
For Sub-Frame 1, 6		N/A	1	1	1	1	1
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	1	1	1	1	1
Binary Channel Bits Per Sub-Frame	Bits						
For Sub-Frame 4, 9		1368	3528	3528	3864	3864	3864
For Sub-Frame 1, 6		N/A	3048	3048	3048	3048	3048
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		672	2832	2832	3168	3168	3168
Max. Throughput averaged over 1 frame	kbps	102.4	474.4	474.4	474.4	474.4	474.4
UE DL Category		0	0	0	0	0	0

- Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
- Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
- Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]
- Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 5: As per Table 4.2-2 in TS 36.211 [4]

Table A.3.2-3 Fixed Reference Channel for Maximum input level for UE Categories 3-8 (FDD)

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	14112	30576	46888	61664
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	6456	12576	28336	45352	61664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	3	5	8	11
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		N/A	2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	18900	41400	62100	82800
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	12547	27294	42046	55498

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.

Table A.3.2-3a Fixed Reference Channel for Maximum input level for UE Category 1 (FDD)

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	18	17	17	17
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	10296	10296	10296	10296
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	6456	8248	10296	10296	10296
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	2	2	2	2
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		N/A	2	2	2	2	2
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	13608	14076	14076	14076
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	8820	11088	14076	14076	14076
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	9079.6	9266.4	9266.4	9266.4

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.2-3b Fixed Reference Channel for Maximum input level for UE Category 2 (FDD)

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	83
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	14112	30576	46888	51024
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	6456	12576	28336	45352	51024
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	3	5	8	9
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		N/A	2	3	5	8	9
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	18900	41400	62100	68724
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	8820	16380	38880	59580	66204
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	12547	27294	42046	45922

- Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.
- Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.2-3c Fixed Reference Channel for Maximum input level for UE DL Category 0 (FDD)

Parameter	Unit	Value								
Channel bandwidth	MHz	1.4	3	5	10	15	20			
Allocated resource blocks		2	2	2	2	2	2			
Subcarriers per resource block		12	12	12	12	12	12			
Allocated subframes per Radio Frame		8	9	9	9	9	9			
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM			
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4			
Number of HARQ Processes	Processes	[8]	[8]	[8]	[8]	[8]	[8]			
Maximum number of HARQ transmissions		1	1	1	1	1	1			
Information Bit Payload										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1000	1000	1000	1000	1000	1000			
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A			
For Sub-Frame 0 (Note 3)	Bits	N/A	1000	1000	1000	1000	1000			
Transport block CRC	Bits	24	24	24	24	24	24			
Number of Code Blocks per Sub-Frame										
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	1	1	1	1			
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A			
For Sub-Frame 0		N/A	1	1	1	1	1			
Binary Channel Bits Per Sub-Frame										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	1512	1512	1656	1656	1656			
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A			
For Sub-Frame 0 (Note 3)	Bits	N/A	1512	1512	1656	1656	1656			
Max. Throughput averaged over 1 frame	kbps	800	900	900	900	900	900			

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211.

Note 3: For Sub-Frame 0, it is assumed that the allocated 2PRBs are scheduled on the RBs other than the center 6PRBs as most of the symbols are occupied by PBCH and synchronization signals.

Table A.3.2-4 Fixed Reference Channel for Maximum input level for UE Categories 3-8 (TDD)

Parameter	Unit	Value							
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks		6	15	25	50	75	100		
Subcarriers per resource block		12	12	12	12	12	12		
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1		
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2		
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM		
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4		
Number of HARQ Processes	Processes	7	7	7	7	7	7		
Maximum number of HARQ transmissions		1	1	1	1	1	1		
Information Bit Payload per Sub-Frame									
For Sub-Frames 4,9	Bits	2984	8504	14112	30576	46888	61664		
For Sub-Frames 1,6	Bits	N/A	6968	11448	23688	35160	46888		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	6968	12576	30576	45352	61664		
Transport block CRC	Bits	24	24	24	24	24	24		
Number of Code Blocks per Sub-Frame									
(Note 4)									
For Sub-Frames 4,9		1	2	3	5	8	11		
For Sub-Frames 1,6		N/A	2	2	4	6	8		
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0		N/A	2	3	5	8	11		
Binary Channel Bits per Sub-Frame									
For Sub-Frames 4,9	Bits	4104	11340	18900	41400	62100	82800		
For Sub-Frames 1,6		N/A	9828	16668	33768	50868	67968		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	9252	16812	39312	60012	80712		
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	27877		

- Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
- Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.
- Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 5: As per Table 4.2-2 in TS 36.211 [4].

Table A.3.2-4a Fixed Reference Channel for Maximum input level for UE Category 1 (TDD)

Parameter	Unit	Value							
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks		6	15	18	17	17	17		
Subcarriers per resource block		12	12	12	12	12	12		
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1		
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2		
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM		
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4		
Number of HARQ Processes	Processes	7	7	7	7	7	7		
Maximum number of HARQ transmissions		1	1	1	1	1	1		
Information Bit Payload per Sub-Frame									
For Sub-Frames 4,9	Bits	2984	8504	10296	10296	10296	10296		
For Sub-Frames 1,6	Bits	N/A	6968	8248	7480	7480	7480		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	6968	8248	10296	10296	10296		
Transport block CRC	Bits	24	24	24	24	24	24		
Number of Code Blocks per Sub-Frame									
(Note 4)									
For Sub-Frames 4,9		1	2	2	2	2	2		
For Sub-Frames 1,6		N/A	2	2	2	2	2		
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0		N/A	2	2	2	2	2		
Binary Channel Bits per Sub-Frame									
For Sub-Frames 4,9	Bits	4104	11340	13608	14076	14076	14076		
For Sub-Frames 1,6		N/A	9828	11880	11628	11628	11628		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	9252	11520	14076	14076	14076		
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	4533.6	4584.8	4584.8	4584.8		

- Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
- Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.
- Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 5: As per Table 4.2-2 in TS 36.211 [4].

Table A.3.2-4b Fixed Reference Channel for Maximum input level for UE Category 2 (TDD)

Parameter	Unit	Value							
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks		6	15	25	50	75	83		
Subcarriers per resource block		12	12	12	12	12	12		
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1		
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2		
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM		
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4		
Number of HARQ Processes	Processes	7	7	7	7	7	7		
Maximum number of HARQ transmissions		1	1	1	1	1	1		
Information Bit Payload per Sub-Frame									
For Sub-Frames 4,9	Bits	2984	8504	14112	30576	46888	51024		
For Sub-Frames 1,6	Bits	N/A	6968	11448	23688	35160	39232		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	6968	12576	30576	45352	51024		
Transport block CRC	Bits	24	24	24	24	24	24		
Number of Code Blocks per Sub-Frame									
(Note 4)									
For Sub-Frames 4,9		1	2	3	5	8	9		
For Sub-Frames 1,6		N/A	2	3	5	7	7		
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0		N/A	2	3	5	8	9		
Binary Channel Bits per Sub-Frame									
For Sub-Frames 4,9	Bits	4104	11340	18900	41400	62100	68724		
For Sub-Frames 1,6		N/A	9828	16668	33768	50868	56340		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	9252	16380	39312	60012	66636		
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	23154		

- Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
- Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.
- Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 5: As per Table 4.2-2 in TS 36.211 [4].

Table A.3.2-4c Fixed Reference Channel for Maximum input level for UE DL Category 0 (TDD)

Parameter	Unit	Value							
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks		2	2	2	2	2	2		
Subcarriers per resource block		12	12	12	12	12	12		
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1		
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2		
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM		
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4		
Number of HARQ Processes	Processes	[7]	[7]	[7]	[7]	[7]	[7]		
Maximum number of HARQ transmissions		1	1	1	1	1	1		
Information Bit Payload per Sub-Frame									
For Sub-Frames 4,9	Bits	1000	1000	1000	1000	1000	1000		
For Sub-Frames 1,6	Bits	N/A	712	712	712	712	712		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	1000	1000	1000	1000	1000		
Transport block CRC	Bits	24	24	24	24	24	24		
Number of Code Blocks per Sub-Frame									
(Note 4)									
For Sub-Frames 4,9		1	1	1	1	1	1		
For Sub-Frames 1,6		N/A	1	1	1	1	1		
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0		N/A	1	1	1	1	1		
Binary Channel Bits per Sub-Frame									
For Sub-Frames 4,9	Bits	1368	1512	1512	1656	1656	1656		
For Sub-Frames 1,6		N/A	1224	1224	1368	1368	1368		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	1512	1512	1656	1656	1656		
Max. Throughput averaged over 1 frame	kbps	200	442.4	442.4	442.4	442.4	442.4		

- Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
- Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.
- Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 5: As per Table 4.2-2 in TS 36.211 [4].

Table A.3.2-5 Fixed Reference Channel for Maximum input level for UE Categories 11/12/13/14/15 and UE DL categories 13, 14 (FDD)

Parameter	Unit	Value							
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks		6	15	25	50	75	100		
Subcarriers per resource block		12	12	12	12	12	12		
Allocated subframes per Radio Frame		8	9	9	9	9	9		
Modulation		256QAM	256QAM	256QAM	256QAM	256QAM	256QAM		
Target Coding Rate		4/5	4/5	4/5	4/5	4/5	4/5		
Number of HARQ Processes	Processes	8	8	8	8	8	8		
Maximum number of HARQ transmissions		1	1	1	1	1	1		
Information Bit Payload per Sub-Frame									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4392	12216	19848	42368	63776	84760		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	9912	17568	40576	63776	84760		
Transport block CRC	Bits	24	24	24	24	24	24		
Number of Code Blocks per Sub-Frame									
(Note 3)									
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	4	7	11	14		
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0		N/A	2	3	7	11	14		
Binary Channel Bits Per Sub-Frame									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	5472	15120	25200	55200	82800	110400		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	12210	22290	51840	79440	107040		
Max. Throughput averaged over 1 frame	kbps	3513.6	10764	17635.2	37952	57398.4	76284		

² symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz. Note 1:

Note 2:

Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].

If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Note 3: Block (otherwise L = 0 Bit).

Table A.3.2-6 Fixed Reference Channel for Maximum input level for UE Categories 11/12/13/14/15 and UE DL categories 13, 14 (TDD)

Parameter	Unit	Value							
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks		6	15	25	50	75	100		
Subcarriers per resource block		12	12	12	12	12	12		
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1		
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2		
Modulation		256QAM	256QAM	256QAM	256QAM	256QAM	256QAM		
Target Coding Rate		4/5	4/5	4/5	4/5	4/5	4/5		
Number of HARQ Processes	Processes	7	7	7	7	7	7		
Maximum number of HARQ transmissions		1	1	1	1	1	1		
Information Bit Payload per Sub-Frame									
For Sub-Frames 4,9	Bits	4392	12216	19848	42368	63776	84760		
For Sub-Frames 1,6	Bits	N/A	10680	17568	36696	55056	75376		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	9912	17568	42368	63776	84760		
Transport block CRC	Bits	24	24	24	24	24	24		
Number of Code Blocks per Sub-Frame									
(Note 4)									
For Sub-Frames 4,9		1	2	4	7	11	14		
For Sub-Frames 1,6		N/A	2	3	6	9	13		
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0		N/A	2	3	7	11	14		
Binary Channel Bits per Sub-Frame									
For Sub-Frames 4,9	Bits	5472	15120	25200	55200	82800	110400		
For Sub-Frames 1,6		N/A	13104	22224	45024	67824	90624		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	N/A	12336	22416	52416	80016	107616		
Max. Throughput averaged over 1 frame	kbps	878.4	5570.4	9240	20049.6	30144	40503.2		

- Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
- Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance.
- Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 5: As per Table 4.2-2 in TS 36.211 [4].

A.3.3 Reference measurement channels for PDSCH performance requirements (FDD)

A.3.3.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.3.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit	Value						
Reference channel		R.4	R.42	R.42-1	R.42-2	R.42-3	R.2	
		FDD	FDD	FDD	FDD	FDD	FDD	
Channel bandwidth	MHz	1.4	20	3	5	15	10	
Allocated resource blocks (Note 4)		6	100	15	25	75	50	
Allocated subframes per Radio Frame		9	9	9	9	9	9	
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3	
Information Bit Payload (Note 4)								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	8760	1320	2216	6712	4392	
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	
For Sub-Frame 0	Bits	152	8760	1064	1800	6712	4392	
Number of Code Blocks								
(Notes 3 and 4)								
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	1	1	2	1	
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A	
For Sub-Frame 0		1	2	1	1	2	1	
Binary Channel Bits (Note 4)								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	27600	3780	6300	20700	13800	
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	
For Sub-Frame 0	Bits	528	26760	2940	5460	19860	12960	
Max. Throughput averaged over 1 frame	Mbps	0.342	7.884	1.162	1.953	6.041	3.953	
(Note 4)								
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	≥ 1	

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 4: Given per component carrier per codeword.

Table A.3.3.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit			Value					
Reference channel				R.3-1 FDD	R.3 FDD				
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks				25	50				
Allocated subframes per Radio Frame				9	9				
Modulation				16QAM	16QAM				
Target Coding Rate				1/2	1/2				
Information Bit Payload									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits			6456	14112				
For Sub-Frame 5	Bits			N/A	N/A				
For Sub-Frame 0	Bits			5736	12960				
Number of Code Blocks per Sub-Frame (Note 3)									
For Sub-Frames 1,2,3,4,6,7,8,9				2	3				
For Sub-Frame 5				N/A	N/A				
For Sub-Frame 0				1	3				
Binary Channel Bits Per Sub-Frame									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits			12600	27600				
For Sub-Frame 5	Bits			N/A	N/A				
For Sub-Frame 0	Bits			10920	25920				
Max. Throughput averaged over 1 frame	Mbps			5.738	12.586				
UE Category				≥ 1	≥2				

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit			Va	lue		
Reference channel			R.5	R.6	R.7	R.8	R.9 FDD
			FDD	FDD	FDD	FDD	
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Allocated subframes per Radio Frame			9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		8504	14112	30576	46888	61664
For Sub-Frame 5	Bits		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits		6456	12576	28336	45352	61664
Number of Code Blocks per Sub-Frame							
(Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9			2	3	5	8	11
For Sub-Frame 5			N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0			2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		11340	18900	41400	62100	82800
For Sub-Frame 5	Bits		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits		8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	Mbps		7.449	12.547	27.294	42.046	55.498
UE Category	-		≥ 1	≥2	≥ 2	≥ 2	≥ 3

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.3.1-3a: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit			Va	lue		
Reference channel		R	.6-1	R.7-1	R.8-1	R.9-1	R.9-2
		F	-DD	FDD	FDD	FDD	FDD
Channel bandwidth	MHz		5	10	15	20	20
Allocated resource blocks (Note 3)			18	17	17	17	83
Allocated subframes per Radio Frame			9	9	9	9	9
Modulation		64	QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate			3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	10	0296	10296	10296	10296	51024
For Sub-Frame 5	Bits	1	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	8	248	10296	10296	10296	51024
Number of Code Blocks per Sub-Frame							
(Note 4)							
For Sub-Frames 1,2,3,4,6,7,8,9			2	2	2	2	9
For Sub-Frame 5		1	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0			2	2	2	2	9
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	10	3608	14076	14076	14076	68724
For Sub-Frame 5	Bits	1	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	1.	1088	14076	14076	14076	66204
Max. Throughput averaged over 1 frame	Mbps	9	.062	9.266	9.266	9.266	45.922
UE Category			≥ 1	≥ 1	≥1	≥ 1	≥ 2

- Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.
- Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 3: Localized allocation started from RB #0 is applied.
- Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.3.1-4: Fixed Reference Channel Single PRB (Channel Edge)

Parameter	Unit			Val	ue		
Reference channel			R.0 FDD		R.1 FDD		
Channel bandwidth	MHz	1.4	3	5	10/20	15	20
Allocated resource blocks			1		1		
Allocated subframes per Radio Frame			9		9		
Modulation			16QAM		16QAM		
Target Coding Rate			1/2		1/2		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		224		256		
For Sub-Frame 5	Bits		N/A		N/A		
For Sub-Frame 0	Bits		224		256		
Number of Code Blocks per Sub-Frame							
(Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9			1		1		
For Sub-Frame 5			N/A		N/A		
For Sub-Frame 0			1		1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		504		552		
For Sub-Frame 5	Bits		N/A		N/A		
For Sub-Frame 0	Bits		504		552		
Max. Throughput averaged over 1 frame	Mbps		0.202		0.230		
UE Category			≥ 1		≥ 1		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.3.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

	Parameter	Unit	Value			
Referenc	e channel	- Cinc	R.29 FDD			
1101010110	o chamici		(MBSFN)			
Channel	bandwidth	MHz	10			
Allocated	resource blocks		1			
MBSFN (Configuration (Note 4)		111111			
	I subframes per Radio Frame		3			
Modulatio			16QAM			
Target C	oding Rate		1/2			
Informati	on Bit Payload					
For Sub	-Frames 4,9	Bits	256			
For Sub	-Frame 5	Bits	N/A			
For Sub	-Frame 0	Bits	256			
For Sub	-Frame 1,2,3,6,7,8	Bits	0 (MBSFN)			
Number	of Code Blocks per Sub-Frame					
(Note 3)						
For Sub	-Frames 4,9		1			
For Sub	-Frame 5		N/A			
	-Frame 0		1			
	-Frame 1,2,3,6,7,8		0 (MBSFN)			
Binary Cl	hannel Bits Per Sub-Frame					
For Sub	-Frames 4,9	Bits	552			
For Sub	-Frame 5	Bits	N/A			
	-Frame 0	Bits	552			
	-Frame 1,2,3,6,7,8	Bits	0 (MBSFN)			
	oughput averaged over 1 frame	kbps	76.8			
UE Cate			≥ 1			
Note 1:	2 symbols allocated to PDCCH.					
Note 2: Reference signal, synchronization signals and PBCH						
	allocated as per TS 36.211 [4].					
Note 3:	If more than one Code Block is p					
	CRC sequence of L = 24 Bits is a	attached to	each Code			

CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation

Note 4:

Table A.3.3.1-6: Fixed Reference Channel QPSK R=1/10

Parameter	Unit	Value								
Reference channel					R.41					
					FDD					
Channel bandwidth	MHz	1.4	3	5	10	15	20			
Allocated resource blocks					50					
Allocated subframes per Radio Frame					9					
Modulation					QPSK					
Target Coding Rate					1/10					
Information Bit Payload										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits				1384					
For Sub-Frame 5	Bits				N/A					
For Sub-Frame 0	Bits				1384					
Number of Code Blocks per Sub-Frame										
(Note 3)										
For Sub-Frames 1,2,3,4,6,7,8,9					1					
For Sub-Frame 5					N/A					
For Sub-Frame 0					1					
Binary Channel Bits Per Sub-Frame										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits				13800					
For Sub-Frame 5	Bits				N/A					
For Sub-Frame 0	Bits				12960	•				
Max. Throughput averaged over 1 frame	Mbps				1.246					
UE Category					≥ 1					

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to

each Code Block (otherwise L = 0 Bit).

Table A.3.3.1-7: Fixed Reference Channel for CA demodulation with power imbalance

Parameter	Unit		Value	
Reference channel		R.49 FDD	R.49-1 FDD	R.49-2 FDD
Channel bandwidth	MHz	20	10	5
Allocated resource blocks		100	50	25
Allocated subframes per Radio Frame		9	9	9
Modulation		64QAM	64QAM	64QAM
Coding Rate				
For Sub-Frame 1,2,3,4,6,7,8,9,		0.84	0.84	0.84
For Sub-Frame 5		N/A	N/A	N/A
For Sub-Frame 0		0.87	0.87	0.86
Information Bit Payload				
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	63776	31704	15840
For Sub-Frame 5	Bits	N/A	N/A	N/A
For Sub-Frame 0		63776	30576	14112
Number of Code Blocks per Sub-Frame (Note 3)				
For Sub-Frames 0,1,2,3,4,6,7,8,9	Code	11	6	3
1 01 000 1 1011100 0, 1,2,0, 1,0,1,0,0	Blocks			Ü
For Sub-Frame 5	Code Blocks	N/A	N/A	N/A
Binary Channel Bits Per Sub-Frame			5	3
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	75600		
For Sub-Frame 5	Bits	N/A	37800	18900
For Sub-Frame 0	Bits	73080	N/A	N/A
Max. Throughput averaged over 1 frame	Mbps	57.398	35280	16380
UE Category		≥5	≥2	≥2

Note 1: 3 symbols allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.3.2 Multi-antenna transmission (Common Reference Symbols)

A.3.3.2.1 Two antenna ports

Table A.3.3.2.1-1: Fixed Reference Channel two antenna ports

Parameter	Unit						Va	lue					
Reference channel		R.10 FDD	R.11 FDD	R.11- 1 FDD	R.11- 2 FDD	R.11- 3 FDD Note 5	R.11- 4 FDD	R.30 FDD	R.30- 1 FDD	R.35- 1 FDD	R.35 FDD	R.35- 2 FDD	R.35- 3 FDD
Channel bandwidth	MHz	10	10	10	5	10	10	20	15	20	10	15	10
Allocated resource blocks (Note 4)		50	50	50	25	40	50	100	75	100	50	75	50
Allocated subframes per Radio Frame		9	9	9	9	9	9	9	8	8	9	8	8
Modulation		QPSK	16QA M	16QA M	16QA M	16QA M	QPSK	16QA M	16QA M	64QA M	64QA M	64QA M	64QA M
Target Coding Rate		1/3	1/2	1/2	1/2	1/2	1/2	1/2	1/2	0.39	1/2	0.39	0.39
Information Bit Payload (Note 4)													
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4392	12960	12960	5736	10296	6968	25456	19080	30576	19848	22920	15264
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	4392	12960	N/A	4968	10296	6968	25456	N/A	N/A	18336	N/A	N/A
Number of Code Blocks (Notes 3 and 4)													
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	3	3	1	2	2	5	4	5	4	4	3
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame	Bits	1	3	N/A	1	2	2	5	N/A	N/A	3	N/A	N/A
Binary Channel Bits (Note 4)													
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	13200	26400	26400	12000	21120	13200	52800	39600	79200	39600	59400	39600
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	12384	24768	N/A	10368	19488	12384	51168	N/A	N/A	37152	N/A	N/A
Max. Throughput averaged over 1 frame (Note 4)	Mbps	3.953	11.66 4	10.36 8	5.086	9.266	6.271	22.91 0	15.26 4	24.46 1	17.71 2	18.33 6	12.21 1
UE Category Note 1: 2 symbo		≥ 1	≥2	≥ 2	≥ 1	≥ 1	≥ 1	≥ 2	≥ 2	4	≥ 2	≥ 2	≥ 2

² symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and Note 1: 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.

Note 2:

Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block Note 3: (otherwise L = 0 Bit).

Note 4:

Given per component carrier per codeword. For R.11-3 resource blocks of RB6–RB45 are allocated. Note 5:

Table A.3.3.2.1-2: Fixed Reference Channel two antenna ports

Parameter	Unit						Value					
Reference channel		R.46	R.47	R.35-4	R.11-5	R.11-6	R.11-7	R.11-8	R.11-	R.11-	R.65	R.10-
		FDD	FDD	FDD	FDD	FDD	FDD	FDD	9 FDD	10	FDD	2 FDD
										FDD		
Channel bandwidth	MHz	10	10	10	1.4	3	15	10	10	10	10	5
Allocated resource blocks (Note 4)		50	50	50	6	15	75	50	50	50	50	25
Allocated number of PDCCH symbols		2	2	2	4	3	2	2	3	3	2	3
Allocated subframes per Radio Frame		9	9	9	9	9	9	9	8	8	9	9
Modulation		QPSK	16QA	64QA	16QA	16QA	16QA	QPSK	QPSK	QPSK	256QA	QPSK
			M	M	М	M	M				M	
Target Coding Rate				0.47	1/2	1/2	1/2	3/5	0.58	0.67	0. 55	1/3
Information Bit Payload (Note 4)												
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	5160	8760	18336	1352	3368	19080	7992	6968	7992	31704	1800
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
For Sub-Frame 0	Bits	5160	8760	16416	N/A	2664	19080	6968	N/A	N/A	N/A	1800
Number of Code Blocks												
(Notes 3 and 4)												
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	2	3	1	1	4	2	2	2	6	1
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
For Sub-Frame 0	Bits	1	2	3	1	1	4	2	N/A	N/A	N/A	1
Binary Channel Bits (Note 4)												
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	13200	26400	39600	2592	7200	39600	13200	12000	12000	57600	6000
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	n/a
For Sub-Frame 0	Bits	12384	24768	37152	N/A	5568	37968	12384	N/A	N/A	N/A	5184
Max. Throughput averaged over 1	Mbps	4.644	7.884	16.310	1.082	2.961	17.172	7.0904	5.5744	6.3936	25.363	1.620
frame (Note 4)	<u> </u>											
UE Category		≥ 1	≥ 1	≥ 2	≥ 1	≥ 1	≥ 2	≥ 2	≥ 1	≥ 1	11-12	≥ 1
UE DL Category		≥ 6	≥ 6	≥ 6	≥ 6	≥ 6	≥ 6	≥ 6			≥ 13	≥ 6

Note 1: Void

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 4: Given per component carrier per codeword.

Table A.3.3.2.1-3: Fixed Reference Channel two antenna ports

Parameter	Unit	Value		
Reference channel		R.62 FDD	R.63 FDD	
Channel bandwidth	MHz	10	10	
Allocated resource blocks (Note 4)		3	1	
Allocated DL subframes per 4 Radio Frames (Note 3)		15	15	
Modulation		16QAM	64QAM	
Target Coding Rate		1/2	1/2	
Information Bit Payload				
For Sub-Frames 0,1,2,3,4,5,6,7,8,9	Bits	744	408	
Number of Code Blocks				
For Sub-Frames 0,1,2,3,4,5,6,7,8,9	Code blocks	1	1	
Binary Channel Bits				
For Sub-Frames 0,1,2,3,4,5,6,7,8,9	Bits	1584	792	
Max. Throughput averaged over 4 frames	Mbps	0.279	0.153	
UE DL Category		0	0	

- Note 1: 2 symbols allocated to PDCCH
- Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]
- Note 3: The downlink subframes are scheduled at the 0th, 1st, 2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled
- downlink subframe is scheduled.

 Note 4: Allocated PRB positions start from {9, 10, ..., 9+N-1}, where N is the number of allocated resource blocks.

A.3.3.2.2 Four antenna ports

Table A.3.3.2.2-1: Fixed Reference Channel four antenna ports

Parameter	Unit						Value					
Reference channel		R.12	R.13	R.14	R.14-	R.14-	R.14-	R.36	R.14-	R.14-	R.14-	R.14-
		FDD	FDD	FDD	1	2	3	FDD	4	5	6	7
					FDD	FDD	FDD		FDD	FDD	FDD	FDD
Channel bandwidth	MHz	1.4	10	10	10	10	20	10	1.4	3	5	15
Allocated resource		6	50	50	6	3	100	50	6	15	25	75
blocks (Note 4)												
Allocated subframes		9	9	9	8	8	9	9	9	9	9	9
per Radio Frame												
Modulation		QPS	QPS	16Q	16QA	16QA	16QA	64Q	16QA	16QA	16QA	16QA
		K	K	AM	M	M	M	AM	М	M	M	М
Target Coding Rate		1/3	1/3	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Information Bit Payload												
(Note 4)												
For Sub-Frames	Bits	408	4392	1296	1544	744	[2545	1833	1192	3368	5736	19080
1,2,3,4,6,7,8,9				0			6]	6				
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	n/a	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	152	3624	1144	N/A	N/A	[2292	1833	N/A	2664	4968	19080
				8			0]	6				
Number of Code												
Blocks												
(Notes 3 and 4)				_				_				
For Sub-Frames		1	1	3	1	1	5	3	1	1	1	4
1,2,3,4,6,7,8,9							,					
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	n/a	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	1	2	N/A	N/A	4	3	N/A	1	1	4
Binary Channel Bits												
(Note 4)	D.:	4040	1000	0500	0070	4500	=1000	00.40	0.400	2222	44000	00400
For Sub-Frames	Bits	1248	1280	2560	3072	1536	51200	3840	2496	6960	11600	38400
1,2,3,4,6,7,8,9			0	0		2.1/2		0				
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	n/a	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	480	1203	2406	N/A	N/A	49664	3609	N/A	5424	10064	36864
NA TI I	N 41	0.04	2	4	4.005	0.505	100.05	6	0.05 /	0.004	5.000	47.47
Max. Throughput	Mbp	0.34	3.87	11.5	1.235	0.595	[22.65	16.5	0.954	2.961	5.086	17.17
averaged over 1 frame	S	2	6	13			6]	02				2
(Note 4)											-	
UE Category	L	≥ 1	≥1	≥ 2	≥ 1	≥ 1	≥ 2	≥ 2	≥ 1	≥ 1	≥ 1	≥2

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.

A.3.3.3 Reference Measurement Channel for UE-Specific Reference Symbols

A.3.3.3.0 Two antenna ports (no CSI-RS)

The reference measurement channels in Table A.3.3.3.0-1 apply with two CRS antenna ports and without CSI-RS.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 4: Given per component carrier per codeword.

Table A.3.3.3.0-1: Fixed Reference Channel without CSI-RS

Parameter	Unit		Value
Reference channel		R.70 FDD	R.71 FDD
Channel bandwidth	MHz	10	10
Allocated resource blocks		50	50
Allocated subframes per Radio		10	10
Frame			
Modulation		QPSK	16QAM
Target Coding Rate		0.65	0.6
Information Bit Payload			
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	6968	12960
For Sub-Frame 5	Bits	N/A	N/A
For Sub-Frame 0	Bits	N/A	N/A
Number of Code Blocks per Sub-			
Frame			
(Note 4)			
For Sub-Frames 1,2,3,4,6,7,8,9		2	3
For Sub-Frame 5		N/A	N/A
For Sub-Frame 0		N/A	N/A
Binary Channel Bits Per Sub-			
Frame			
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	10800	21600
For Sub-Frame 5	Bits	N/A	N/A
For Sub-Frame 0	Bits	N/A	N/A
Max. Throughput averaged over 1	Mbps	5.5744	10.368
frame			
UE Category		≥ 1	≥ 2
Note 1: 3 symbols allocated to PD	CCH		

Note 1: 3 symbols allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

A.3.3.3.1 Two antenna port (CSI-RS)

The reference measurement channels in Table A.3.3.3.1-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports.

Table A.3.3.3.1-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

Reference channel Channel bandwidth	MHz	R.51 FDD 10
	MHz	10
Allocated resource blocks		50 (Note 3)
Allocated subframes per Radio Frame		9
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 1,4,6,9	Bits	11448
For Sub-Frames 2,3,7,8	Bits	11448
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	9528
Number of Code Blocks (Note 4)		
For Sub-Frames 1,4,6,9	Code	2
l k	blocks	
For Sub-Frames 2,3,7,8	Code	2
l t	blocks	
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	2
Binary Channel Bits		
For Sub-Frames 1,4,6,9	Bits	24000
For Sub-Frames 2,7		23600
For Sub-Frames 3,8		23200
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	19680
Max. Throughput averaged over 1	Mbps	10.1112
frame		
UE Category		≥ 2
Note 1: 2 symbols allocated to PDCCH.		
Note 2: Reference signal, synchronization	n signal	s and PBCH
allocated as per TS 36.211 [4].	Charles &	

Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0-RB20 and

RB30–RB49) are allocated in sub-frame 0.

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code

Block (otherwise L = 0 Bit).

The reference measurement channels in Table A3.3.3.1-2 apply for verifying demudlation performance for UE-specific reference symbols with two cell specific antenna ports and two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS in same subframe.

Table A.3.3.3.1-2: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

Parameter	Unit		Value	
Reference channel		R.52 FDD	R.53 FDD	R.54 FDD
Channel bandwidth	MHz	10	10	10
Allocated resource blocks		50 (Note 3)	50 (Note 3)	50 (Note 3)
Allocated subframes per Radio Frame		9	9	9
Modulation		64QAM	64QAM	16QAM
Target Coding Rate		1/2	1/2	1/2
Information Bit Payload				
For Sub-Frames 1,3,4,6,8,9	Bits	18336	18336	11448
For Sub-Frames 2,7	Bits	16416	16416	11448
For Sub-Frame 5	Bits	n/a	n/a	n/a
For Sub-Frame 0	Bits	14688	14688	9528
Number of Code Blocks (Note 4)				
For Sub-Frames 1,3,4,6,8,9	Code	3	3	2
	blocks			
For Sub-Frames 2, 7	Code	3	3	2
	blocks			
For Sub-Frame 5	Bits	n/a	n/a	n/a
For Sub-Frame 0	Bits	3	3	2
Binary Channel Bits				
For Sub-Frames 1,3,4,6,8,9	Bits	36000	36000	24000
For Sub-Frames 2,7		34200	33600	22800
For Sub-Frame 5	Bits	n/a	n/a	n/a
For Sub-Frame 0	Bits	29520	29520	19680
Max. Throughput averaged over 1	Mbps	15.7536	15.7536	10.1112
frame				

Note 1: 2 symbols allocated to PDCCH.

A.3.3.3.2 Four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.3.3.2-1 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.3.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

Parameter	Unit		Val	ue	
Reference channel		R.43 FDD	R.50 FDD	R.48 FDD	R.66 FDD
Channel bandwidth	MHz	10	10	10	10
Allocated resource blocks		50 (Note 3)	50 (Note 3)	50 (Note	50 (Note
				3)	3)
Allocated subframes per Radio Frame		9	9	9	9
Modulation		QPSK	64QAM	QPSK	256QAM
Target Coding Rate		1/3	1/2		0.77
Information Bit Payload					
For Sub-Frames 1,4,6,9	Bits	3624	18336	6200	36696
For Sub-Frames 2,3,7,8	Bits	3624	16416	6200	35160
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	2984	14688	4968	30576
Number of Code Blocks (Note 4)					
For Sub-Frames 1,4,6,9	Code	1	3	2	6
	blocks				
For Sub-Frames 2,3,7,8	Code	1	3	2	6
	blocks				
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	1	3	1	5
Binary Channel Bits					
For Sub-Frames 1,4,6,9	Bits	12000	36000	12000	48000
For Sub-Frames 2,7		11600	34800	11600	46400
For Sub-Frames 3,8		11600	34800	12000	46400
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	9840	29520	9840	39360
Max. Throughput averaged over 1	Mbps	3.1976	15.3696	5.4568	31.800
frame					
UE Category		≥ 1	≥ 2	≥ 1	11-12
UE DL Category		≥ 6	≥ 6	≥ 6	≥ 13

Note 1: 2 symbols allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks

(RB0-RB20 and RB30-RB49) are allocated in sub-frame 0.

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached

to each Code Block (otherwise $\dot{L} = 0$ Bit).

The reference measurement channels in Table A.3.3.3.2-2 apply for verifying FDD PMI accuracy measurement with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-2: Fixed Reference Channel for four antenna ports (CSI-RS)

Parameter	Unit		Value)	
Reference channel		R.44	R.45	R.45-1	R.60
		FDD	FDD	FDD	FDD
Channel bandwidth	MHz	10	10	10	10
Allocated resource blocks		50 ³	50 ³	39	50 ³
Allocated subframes per Radio Frame		10	10	10	10
Modulation		QPSK	16QAM	16QAM	QPSK
Target Coding Rate		1/3	1/2	1/2	1/2
Information Bit Payload					
For Sub-Frames (Non CSI-RS subframe)	Bits	3624	11448	8760	6200
For Sub-Frames (CSI-RS subframe)	Bits	3624	11448	8760	6200
For Sub-Frames (ZeroPowerCSI-RS	Bits	N/A	N/A	N/A	N/A
subframe)					
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	2984	9528	8760	N/A
Number of Code Blocks per Sub-Frame					
(Note 4)					
For Sub-Frames (Non CSI-RS subframe)		1	2	2	2
For Sub-Frames (CSI-RS subframe)		1	2	2	2
For Sub-Frames (ZeroPowerCSI-RS	Bits	N/A	N/A	N/A	N/A
subframe)					
For Sub-Frame 5		N/A	N/A	N/A	N/A
For Sub-Frame 0		1	2	2	N/A
Binary Channel Bits Per Sub-Frame					
For Sub-Frames (Non CSI-RS subframe)	Bits	12000	24000	18720	12000
For Sub-Frames (CSI-RS subframe)	Bits	11600	23200	18096	11600
For Sub-Frames (ZeroPowerCSI-RS	Bits	N/A	N/A	N/A	N/A
subframe)					
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	9840	19680	18720	N/A
Max. Throughput averaged over 1 frame	Mbps	3.1976	10.1112	7.884	4.96
UE Category		≥ 1	≥ 2	≥ 1	≥ 1

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]

Note 3: For R.44, R.45 and R.60, 50 resource blocks are allocated in sub-frames 1,2,3,4,6,7,8,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. For R.45-1, 39 resource blocks are allocated in all subframes (RB0–RB20 and RB30–RB47).

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

The reference measurement channels in Table A.3.3.3.2-3 apply for verifying demodulation performance for UE-specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-3: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

	Parameter	Unit	Value					
Reference	ce channel		R.64					
			FDD					
Channel	bandwidth	MHz	10					
Allocated	I resource blocks (Note 4)		6					
Allocated	l subframes per 4 Radio Frames		15					
Modulation			QPSK					
Target C	oding Rate		1/3					
Informati	on Bit Payload							
For Sub	o-Frames 0,1,4,5,6,9 (Note 3)	Bits	504					
For Sub	o-Frames 2,3,7,8 (Note 3)	Bits	504					
Number	of Code Blocks							
For Sub	o-Frames 0,1,4,5,6,9	Code	1					
		blocks						
For Sub	o-Frames 2,3,7,8	Code	1					
		blocks						
	hannel Bits							
	o-Frames 0,1,4,5,6,9	Bits	1440					
For Sub	o-Frames 2,3,7,8	Bits	1392					
Max. Thr	oughput averaged over 4 frames	Mbps	0.189					
UE DL C			0					
Note 1:	2 symbols allocated to PDCCH.							
Note 2:	Note 2: Reference signal, synchronization signals and PBCH							
	allocated as per TS 36.211 [4].							
Note 3:	The downlink subframes are scheduled at the 0th, 1st,							
	2nd, 8th, 9th, 10th, 16th, 17th, 18th, 24th, 25th, 26th,							
	32nd, 33rd, 34th subframes every 40ms. Information bit							
	payload is avaialbe if downlink subframe is scheduled.							
Note 4:	te 4: Allocated PRB positions start from {9, 10,, 9+N-1},							
	where N is the number of allocated resource blocks.							

The reference measurement channels in Table A.3.3.3.2-4 apply with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.3.3.2-4: Fixed Reference Channel for four antenna ports (CSI-RS)

Parameter	Unit	Value
Reference channel		R.69 FDD
Channel bandwidth	MHz	10
Allocated resource blocks		50
Allocated subframes per Radio Frame		10
Modulation		QPSK
Target Coding Rate		
For Sub-Frames 2,3,4,6,7,8,9		0.74
For Sub-Frame 1		0.8
Information Bit Payload		
For Sub-Frames 2,3,4,6,7,8,9	Bits	7992
For Sub-Frame 1	Bits	7992
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	N/A
Number of Code Blocks per Sub-Frame		
(Note 4)		
For Sub-Frames 2,3,4,6,7,8,9		2
For Sub-Frame 1		2
For Sub-Frame 5		N/A
For Sub-Frame 0		N/A
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 2,3,4,6,7,8,9	Bits	10800
For Sub-Frame 1	Bits	10000
2 For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	N/A
Max. Throughput averaged over 1 frame	Mbps	6.3936
UE Category		≥ 1
N		

3 symbols allocated to PDCCH. Note 1:

Note 2:

Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 3:

A.3.4 Reference measurement channels for PDSCH performance requirements (TDD)

A.3.4.1 Single-antenna transmission (Common Reference Symbols)

Table A.3.4.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit	Value						
Reference channel		R.4	R.42	R.2A	R.2	R.42-1	R.42-2	R.42-3
		TDD	TDD	TDD	TDD	TDD	TDD	TDD
Channel bandwidth	MHz	1.4	20	10	10	3	5	15
Allocated resource blocks (Note 6)		6	100	50	50	15	25	75
Uplink-Downlink Configuration (Note 4)		1	1	2	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3	3+2	5+2	3+2	3+2	3+2	3+2
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3
Information Bit Payload (Note 6)								
For Sub-Frames 4,9	Bits	408	8760	4392	4392	1320	2216	6712
For Sub-Frames 1,6	Bits	N/A	7736	3240	3240	1128	1864	5992
For Sub-Frames 3,8	Bits	N/A	N/A	4392	N/A	N/A	N/A	N/A
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	208	8760	4392	4392	1064	1800	6712
Number of Code Blocks								
(Notes 5 and 6)								
For Sub-Frames 4,9		1	2	1	1	1	1	2
For Sub-Frames 1,6		N/A	2	1	1	1	1	1
For Sub-Frames 3,8		N/A	N/A	1	N/A	N/A	N/A	N/A
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	2	1	1	1	1	2
Binary Channel Bits (Note 6)								
For Sub-Frames 4,9	Bits	1368	27600	13800	13800	3780	6300	20700
For Sub-Frames 1,6	Bits	N/A	22656	11256	11256	3276	5556	16956
For Sub-Frames 3,8		N/A	N/A	13800	N/A	N/A	N/A	N/A
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	672	26904	13104	13104	3084	5604	20004
Max. Throughput averaged over 1 frame	Mbps	0.102	4.175	2.844	1.966	0.596	0.996	3.212
(Note 6)								
UE Category		≥ 1	≥1	≥ 1	≥ 1	≥1	≥ 1	≥1

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.

Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 4: As per Table 4.2-2 in TS 36.211 [4].

Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 6: Given per component carrier per codeword.

Table A.3.4.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel				R.3-1	R.3		
				TDD	TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	50		
Uplink-Downlink Configuration (Note 3)				1	1		
Allocated subframes per Radio Frame (D+S)				3+2	3+2		
Modulation				16QAM	16QAM		
Target Coding Rate				1/2	1/2		
Information Bit Payload							
For Sub-Frames 4,9	Bits			6456	14112		
For Sub-Frames 1,6	Bits			5160	11448		
For Sub-Frame 5	Bits			N/A	N/A		
For Sub-Frame 0	Bits			5736	12960		
Number of Code Blocks per Sub-Frame							
(Note 4)							
For Sub-Frames 4,9				2	3		
For Sub-Frames 1,6				1	2		
For Sub-Frame 5				N/A	N/A		
For Sub-Frame 0				1	3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits			12600	27600		
For Sub-Frames 1,6	Bits			11112	22512		
For Sub-Frame 5	Bits			N/A	N/A		
For Sub-Frame 0	Bits			11208	26208		
Max. Throughput averaged over 1 frame	Mbps			2.897	6.408		
UE Category				≥ 1	≥ 2		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]

Note 3: As per Table 4.2-2 in TS 36.211 [4].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.4.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			R.5	R.6 TDD	R.7	R.8	R.9
			TDD		TDD	TDD	TDD
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Uplink-Downlink Configuration (Note 3)			1	1	1	1	1
Allocated subframes per Radio Frame (D+S)			3+2	3+2	3+2	3+2	3+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate			3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 4,9	Bits		8504	14112	30576	46888	61664
For Sub-Frames 1,6	Bits		6968	11448	23688	35160	46888
For Sub-Frame 5	Bits		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits		6968	12576	30576	45352	61664
Number of Code Blocks per Sub-Frame							
(Note 4)							
For Sub-Frames 4,9			2	3	5	8	11
For Sub-Frames 1,6			2	2	4	6	8
For Sub-Frame 5			N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0			2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		11340	18900	41400	62100	82800
For Sub-Frames 1,6	Bits		9828	16668	33768	50868	67968
For Sub-Frame 5	Bits		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits		9252	16812	39312	60012	80712
Max. Throughput averaged over 1 frame	Mbps		3.791	6.370	13.910	20.945	27.877
UE Category			≥1	≥ 2	≥2	≥ 2	≥ 3

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]

Note 3: As per Table 4.2-2 TS 36.211 [4].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.4.1-3a: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit		Val	ue		
Reference channel		R.6-1	R.7-1	R.8-1	R.9-1	R.9-2
		TDD	TDD	TDD	TDD	TDD
Channel bandwidth	MHz	5	10	15	20	20
Allocated resource blocks (Note 3)		18	17	17	17	83
Uplink-Downlink Configuration (Note 4)		1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2	3+2	3+2	3+2
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4
Information Bit Payload						
For Sub-Frames 4,9	Bits	10296	10296	10296	10296	51024
For Sub-Frames 1,6	Bits	8248	7480	7480	7480	39232
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	8248	10296	10296	10296	51024
Number of Code Blocks per Sub-Frame						
(Note 5)						
For Sub-Frames 4,9		2	2	2	2	9
For Sub-Frames 1,6		2	2	2	2	7
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		2	2	2	2	9
Binary Channel Bits Per Sub-Frame						
For Sub-Frames 4,9	Bits	13608	14076	14076	14076	68724
For Sub-Frames 1,6	Bits	11880	11628	11628	11628	56340
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	11520	14076	14076	14076	66636
Max. Throughput averaged over 1 frame	Mbps	4.534	4.585	4.585	4.585	23.154
UE Category		≥ 1	≥ 1	≥1	≥ 1	≥ 2

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]

Note 3: Localized allocation started from RB #0 is applied.

Note 4: As per Table 4.2-2 TS 36.211 [4].

Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.4.1-4: Fixed Reference Channel Single PRB

Parameter	Unit Value									
Reference channel			R.0		R.1 TDD					
			TDD							
Channel bandwidth	MHz	1.4	3	5	10/20	15	20			
Allocated resource blocks			1		1					
Uplink-Downlink Configuration (Note 3)			1		1					
Allocated subframes per Radio Frame (D+S)			3+2		3+2					
Modulation			16QAM		16QAM					
Target Coding Rate			1/2		1/2					
Information Bit Payload										
For Sub-Frames 4,9	Bits		224		256					
For Sub-Frames 1,6	Bits		208		208					
For Sub-Frame 5	Bits		N/A		N/A					
For Sub-Frame 0	Bits		224		256					
Number of Code Blocks per Sub-Frame										
(Note 4)										
For Sub-Frames 4,9			1		1					
For Sub-Frames 1,6			1		1					
For Sub-Frame 5			N/A		N/A					
For Sub-Frame 0			1		1					
Binary Channel Bits Per Sub-Frame										
For Sub-Frames 4,9	Bits		504		552					
For Sub-Frames 1,6	Bits		456		456					
For Sub-Frame 5	Bits		N/A		N/A					
For Sub-Frame 0	Bits		504		552					
Max. Throughput averaged over 1 frame	Mbps		0.109		0.118					
UE Category			≥ 1		≥ 1					

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]

Note 3: As per Table 4.2-2 in TS 36.211 [4].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.4.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

Parameter	Unit	Value
Reference channel		R.29 TDD
		(MBSFN)
Channel bandwidth	MHz	10
Allocated resource blocks		1
MBSFN Configuration (Note 5)		010010
Uplink-Downlink Configuration (Note 3)		1
Allocated subframes per Radio Frame (D+S)		1+2
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	208
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	256
Number of Code Blocks per Sub-Frame		
(Note 4)		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	1
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	1
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	456
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	552
Max. Throughput averaged over 1 frame	kbps	67.2
UE Category		≥ 1
Note 1: 2 symbols allocated to PDCCH		•

Note 1: 2 symbols allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

as per Table 4.2-2 in TS 36.211 [4]. Note 3:

If more than one Code Block is present, an additional CRC Note 4:

sequence of L = 24 Bits is attached to each Code Block (otherwise

L = 0 Bit).

MBSFN Subframe Allocation as defined in [7], one frame with 6 bits is chosen for MBSFN subframe allocation Note 5:

Table A.3.4.1-6: Fixed Reference Channel QPSK R=1/10

Parameter	Unit	Value									
Reference channel					R.41 TDD						
Channel bandwidth	MHz	1.4	3	5	10	15	20				
Allocated resource blocks					50						
Uplink-Downlink Configuration (Note 4)					1						
Allocated subframes per Radio Frame (D+S)					3+2						
Modulation					QPSK						
Target Coding Rate					1/10						
Information Bit Payload											
For Sub-Frames 4,9	Bits				1384						
For Sub-Frames 1,6	Bits				1032						
For Sub-Frame 5	Bits				N/A						
For Sub-Frame 0	Bits				1384						
Number of Code Blocks per Sub-Frame (Note 5)											
For Sub-Frames 4,9					1						
For Sub-Frames 1,6					1						
For Sub-Frame 5					N/A						
For Sub-Frame 0					1						
Binary Channel Bits Per Sub-Frame											
For Sub-Frames 4,9	Bits				13800						
For Sub-Frames 1,6	Bits				11256						
For Sub-Frame 5	Bits				N/A						
For Sub-Frame 0	Bits				13104						
Max. Throughput averaged over 1 frame	Mbps				0.622						
UE Category					≥ 1						

- 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated Note 1: to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
- Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.
- Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3:
- Note 4:
- As per Table 4.2-2 in TS 36.211 [4].

 If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to Note 5: each Code Block (otherwise L = 0 Bit).

Table A.3.4.1-7: Fixed Reference Channel for CA demodulation with power imbalance

Parameter	Unit	Val	ue
Reference channel		R.49 TDD	R.49-1 TDD
Channel bandwidth	MHz	20	15
Allocated resource blocks		100	75
Uplink-Downlink Configuration (Note 1)		1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2
Modulation		64QAM	64QAM
Number of OFDM symbols for PDCCH per component carrier			
For Sub-Frames 0,4,5,9	OFDM symbols	3	3
For Sub-Frames 1,6	OFDM symbols	2	2
Target Coding Rate			
For Sub-Frames 4,9		0.84	0.83
For Sub-Frames 1,6		0.81	0.80
For Sub-Frames 5		N/A	N/A
For Sub-Frames 0		0.87	0.86
Information Bit Payload			
For Sub-Frames 0, 4, 9	Bits	63776	46888
For Sub-Frame 1,6	Bits	55056	40576
For Sub-Frame 5	Bits	N/A	N/A
Number of Code Blocks per Sub-Frame (Note 2)			
For Sub-Frames 0, 4, 9	Code Blocks	11	8
For Sub-Frame 1,6	Code Blocks	9	7
For Sub-Frame 5	Code Blocks	N/A	N/A
Binary Channel Bits Per Sub-Frame			
For Sub-Frames 4,9	Bits	75600	56700
For Sub-Frame 1,6	Bits	67968	50868
For Sub-Frame 5	Bits	N/A	N/A
For Sub-Frame 0	Bits	73512	54612
Max. Throughput averaged over 1 frame	Mbps	30.144	22.182
UE Category		≥5	≥ 3

Note 1: Reference signal, synchronization signals and PBC allocated as per TS 36.211 [4].

Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.4.2 Multi-antenna transmission (Common Reference Signals)

A.3.4.2.1 Two antenna ports

Table A.3.4.2.1-1: Fixed Reference Channel two antenna ports

Parameter			Uı	nit					Va	lue
Reference channel		R.10 TDD	R.11 TDD	R.11-1 TDD	R.11-2 TDD	R.11-3 TDD Note 6	R.11-4 TDD	R.30 TDD	R.30-1 TDD	R.30-2 TDD
Channel bandwidth	MHz	10	10	10	5	10	10	20	20	20
Allocated resource blocks (Note 5)		50	50	50	25	40	50	100	100	100
Uplink-Downlink Configuration (Note 3)		1	1	1	1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2	2+2	3+2	3+2	2	3+2	2+2	2
Modulation		QPSK	16QAM	16QAM	16QAM	16QAM	QPSK	16QAM	16QAM	16QAM
Target Coding Rate		1/3	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Information Bit Payload (Note 5)										
For Sub-Frames 4,9	Bits	4392	12960	12960	5736	10296	6968	25456	25456	25456
For Sub-Frames 1,6		3240	9528	9528	5160	9144	N/A	22920	21384	N/A
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	4392	12960	N/A	4968	10296	N/A	25456	N/A	N/A
Number of Code Blocks (Notes 4 and 5)										
For Sub-Frames 4,9		1	3	3	1	2	2	5	5	5
For Sub-Frames 1,6		1	2	2	1	2	N/A	4	4	N/A
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	3	N/A	1	2	N/A	5	N/A	N/A
Binary Channel Bits (Note 5)										
For Sub-Frames 4,9	Bits	13200	26400	26400	12000	21120	13200	52800	52800	52800
For Sub-Frames 1,6		10656	21312	21312	10512	16992	10656	42912	42912	N/A
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	12528	25056	N/A	10656	19776	12528	51456	N/A	N/A
Max. Throughput averaged over 1 frame (Note 5)	Mbps	1.966	5.794	4.498	2.676	4.918	1.39	12.221	9.368	5.091
UE Category		≥ 1	≥ 2	≥2	≥ 1	≥ 1	≥ 1	≥ 2	≥2	3
Mata 4. O accessor also al		DDOOLL4-		1 - N 41 1	-1.40 MILL		/. O l	1114	Lt- DDOOL	

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz a symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: As per Table 4.2-2 in TS 36.211 [4].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (other

Note 5: Given per component carrier per codeword.

Note 6: For R.11-3 resource blocks of RB6-RB45 are allocated.

Table A.3.4.2.1-2: Fixed Reference Channel two antenna ports

Parameter	Unit						Value					
Reference channel		R.46 TDD	R.47 TDD	R.35-2	R.11-5	R.11-6	R.11-7	R.11-8	R.11-9	R.11-10	R.11-11	R.11-12
				TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD	TDD
Channel bandwidth	MHz	10	10	10	1.4	3	5	10	15	10	10	10
Allocated resource blocks (Note		50	50	50	6	15	25	50	75	50	50	50
5)												
Uplink-Downlink Configuration (Note 3)		1	1	1	1	1	1	1	1	1	1	1
Allocated number of PDCCH		2	2	2	4	3	3	2	2	2	3	3
symbols in normal subframes			_		7	<u> </u>	J		_	_	<u> </u>	
Allocated number of PDCCH		2	2	2	2	2	2	2	2	2	2	2
symbols in special subframes		3+2	3+2	2+2	2+2	2+2	2+2	2+2	2+2	3+2	2+2	2+2
Allocated subframes per Radio Frame (D+S)		3+2	3+2	2+2	2+2	2+2	2+2	2+2	2+2	3+2	2+2	2+2
Modulation		QPSK	16QAM	64QAM	16QAM	16QAM	16QAM	16QAM	16QAM	QPSK	QPSK	QPSK
Target Coding Rate		Q. O.	100,	0.47	1/2	1/2	1/2	1/2	1/2	3/5		
For Sub-Frames 4,9				0.11	.,,_	.,,_	.,,_	.,_	1,2	0,0	0.58	0.66
For Sub-Frames 1,6											0.48	0.54
Information Bit Payload (Note 5)												
For Sub-Frames 4,9	Bits	5160	8760	18336	1352	3368	5736	12960	19080	7992	6968	7992
For Sub-Frames 1,6		3880	7480	14688	1128	3112	5160	10680	15840	5736	5160	5736
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	5160	8760	N/A	N/A	N/A	N/A	N/A	N/A	7992	N/A	N/A
Number of Code Blocks												
(Notes 4 and 5)												
For Sub-Frames 4,9		1	2	3	1	1	1	3	4	2	2	2
For Sub-Frames 1,6		1	2	3	1	1	1	2	3	1	1	1
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	2	N/A	N/A	N/A	N/A	N/A	N/A	2	N/A	N/A
Binary Channel Bits (Note 5)												
For Sub-Frames 4,9	Bits	13200	26400	39600	2592	7200	12000	26400	39600	13200	12000	12000
For Sub-Frames 1,6		10656	21312	31968	2304	6192	10512	21312	32112	10656	10656	10656
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	12528	25056	N/A	N/A	N/A	N/A	N/A	N/A	12528	N/A	N/A
Max. Throughput averaged over 1 frame (Note 5)	Mbps	2.324	4.124	6.604	0.496	1.296	2.179	4.498	6.984	3.5448	2.4256	2.7456
UE Category		≥ 1	≥ 1	≥ 2	≥ 1	≥ 1	≥ 1	≥ 2	≥ 2	≥ 2	≥ 1	≥ 1

Note 1: Void

Note 2:

Note 3:

Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
As per Table 4.2-2 in TS 36.211 [4].
If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). Note 4:

Given per component carrier per codeword Note 5:

Table A.3.4.2.1-3: Fixed Reference Channel two antenna ports

Parameter	Unit	Va	lue
Reference channel		R.62 TDD	R.63 TDD
Channel bandwidth	MHz	10	10
Allocated resource blocks (Note 4)		3	1
Uplink-Downlink Configuration (Note 3)		1	1
Allocated subframes per Radio Frame		4+2	4+2
(D+S) Modulation		16QAM	64QAM
Target Coding Rate		1/2	1/2
Information Bit Payload		1/2	1/2
For Sub-Frames 0,4,5,9	Bits	744	408
For Sub-Frames 1,6	Bits	440	280
Number of Code Blocks		-	
For Sub-Frames 0,4,5,9	Code blocks	1	1
For Sub-Frames 1,6	Clode blocls	1	1
Binary Channel Bits			
For Sub-Frames 0,4,5,9	Bits	1584	792
For Sub-Frames 1,6		1296	648
Max. Throughput averaged over 1 frame	Mbps	0.3856	0.2192
UE DL Category		0	0

Note 1:

2 symbols allocated to PDCCH.
Reference signal, synchronization signals and PBCH allocated as per Note 2: TS 36.211 [4].

Note 3:

As per Table 4.2-2 in TS 36.211 [4]. Allocated PRB positions start from {9, 10, ..., 9+N-1}, where N is the number of allocated resource blocks. Note 4:

Table A.3.4.2.1-4: Fixed Reference Channel two antenna ports

	Parameter	Unit	Va	lue					
Reference	ce channel		R.65 TDD						
Channel	bandwidth	MHz	20						
Allocated	resource blocks (Note 5)		100						
Uplink-D	ownlink Configuration (Note 3)		1						
Allocated	d subframes per Radio Frame		2+2						
(D+S)	•								
Modulati	on		256QAM						
Target C	oding Rate								
	on Bit Payload (Note 5)								
	o-Frames 4,9	Bits	63776						
For Sub	o-Frames 1,6		46888						
For Sub	o-Frame 5	Bits	N/A						
For Sub	o-Frame 0	Bits	N/A						
Number	of Code Blocks								
(Notes 4	and 5)								
For Sub	o-Frames 4,9		11						
For Sub	o-Frames 1,6		9						
For Sub	o-Frame 5		N/A						
For Sub	o-Frame 0		N/A						
Binary C	hannel Bits (Note 5)								
For Sub	o-Frames 4,9	Bits	115200						
For Sub	o-Frames 1,6		95424						
For Sub	o-Frame 5	Bits	N/A						
For Sub	o-Frame 0	Bits	N/A						
Max. Thr	oughput averaged over 1 frame	Mbps	22.133						
(Note 5)									
UE Cate	gory		11-12						
UE DL C			≥ 13						
Note 1:	2 symbols allocated to PDCCH for channel BW; 3 symbols allocated to symbols allocated to PDCCH for 1 OFDM symbols are allocated to PI channel 1 symbol is allocated.	o PDCCH 1 .4 MHz. Fo DCCH. For	or 5 MHz and r subframe 1& 256QAM refer	3 MHz; 4 6, only 2 ence					
Note 2:	Reference signal, synchronization TS 36.211 [4].		I PBCH allocat	ted as per					
Note 3: As per Table 4.2-2 in TS 36.211 [4].									
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).									
Note 5:	Given per component carrier per co	odeword							

Table A.3.4.2.1-5: Fixed Reference Channel two antenna ports when *EIMTA-MainConfigServCell-r12* is configured

Parameter	Unit	Value							
Reference channel		R.67 TDD							
Channel bandwidth	MHz	10							
Allocated resource blocks (Note 5)		50							
Modulation		16QAM							
Target Coding Rate		0.4							
Dynamic Uplink-Downlink Configuration (Note 3)		0	1	2	3	4	5	6	
Allocated subframes per Radio Frame (D+S)		1+2	3+2	5+2	5+1	6+1	7+1	2+2	
Information Bit Payload (Note 5)									
For Sub-Frame 0	Bits	9912	9912	9912	9912	9912	9912	9912	
For Sub-Frame 1	Bits	7480	7480	7480	7480	7480	7480	7480	
For Sub-Frame 2	Bits	NA	NA	NA	NA	NA	NA	NA	
For Sub-Frame 3	Bits	NA	NA	9912	NA	NA	9912	NA	
For Sub-Frame 4	Bits	NA	9912	9912	NA	9912	9912	NA	
For Sub-Frame 5	Bits	NA	NA	NA	NA	NA	NA	NA	
For Sub-Frame 6	Bits	7480	7480	7480	9912	9912	9912	7480	
For Sub-Frame 7	Bits	NA	NA	NA	9912	9912	9912	NA	
For Sub-Frame 8	Bits	NA	NA	9912	9912	9912	9912	NA	
For Sub-Frame 9	Bits	NA	9912	9912	9912	9912	9912	9912	

Number of Code Blocks (Notes 4 and 5)								
For Sub-Frame 0		2	2	2	2	2	2	2
For Sub-Frame 1		2	2	2	2	2	2	2
For Sub-Frame 2		NA	NA	NA	NA	NA	NA	NA
For Sub-Frame 3	1	NA	NA	2	NA	NA	2	NA
For Sub-Frame 4		NA	2	2	NA	2	2	NA
For Sub-Frame 5		NA	NA	NA	NA	NA	NA	NA
For Sub-Frame 6		2	2	2	2	2	2	2
For Sub-Frame 7		NA	NA	NA	2	2	2	NA
For Sub-Frame 8		NA	NA	2	2	2	2	NA
For Sub-Frame 9		NA	2	2	2	2	2	2
Binary Channel Bits (Note 5)								
For Sub-Frame 0	Bits	25056	25056	25056	25056	25056	25056	25056
For Sub-Frame 1	Bits	21312	21312	21312	21312	21312	21312	21312
For Sub-Frame 2	Bits	NA	NA	NA	NA	NA	NA	NA
For Sub-Frame 3	Bits	NA	NA	26400	NA	NA	26400	NA
For Sub-Frame 4	Bits	NA	26400	26400	NA	26400	26400	NA
For Sub-Frame 5	Bits	NA	NA	NA	NA	NA	NA	NA
For Sub-Frame 6	Bits	21312	21312	21312	26112	26112	26112	21312
For Sub-Frame 7	Bits	NA	NA	NA	26400	26400	26400	NA
For Sub-Frame 8	Bits	NA	NA	26400	26400	26400	26400	NA
For Sub-Frame 9	Bits	NA	26400	26400	26400	26400	26400	26400
Max. Throughput averaged over 1 frame (Note 5)	Mbps	2.49	4.47	6.45	5.70	6.70	7.69	3.48
Max. Throughput averaged over 1 frame and	Mbps				5.28			
over all dynamic UL-DL configurations (Note 5)					5.20			
UE Category					≥ 1			

Note 1:

Note 2:

Note 3:

2 OFDM symbols are allocated to PDCCH in all subframes
Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
As per Table 4.2-2 in TS 36.211 [4].
If more code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Note 4: Block (otherwise L = 0 Bit).

Note 5: Given per component carrier per codeword.

A.3.4.2.2 Four antenna ports

Table A.3.4.2.2-1: Fixed Reference Channel four antenna ports

Reference channel	Parameter	Unit						1	/alue					
Channel bandwidth	Reference channel		R.12	R.13	R.14	R.14-	R.14-		R.36	R.43-	R.43-	R.43-	R.43-	R.43-
Allocated resource blocks (Note 6)			TDD	TDD	TDD	1 TDD	2 TDD	TDD	TDD	1 TDD	2 TDD	3 TDD	4 TDD	5 TDD
Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 5 and 6) Dilocks (Note 5 and 6) Dilocks (Note 6) Dilocks (Note 5 and 6) Dilocks (Note 6) Dilocks (Note 5 and 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 6) Dilocks (Note 5 and 6) Dilocks (Note 6)	Channel bandwidth	MHz	1.4			10	10			1.4		5	10	15
Uplink-Downlink	Allocated resource		6	50	50	6	3	100	50	6	15	25	50	75
Configuration (Note 4) Allocated subframes per Radio Frame (D+S) Modulation QPS QPS 16Q 16QA MM M M M M M M M M M M M M M M M M M	blocks (Note 6)													
4) Allocated subframes per Radio Frame (D+S) 3 3+2 2+2 2 2+2			1	1	1	1	1	1	1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)	Configuration (Note													
per Radio Frame (D+S) QPS (D+S) QPS (D+S) 16Q (D+S) 16QA (D+S) <th< td=""><td>4)</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th<>	4)													
CD+S CD+S			3	3+2	2+2	2	2	2+2	2+2	2	2+2	2+2	2+2	2+2
Modulation														
Target Coding Rate K K K AM M AM AM M														
Target Coding Rate 1/3 1/3 1/2	Modulation		QPS	QPS		16QA				16QA		16QA		
Information Bit														
Payload (Note 6) Bits 408 4392 1296 0 1544 0 744 2545 6 6 1833 6 6 1192 3368 5736 12960 19080 12960 19080 For Sub-Frames 1,6 Bits N/A 3240 9528 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A			1/3	1/3	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
For Sub-Frames 4,9 Bits 408 4392 1296 1544 744 2545 1833 1192 3368 5736 12960 19080 For Sub-Frames 1,6 Bits N/A 3240 9528 N/A N/A 1584 N/A 1584 N/A 2436 5160 10680 15840 For Sub-Frame 5 Bits N/A > <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>														
For Sub-Frames 1,6 Bits N/A 3240 9528 N/A N/A 2138 1584 N/A 2856 5160 10680 15840 For Sub-Frame 5 Bits N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A														
For Sub-Frames 1,6 Bits N/A 3240 9528 N/A N/A 2138 4 0 1584 0 N/A 2856 5160 10680 15840 For Sub-Frame 5 Bits N/A N/	For Sub-Frames 4,9	Bits	408	4392	1296	1544	744	2545	1833	1192	3368	5736	12960	19080
For Sub-Frame 5 Bits N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A														
For Sub-Frame 5 Bits N/A	For Sub-Frames 1,6	Bits	N/A	3240	9528	N/A	N/A	2138	1584	N/A	2856	5160	10680	15840
For Sub-Frame 0 Bits 208 4392 N/A														
Number of Code Blocks (Notes 5 and 6) For Sub-Frames 4,9 1 1 3 1 1 5 3 1 1 1 3 4 For Sub-Frames 1,6 N/A 1 2 N/A N/A 4 3 N/A 1 1 2 3											N/A			
Blocks (Notes 5 and 6) Image: Control of the control of		Bits	208	4392	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
(Notes 5 and 6) Image: Control of the con														
For Sub-Frames 4,9 1 1 3 1 1 5 3 1 1 1 3 4 For Sub-Frames 1,6 N/A 1 2 N/A N/A 4 3 N/A 1 1 2 3														
For Sub-Frames 1,6 N/A 1 2 N/A N/A 4 3 N/A 1 1 2 3														
						-				-		1		
For Sub-Frame 5														
	For Sub-Frame 5		N/A	N/A			N/A				N/A	N/A		N/A
For Sub-Frame 0 1 1 N/A ""><td></td><td></td><td>1</td><td>1</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></th<>			1	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Binary Channel Bits														
(Note 6)														
For Sub-Frames 4,9 Bits 1248 1280 2560 3072 1536 5120 3840 2496 6960 11600 25600 38400	For Sub-Frames 4,9	Bits	1248	1280	2560	3072	1536	5120	3840	2496	6960	11600	25600	38400
				_				_						
For Sub-Frames 1,6 N/A 1025 2051 N/A N/A 4131 3076 N/A 5952 10112 20512 30912	For Sub-Frames 1,6		N/A	1025	2051	N/A	N/A	4131	3076	N/A	5952	10112	20512	30912
For Sub-Frame 5 Bits N/A														
For Sub-Frame 0 Bits 624 1217 N/A N/A N/A N/A N/A N/A N/A N/A N/A N/A	For Sub-Frame 0	Bits	624	1217	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6														
Max. Throughput Mbp 0.10 1.96 4.49 0.309 0.149 9.36 6.83 0.238 1.245 2.179 4.728 6.984		Mbp				0.309	0.149			0.238	1.245	2.179	4.728	6.984
averaged over 1 s 2 6 8 8 5		S	2	6	8			8	5					
frame (Note 6)														
UE Category														

- Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
- Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.
- Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 4: As per Table 4.2-2 in TS 36.211 [4].
- Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 6: Given per component carrier per codeword.

A.3.4.3 Reference Measurement Channels for UE-Specific Reference Symbols

A.3.4.3.1 Single antenna port (Cell Specific)

The reference measurement channels in Table A.3.4.3.1-1 apply for verifying demodulation performance for UE-specific reference symbols with one cell-specific antenna port.

Table A.3.4.3.1-1: Fixed Reference Channel for DRS

Parameter	Unit	Value					
Reference channel		R.25	R.26	R.26-1	R.27	R.27-1	R.28
		TDD	TDD	TDD	TDD	TDD	TDD
Channel bandwidth	MHz	10	10	5	10	10	10
Allocated resource blocks		50 ⁴	50 ⁴	25 4	50 ⁴	18 ⁶	1
Uplink-Downlink Configuration (Note 3)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2	3+2	3+2	3+2	3+2
Modulation		QPSK	16QAM	16QAM	64QAM	64QAM	16QAM
Target Coding Rate		1/3	1/2	1/2	3/4	3/4	1/2
Information Bit Payload							
For Sub-Frames 4,9	Bits	4392	12960	5736	28336	10296	224
For Sub-Frames 1,6	Bits	3240	9528	4584	22920	8248	176
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	2984	9528	3880	22152	10296	224
Number of Code Blocks per Sub-Frame (Note 5)							
For Sub-Frames 4,9		1	3	1	5	2	1
For Sub-Frames 1,6		1	2	1	4	2	1
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	2	1	4	2	1
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits	12600	25200	11400	37800	13608	504
For Sub-Frames 1,6	Bits	10356	20712	10212	31068	11340	420
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	10332	20664	7752	30996	13608	504
Max. Throughput averaged over 1 frame	Mbps	1.825	5.450	2.452	12.466	4.738	0.102
UE Category		≥ 1	≥ 2	≥ 1	≥ 2	≥ 1	≥ 1

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

- Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 3: as per Table 4.2-2 in TS 36.211 [4].
- Note 4: For R.25, R.26 and R.27, 50 resource blocks are allocated in sub-frames 1, 4, 6, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0. For R.26-1, 25 resource blocks are allocated in sub-frames 1, 4, 6, 9 and 17 resource blocks (RB0–RB7 and RB16–RB24) are allocated in sub-frame 0.
- Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 6: Localized allocation started from RB #0 is applied.

A.3.4.3.2 Two antenna ports (Cell Specific)

The reference measurement channels in Table A.3.4.3.2-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports.

Table A.3.4.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS

Reference channel		R.31 TDD	R.32 TDD	R.32-1 TDD	R.33 TDD	R.33-1 TDD	R.34 TDD
Channel bandwidth	MHz	10	10	5	10	10	10
Allocated resource		50 ⁴	50 ⁴	25 ⁴	50 ⁴	18 ⁶	50 ⁴
blocks							
Uplink-Downlink		1	1	1	1	1	1
Configuration (Note 3)							
Allocated subframes		3+2	3+2	3+2	3+2	3+2	3+2
per Radio Frame (D+S)							
Modulation		QPSK	16QAM	16QAM	64QAM	64QAM	64QAM
Target Coding Rate		1/3	1/2	1/2	3/4	3/4	1/2
Information Bit Payload							
For Sub-Frames 4,9	Bits	3624	11448	5736	27376	9528	18336
For Sub-Frames 1,6		2664	7736	3112	16992	7480	11832
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	2984	9528	3496	22152	9528	14688
Number of Code Blocks							
per Sub-Frame							
(Note 5)							
For Sub-Frames 4,9		1	2	1	5	2	3
For Sub-Frames 1,6		1	2	1	3	2	2
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	2	1	4	2	3
Binary Channel Bits Per							
Sub-Frame							
For Sub-Frames 4,9	Bits	12000	24000	10800	36000	12960	36000
For Sub-Frames 1,6		7872	15744	6528	23616	10368	23616
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	9840	19680	7344	29520	12960	29520
Max. Throughput	Mbps	1.556	4.79	2.119	11.089	4.354	7.502
averaged over 1 frame							
UE Category		≥ 1	≥2	≥ 1	≥2	≥ 1	≥ 2
Note 1: 2 symbols allo							
allocated to PD	OCCH for 5	MHz and 3	3 MHz; 4 s	ymbols allo	cated to P	DCCH for 1.	.4 MHz.
For subframe 1							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].							

Reference signal, synchronization si as per Table 4.2-2 in TS 36.211 [4]. Note 3:

For R.31, R.32, R.33and R.34, 50 resource blocks are allocated in sub-frames 4,9 and 41 Note 4: resource blocks (RB0-RB20 and RB30-RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. For R.32-1, 25 resouce blocks are allocated in sub-frames 4,9 and 17 resource blocks (RB0–RB7 and RB16–RB24) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.

If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is Note 5: attached to each Code Block (otherwise L = 0 Bit).

Note 6: Localized allocation started from RB #0 is applied.

The reference measurement channels in Table A.3.4.3.2-2 apply with two CRS antenna ports.

Table A.3.4.3.2-2: Fixed Reference Channel for CDM-multiplexed DM RS

Parameter	Unit	V	alue
Reference channel		R.70 TDD	R.71 TDD
Channel bandwidth	MHz	10	10
Allocated resource blocks		50 (Note 4)	50 (Note 4)
Uplink-Downlink Configuration (Note 3)		1	1
Allocated subframes per Radio Frame (D+S)		2+2	2+2
Modulation		QPSK	16QAM
Target Coding Rate			
For Sub-Frames 4,9		0.65	0.6
For Sub-Frames 1,6		0.54	0.5
Information Bit Payload			
For Sub-Frames 4,9	Bits	6968	12960
For Sub-Frames 1,6	Bits	4264	7736
For Sub-Frame 5	Bits	N/A	N/A
For Sub-Frame 0	Bits	N/A	N/A
Number of Code Blocks per Sub-Frame			
(Note 5)			
For Sub-Frames 4,9		2	3
For Sub-Frames 1,6		1	2
For Sub-Frame 5		N/A	N/A
For Sub-Frame 0		N/A	N/A
Binary Channel Bits Per Sub-Frame			
For Sub-Frames 4,9	Bits	10800	21600
For Sub-Frames 1,6	Bits	7872	15744
For Sub-Frame 5	Bits	N/A	N/A
For Sub-Frame 0	Bits	N/A	N/A
Max. Throughput averaged over 1 frame	Mbps	2.2464	4.1392
UE Category		≥ 1	≥ 2

- Note 1: 3 symbols allocated to PDCCH in normal subframes and 2 symbols allocated to PDCCH in special subframes
- Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 3: As per Table 4.2-2 in TS 36.211 [4].
- Note 4: For R.63, and R.64, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in the DwPTS portion of sub-frames 1,6.
- Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.4.3.3 Two antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.3-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and two CSI-RS antenna ports.

Table A.3.4.3.3-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

	Parameter	Unit	Value			
Referenc	e channel		R.51 TDD			
	bandwidth	MHz	10			
	resource blocks		50 (Note 5)			
	ownlink Configuration (Note 3)		1			
	subframes per Radio Frame		3+2			
(D+S)						
Modulatio			16QAM			
	oding Rate		1/2			
	on Bit Payload					
	-Frames 4,9 (non CSI-RS	Bits	11448			
subframe						
	-Frame 4,9	Bits	11448			
	-Frames 1,6	Bits	7736			
	-Frame 5	Bits	N/A			
	-Frame 0	Bits	9528			
	of Code Blocks					
(Note 4)						
	-Frames 4, 9 (non CSI-RS	Code	2			
subframe		blocks				
For Sub	-Frames 4,9	Code blocks	2			
	F 0 F 10					
For Sub	For Sub-Frames 1,6		2			
		blocks				
	-Frame 5		N/A			
For Sub	-Frame 0	Code	2			
D: 01	1.5%	blocks				
	nannel Bits	D::	0.4000			
	-Frames 4, 9 (non CSI-RS	Bits	24000			
subframe			22200			
	-Frames 4,9 -Frames 1,6		22800 15744			
	-Frame 5	Dita	N/A			
		Bits				
	-Frame 0 oughput averaged over 1	Bits	19680 4.7896			
frame	ougriput averaged over 1	Mbps	4.7090			
UE Cate	NOTV.		≥ 2			
Note 1:	2 symbols allocated to PDCCl	<u> </u> 	- 4			
Note 1:	Reference signal, synchroniza	ı. tion cianal	e and DRCH			
NOIG Z.	allocated as per TS 36.211 [4]	alon signal	3 and 1 DOI1			
Note 3:						
Note 4:						
	CRC sequence of L = 24 Bits is attached to each Code					
	Block (otherwise L = 0 Bit).					
Note 5:	50 resource blocks are allocat	ed in sub-f	rames 4,9 and			
	41 resource blocks (RB0-RB2	0 and RB	30-RB49) are			
	allocated in sub-frame 0 and the	ne DwPTS	portion of			
	sub-frames 1,6.					

The reference measurement channels in Table A3.4.3.3-2 apply for verifying demudlation performance for UE-specific reference symbols with two cell specific antenna ports and two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS in same subframe.

Table A.3.4.3.3-2: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

Parameter	Unit	Value				
Reference channel		R.52 TDD	R.53 TDD	R.54 TDD		
Channel bandwidth	MHz	10	10	10		
Allocated resource blocks		50 (Note 5)	50 (Note 5)	50 (Note 5)		
Uplink-Downlink Configuration (Note 3)		1	1	1		
Allocated subframes per Radio Frame		3+2	3+2	3+2		
(D+S)						
Modulation		64QAM	64QAM	16QAM		
Target Coding Rate		1/2	1/2	1/2		
Information Bit Payload						
For Sub-Frame 4,9	Bits	16416	16416	11448		
For Sub-Frames 1,6	Bits	11832	11832	7736		
For Sub-Frame 5	Bits	n/a	n/a	n/a		
For Sub-Frame 0	Bits	14688	14688	9528		
Number of Code Blocks						
(Note 4)						
For Sub-Frames 4,9	Code	3	3	2		
	blocks					
For Sub-Frames 1,6	Code	2	2	2		
	blocks					
For Sub-Frame 5		n/a	n/a	n/a		
For Sub-Frame 0	Code	3	3	2		
	blocks					
Binary Channel Bits						
For Sub-Frames 4,9		34200	33600	22800		
For Sub-Frames 1,6		23616	23616	15744		
For Sub-Frame 5	Bits	n/a	n/a	n/a		
For Sub-Frame 0	Bits	29520	29520	19680		
Max. Throughput averaged over 1	Mbps	7.1184	7.1184	4.7896		
frame						
UE Category		≥ 2	≥ 2	≥ 2		

Note 1: 2 symbols allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: as per Table 4.2-2 in TS 36.211 [4].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 5: 50 resource blocks are allocated in sub-frames 4, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1, 6.

A.3.4.3.4 Four antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.4-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

Parameter	Unit	Value			
Reference channel		R.44 TDD	R.48 TDD	R.66 TDD	
Channel bandwidth	MHz	10	10	20	
Allocated resource blocks		50 (Note 4)	50 (Note 4)	100	
Uplink-Downlink Configuration (Note 3)		1	1	1	
Allocated subframes per Radio Frame (D+S)		3+2	3+2	3+2	
Modulation		64QAM	QPSK	256QAM	
Target Coding Rate		1/2			
Information Bit Payload					
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	18336	N/A	N/A	
For Sub-Frames 4,9 (CSI-RS subframe)	Bits	16416	6200	71112	
For Sub-Frames 1,6		11832	4264	48936	
For Sub-Frame 5	Bits	N/A	N/A	N/A	
For Sub-Frame 0	Bits	14688	4968	66592	
Number of Code Blocks per Sub- Frame (Note 5)					
For Sub-Frames 4,9 (non CSI-RS subframe)		3	2	N/A	
For Sub-Frames 4,9 (CSI-RS subframe)		3	2	12	
For Sub-Frames 1,6		2	1	8	
For Sub-Frame 5		N/A	N/A	N/A	
For Sub-Frame 0		3	1	11	
Binary Channel Bits Per Sub- Frame					
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	36000	12000	N/A	
For Sub-Frames 4,9 (CSI-RS subframe)	Bits	33600	11600	89600	
For Sub-Frames 1,6		23616	7872	67584	
For Sub-Frame 5	Bits	N/A	N/A	N/A	
For Sub-Frame 0	Bits	29520	9840	84480	
Max. Throughput averaged over 1 frame	Mbps	7.1184	2.5896	30.669	
UE Category		≥ 2	≥ 1	11-12	
UE DL Category		≥ 6	≥ 6	≥ 13	

Note 1: 2 symbols allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: as per Table 4.2-2 in TS 36.211 [4].

Note 4: For R.44 and R.48, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. For R.66, 100 resource blocks are allocated in sub-frames 4, 9 and 88 resources blockes (RB0–RB43 and RB56–RB99) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.

Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

The reference measurement channels in Table A.3.4.3.4-2 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-2: Fixed Reference Channel for four antenna ports (CSI-RS)

Parameter	Unit		Value	
Reference channel		R.60	R.61	R.61-1
		TDD	TDD	TDD
Channel bandwidth	MHz	10	10	10
Allocated resource blocks		50 ⁴	50 ⁴	39 ⁵
Uplink-Downlink Configuration (Note 3)		1	1	1
Allocated subframes per Radio Frame (D+S)		4+2	4+2	4+2
Allocated subframes per Radio Frame		10	10	10
Modulation		QPSK	16QAM	16QAM
Target Coding Rate		1/2	1/2	1/2
Information Bit Payload				
For Sub-Frames 4 and 9 (Non CSI-RS subframe)	Bits	N/A	N/A	N/A
For Sub-Frames 4 and 9 (CSI-RS subframe)	Bits	6200	11448	8760
For Sub-Frames 1,6	Bits	N/A	7736	7480
For Sub-Frame 5	Bits	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	9528	8760
Number of Code Blocks per Sub-Frame (Note 6)				
For Sub-Frames 4 and 9 (Non CSI-RS subframe)		N/A	N/A	N/A
For Sub-Frames 4 and 9 (CSI-RS subframe)		2	2	2
For Sub-Frames 1,6		N/A	2	2
For Sub-Frame 5		N/A	N/A	N/A
For Sub-Frame 0		N/A	2	2
Binary Channel Bits Per Sub-Frame				
For Sub-Frames 4 and 9 (Non CSI-RS subframe)	Bits	N/A	N/A	N/A
For Sub-Frames 4 and 9 (CSI-RS subframe)	Bits	11600	23200	18096
For Sub-Frames 1,6	Bits	N/A	15744	14976
For Sub-Frame 5	Bits	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	19680	18720
Max. Throughput averaged over 1 frame	Mbps	1.24	4.7896	4.1240
UE Category		≥ 1	≥ 2	≥ 1

- Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
- Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 3: As per Table 4.2-2 in TS 36.211 [4].
- Note 4: For R. 60 and R.61, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6.
- Note 5: For R. 61-1, 39 resource blocks (RB0–RB20 and RB30–RB47) are allocated in subframe 0. 1, 4, 6 and 9.
- Note 6: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 7: Localized allocation started from RB #0 is applied.

The reference measurement channels in Table A.3.4.3.4-3 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-3: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

Parameter	Unit	Value
Reference channel		R.64 TDD
Channel bandwidth	MHz	10
Allocated resource blocks (Note 4)		6
Uplink-Downlink Configuration (Note 3)		1
Allocated subframes per Radio Frame (D+S)		4+2
Modulation		QPSK
Target Coding Rate		1/3
Information Bit Payload		
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	504
For Sub-Frames 4,9 (CSI-RS subframe)	Bits	504
For Sub-Frames 1,6		256
For Sub-Frames 0,5	Bits	504
Number of Code Blocks per Sub-Frame		
For Sub-Frames 4,9 (non CSI-RS subframe)	Code	1
	blocks	
For Sub-Frames 4,9 (CSI-RS subframe)	Code	1
	blocks	
For Sub-Frames 1,6	Code	1
	blocks	
For Sub-Frames 0,5	Code	1
	blocks	
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 4,9 (non CSI-RS subframe)	Bits	1440
For Sub-Frames 4,9 (CSI-RS subframe)	Bits	1352
For Sub-Frames 1,6		1152
For Sub-Frames 0,5	Bits	1440
Max. Throughput averaged over 1 frame	Mbps	0.2528
UE DL Category		0

Note 1: 2 symbols allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH

allocated as per TS 36.211 [4].

Note 3: as per Table 4.2-2 in TS 36.211 [4].

Note 4: Allocated PRB positions start from {9, 10, ..., 9+N-1}, where

N is the number of allocated resource blocks.

The reference measurement channels in Table A.3.4.3.4-4 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

Table A.3.4.3.4-4: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

Parameter	Unit	Value
Reference channel		R.69
Channel bandwidth	MHz	10
Allocated resource blocks		50 (Note 4)
Uplink-Downlink Configuration (Note 3)		1
Allocated subframes per Radio Frame (D+S)		2+2
Modulation		QPSK
Target Coding Rate		
For Sub-Frame 4(CSI-RS subframe)		0.8
For Sub-Frame 9 (non CSI-RS subframe)		0.74
For Sub-Frames 1,6		0.61
Information Bit Payload		
For Sub-Frame 4(CSI-RS subframe)	Bits	7992
For Sub-Frame 9 (non CSI-RS subframe)	Bits	7992
For Sub-Frames 1,6	Bits	4776
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	N/A
Number of Code Blocks per Sub-Frame		
(Note 5)		
For Sub-Frame 4(CSI-RS subframe)		2
For Sub-Frame 9 (non CSI-RS subframe)		2
For Sub-Frames 1,6		1
For Sub-Frame 5		N/A
For Sub-Frame 0		N/A
Binary Channel Bits Per Sub-Frame		
For Sub-Frame 4(CSI-RS subframe)	Bits	10000
For Sub-Frame 9 (non CSI-RS subframe)	Bits	10800
For Sub-Frames 1,6	Bits	7872
For Sub-Frame 5	Bits	N/A
For Sub-Frame 0	Bits	N/A
Max. Throughput averaged over 1 frame	Mbps	2.5536
UE Category		≥1
Note 1: 3 symbols allocated to PDCCH.		

Note 1: 3 symbols allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: As per Table 4.2-2 in TS 36.211 [4].

Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in the DwPTS portion of sub-frames 1,6.

Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.4.3.5 Eight antenna ports (CSI-RS)

The reference measurement channels in Table A.3.4.3.5-1 apply for verifying demodulation performance for CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports and eight CSI-RS antenna ports.

Table A.3.4.3.5-1: Fixed Reference Channel for CDM-multiplexed DM RS with eight CSI-RS antenna ports

Parameter	Unit	Value				
Reference channel		R.50 TDD				
Channel bandwidth	MHz	10				
Allocated resource blocks		50 (Note 4)				
Uplink-Downlink Configuration (Note		1				
3)						
Allocated subframes per Radio		3+2				
Frame (D+S)						
Modulation		QPSK				
Target Coding Rate		1/3				
Information Bit Payload						
For Sub-Frames 4,9 (non CSI-RS	Bits	3624				
subframe)						
For Sub-Frames 4,9 (CSI-RS	Bits	3624				
subframe)						
For Sub-Frames 1,6		2664				
For Sub-Frame 5	Bits	N/A				
For Sub-Frame 0	Bits	2984				
Number of Code Blocks per Sub-						
Frame						
(Note 5)						
For Sub-Frames 4,9 (non CSI-RS		1				
subframe)						
For Sub-Frames 4,9 (CSI-RS		1				
subframe)						
For Sub-Frames 1,6		1				
For Sub-Frame 5		N/A				
For Sub-Frame 0		1				
Binary Channel Bits Per Sub-Frame						
For Sub-Frames 4,9 (non CSI-RS	Bits	12000				
subframe)						
For Sub-Frames 4,9 (CSI-RS	Bits	10400				
subframe)						
For Sub-Frames 1,6		7872				
For Sub-Frame 5	Bits	N/A				
For Sub-Frame 0	Bits	9840				
Max. Throughput averaged over 1	Mbps	1.556				
frame						
UE Category		≥ 1				
Note 1: 2 symbols allocated to PDCCH.						

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: as per Table 4.2-2 in TS 36.211 [4].

Note 4: 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-

frames 1,6.

Note 5: If more than one Code Block is present, an additional CRC sequence of L=24 Bits is attached to each Code Block (otherwise L=0 Bit).

The reference measurement channels in Table A.3.4.3.5-2 apply for verifying TDD PMI accuracy measurement with two CRS antenna ports and eight CSI-RS antenna ports.

Table A.3.4.3.5-2: Fixed Reference Channel for eight antenna ports (CSI-RS)

Parameter	Unit	Valu	ue
Reference channel		R.45	R.45-1
		TDD	TDD
Channel bandwidth	MHz	10	10
Allocated resource blocks		50 ⁴	39
Uplink-Downlink Configuration (Note 3)		1	1
Allocated subframes per Radio Frame		4+2	4+2
(D+S)			
Allocated subframes per Radio Frame		10	10
Modulation		16QAM	16QAM
Target Coding Rate		1/2	1/2
Information Bit Payload			
For Sub-Frames 4 and 9	Bits	N/A	N/A
(Non CSI-RS subframe)			
For Sub-Frames 4 and 9	Bits	11448	8760
(CSI-RS subframe)			
For Sub-Frames 1,6	Bits	7736	7480
For Sub-Frame 5	Bits	N/A	N/A
For Sub-Frame 0	Bits	9528	8760
Number of Code Blocks per Sub-Frame			
(Note 5)			
For Sub-Frames 4 and 9		N/A	N/A
(Non CSI-RS subframe)			
For Sub-Frames 4 and 9		2	2
(CSI-RS subframe)			
For Sub-Frames 1,6		2	2
For Sub-Frame 5		N/A	N/A
For Sub-Frame 0		2	2
Binary Channel Bits Per Sub-Frame			
For Sub-Frames 4 and 9	Bits	N/A	N/A
(Non CSI-RS subframe)			
For Sub-Frames 4 and 9	Bits	22400	17472
(CSI-RS subframe)			
For Sub-Frames 1,6	Bits	15744	14976
For Sub-Frame 5	Bits	N/A	N/A
For Sub-Frame 0	Bits	19680	18720
Max. Throughput averaged over 1 frame	Mbps	4.7896	4.1240
UE Category		≥ 2	≥ 1

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: As per Table 4.2-2 in TS 36.211 [4].

Note 4: For R.45, 50 resource blocks are allocated in sub-frames 4,9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0 and the DwPTS portion of sub-frames 1,6. For R.45-1, 39 resource blocks are allocated in sub-frames 0,4,9 and the DwPTS portion of sub-frames 1,6 (RB0–RB20 and RB30–RB47).

Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 6: Localized allocation started from RB #0 is applied.

A.3.5 Reference measurement channels for PDCCH/PCFICH performance requirements

A.3.5.1 FDD

Table A.3.5.1-1: Reference Channel FDD

Parameter	Unit	Value					
Reference channel		R.15 FDD	R.15-1 FDD	R.15-2 FDD	R.16 FDD	R.17 FDD	
Number of transmitter antennas		1	2	2	2	4	
Channel bandwidth	MHz	10	10	10	10	5	
Number of OFDM symbols for PDCCH	symbols	2	3	2	2	2	
Aggregation level	CCE	8	8	8	4	2	
DCI Format		Format 1	Format 1	Format 1	Format 2	Format 2	
Cell ID		0	0	0	0	0	
Payload (without CRC)	Bits	31	31	31	43	42	

A.3.5.2 TDD

Table A.3.5.2-1: Reference Channel TDD

Parameter	Unit	Value								
Reference channel		R.15 TDD	R.15-1 TDD	R.15-2 TDD	R.16 TDD	R.17 TDD				
Number of transmitter antennas		1	2	2	2	4				
Channel bandwidth	MHz	10	10	10	10	5				
Number of OFDM symbols for PDCCH	symbols	2	3	2	2	2				
Aggregation level	CCE	8	8	8	4	2				
DCI Format		Format 1	Format 1	Format 1	Format 2	Format 2				
Cell ID		0	0	0	0	0				
Payload (without CRC)	Bits	34	34	34	46	45				

A.3.6 Reference measurement channels for PHICH performance requirements

Table A.3.6-1: Reference Channel FDD/TDD

Parameter	Unit			Value		
Reference channel		R.18	R.19	R.19-1	R.20	R.24
Number of transmitter antennas		1	2	2	4	1
Channel bandwidth	MHz	10	10	5	5	10
User roles (Note 1)		W I1 I2	W I1 I2	W I1 I2	W I1 I2	W I1
Resource allocation (Note 2)		(0,0) (0,1) (0,4)	(0,0) (0,1) (0,4)	(0,0) (0,1) (0,4)	(0,0) (0,1) (0,4)	(0,0) (0,1)
Power offsets (Note 3)	dB	-4 0 -3	-40-3	-40-3	-40-3	+3 0
Payload (Note 4)		ARR	ARR	ARR	ARR	AR

Note 1: W=wanted user, I1=interfering user 1, I2=interfering user 2.

Note 2: The resource allocation per user is given as (N_group_PHICH, N_seq_PHICH).

Note 3: The power offsets (per user) represent the difference of the power of BPSK modulated symbol per PHICH relative to the first interfering user.

Note 4: A=fixed ACK, R=random ACK/NACK.

A.3.7 Reference measurement channels for PBCH performance requirements

Table A.3.7-1: Reference Channel FDD/TDD

Parameter	Unit	Value						
Reference channel		R.21	R.22	R.23				
Number of transmitter antennas		1	2	4				
Channel bandwidth	MHz	1.4	1.4	1.4				
Modulation		QPSK	QPSK	QPSK				
Target coding rate		40/1920	40/1920	40/1920				
Payload (without CRC)	Bits	24	24	24				

A.3.8 Reference measurement channels for MBMS performance requirements

A.3.8.1 FDD

Table A.3.8.1-1: Fixed Reference Channel QPSK R=1/3

Parameter			Р	МСН			
	Unit			Val	ue		
Reference channel		R.40 FDD			R.37 FDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Allocated subframes per Radio		6			6		
Frame (Note 1)							
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload (Note 2)							
For Sub-Frames 1,2,3,6,7,8	Bits	408			3624		
For Sub-Frames 0,4,5,9	Bits	N/A			N/A		
Number of Code Blocks per		1			1		
Subframe (Note 3)							
Binary Channel Bits Per Subframe							
For Sub-Frames 1,2,3,6,7,8	Bits	1224			10200		
For Sub-Frames 0,4,5,9	Bits	N/A			N/A		
MBMS UE Category		≥ 1			≥ 1		

Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.

Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.8.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter				PMC	CH		
	Unit				Value		
Reference channel					R.38 FDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Allocated subframes per Radio Frame (Note 1)					6		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload (Note 2)							
For Sub-Frames 1,2,3,6,7,8	Bits				9912		
For Sub-Frames 0,4,5,9	Bits				N/A		
Number of Code Blocks per Subframe (Note 3)					2		
Binary Channel Bits Per Subframe							
For Sub-Frames 1,2,3,6,7,8	Bits				20400		
For Sub-Frames 0,4,5,9	Bits				N/A		
MBMS UE Category			·		≥ 1		

Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.

Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.8.1-3: Fixed Reference Channel 64QAM R=2/3

Parameter				PMCH					
	Unit	Value							
Reference channel				R.39-1 FDD	R.39 FDD				
Channel bandwidth	MHz	1.4	3	5	10	15	20		
Allocated resource blocks				25	50				
Allocated subframes per Radio Frame(Note1)				6	6				
Modulation				64QAM	64QAM				
Target Coding Rate				2/3	2/3				
Information Bit Payload (Note 2)							•		
For Sub-Frames 1,2,3,6,7,8	Bits			9912	19848				
For Sub-Frames 0,4,5,9	Bits			N/A	N/A				
Number of Code Blocks per Sub-Frame (Note 3)				2	4				
Binary Channel Bits Per Subframe							•		
For Sub-Frames 1,2,3,6,7,8	Bits			15300	30600				
For Sub-Frames 0,4,5,9	Bits			N/A	N/A				
MBMS UE Category				≥ 1	≥ 2				

Note 1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, in line with TS 36.331.

Note 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS 36.211.

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.8.2 TDD

Table A.3.8.2-1: Fixed Reference Channel QPSK R=1/3

Parameter				РМСН			
	Unit			Va	lue		
Reference channel		R.40 TDD			R.37 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Uplink-Downlink Configuration(Note 1)		5			5		
Allocated subframes per Radio Frame		5			5		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload (Note 2)							
For Sub-Frames 3,4,7,8,9	Bits	408			3624		
For Sub-Frames 0,1,2,5,6	Bits	N/A			N/A		
Number of Code Blocks per Subframe		1			1		
(Note 3)							
Binary Channel Bits Per Subframe							
For Sub-Frames 3,4,7,8,9	Bits	1224			10200		
For Sub-Frames 0,1,2,5,6	Bits	N/A			N/A		
MBMS UE Category		≥ 1			≥ 1		

Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.

Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.3.8.2-2: Fixed Reference Channel 16QAM R=1/2

Parameter				PMC	CH		
	Unit				Value		
Reference channel					R.38 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Uplink-Downlink Configuration(Note 1)					5		
Allocated subframes per Radio Frame					5		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload (Note 2)							
For Sub-Frames 3,4,7,8,9	Bits				9912		
For Sub-Frames 0,1,2,5,6	Bits				N/A		
Number of Code Blocks per Subframe (Note 3)					2		
Binary Channel Bits Per Subframe							
For Sub-Frames 3,4,7,8,9	Bits				20400		
For Sub-Frames 0,1,2,5,6	Bits				N/A		
MBMS UE Category					≥ 1	·	

Note 1: For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 subframes (#3/4/7/8/9) are available for MBMS.

Note 2: 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211. Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is

attached to each Code Block (otherwise L = 0 Bit).

Table A.3.8.2-3: Fixed Reference Channel 64QAM R=2/3

Parameter				PMCH			
	Unit			Val	ue		
Reference channel				R.39-1TDD	R.39 TDD		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	50		
Uplink-Downlink Configuration(Note 1)				5	5		
Allocated subframes per Radio Frame				5	5		
Modulation				64QAM	64QAM		
Target Coding Rate				2/3	2/3		
Information Bit Payload (Note 2)							
For Sub-Frames 3,4,7,8,9	Bits			9912	19848		
For Sub-Frames 0,1,2,5,6	Bits			N/A	N/A		
Number of Code Blocks per Sub-Frame (Note 3)				2	4		
Binary Channel Bits Per Subframe							
For Sub-Frames 3,4,7,8,9	Bits			15300	30600		
For Sub-Frames 0,1,2,5,6	Bits			N/A	N/A		
MBMS UE Category				≥ 1	≥ 2		

For TDD mode, in line with TS 36.331, Uplink-Downlink Configuration 5 is proposed, up to 5 Note 1: subframes (#3/4/7/8/9) are available for MBMS. 2 OFDM symbols are reserved for PDCCH; reference signal allocated as per TS 36.211.

Note 2:

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.3.9 Reference measurement channels for sustained downlink data rate provided by lower layers

A.3.9.1 FDD

Table A.3.9.1-1: Fixed Reference Channel for sustained data-rate test (FDD 64QAM)

Parameter	Unit				Va	alue			
Reference channel		R.31-1	R.31-2	R.31-3	R.31-	R.31-3C	R.31-4	R.31-4B	R.31-5
		FDD	FDD	FDD	3A FDD	FDD	FDD	FDD	FDD
Channel bandwidth	MHz	10	10	20	10	15	20	15	15
Allocated resource blocks (Note 8)		Note 5	Note 6	Note 7	Note 6	Note 10	Note 7	Note 11	Note 9
Allocated subframes per Radio Frame		10	10	10	10	10	10	10	10
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Coding Rate									
For Sub-Frame 1,2,3,4,6,7,8,9,		0.40	0.59	0.59	0.85	0.87	0.88	0.85	0.85
For Sub-Frame 5		0.40	0.64	0.62	0.89	0.88	0.87	0.87	0.91
For Sub-Frame 0		0.40	0.63	0.61	0.90	0.91	0.90	0.88	0.88
Information Bit Payload (Note 8)									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	10296	25456	51024	36696	51024	75376	55056	55056
For Sub-Frame 5	Bits	10296	25456	51024	35160	51024	71112	52752	52752
For Sub-Frame 0	Bits	10296	25456	51024	36696	51024	75376	55056	55056
Number of Code Blocks									
(Notes 3 and 8)									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2	5	9	6	9	13	9	9
For Sub-Frame 5	Bits	2	5	9	6	9	12	9	9
For Sub-Frame 0	Bits	2	5	9	6	9	13	9	9
Binary Channel Bits (Note 8)									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	26100	43200	86400	43200	58752	86400	64800	64800
For Sub-Frame 5	Bits	26100	39744	82080	39744	57888	82080	60480	60480
For Sub-Frame 0	Bits	26100	40752	83952	40752	56304	83952	62352	62352
Number of layers		1	2	2	2	2	2	2	2
Max. Throughput averaged over 1	Mbps	10.296	25.456	51.024	36.542	51.024	74.950	54.826	54.826
frame (Note 8)									
UE Categories		≥ 1	≥ 2	≥2	≥ 2	≥ 3	≥ 3	≥ 4	≥ 3

- Note 1: 1 symbol allocated to PDCCH for all tests.
- Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 4: Resource blocks n_{PRB} = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.
- Note 5: Resource blocks n_{PRB} = 6..14,30..49 are allocated for the user data in all sub-frames.
- Note 6: Resource blocks $n_{PRB} = 3..49$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..49$ in sub-frames 0,1,2,3,4,6,7,8,9.
- Note 7: Resource blocks $n_{PRB} = 4..99$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..99$ in sub-frames 0,1,2,3,4,6,7,8,9.
- Note 8: Given per component carrier per codeword.
- Note 9: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.
- Note 10: Resource blocks $n_{PRB} = 4..71$ are allocated for the user data in sub-frames 0,1,2,3,4,5,6,7,8,9.
- Note 11: Resource blocks $n_{PRB} = 4..74$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..74$ in sub-frames 0,1,2,3,4,6,7,8,9.

Table A.3.9.1-2: Fixed Reference Channel for sustained data-rate test (FDD 64QAM)

Parameter	Unit		Value							
Reference channel		R.31-6								
		FDD								
Channel bandwidth	MHz	5								
Allocated resource blocks (Note 8)		Note 4								
Allocated subframes per Radio Frame		10								
Modulation		64QAM								
Coding Rate										
For Sub-Frame 1,2,3,4,6,7,8,9,		0.85								
For Sub-Frame 5		0.83								
For Sub-Frame 0		0.83								
Information Bit Payload (Note 8)										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	18336								
For Sub-Frame 5	Bits	15840								
For Sub-Frame 0	Bits	15840								
Number of Code Blocks										
(Notes 3 and 8)										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	3								
For Sub-Frame 5	Bits	3								
For Sub-Frame 0	Bits	3								
Binary Channel Bits (Note 8)										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	21600								
For Sub-Frame 5	Bits	19008								
For Sub-Frame 0	Bits	19152								
Number of layers		2								
Max. Throughput averaged over 1 frame (Note 8)	Mbps	17.837								
UE Categories		≥ 2								

Note 1: 1 symbol allocated to PDCCH for all tests.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 4: Resource blocks $n_{PRB} = 2..24$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..24$ in sub-frames 0,1,2,3,4,6,7,8,9.

Table A.3.9.1-3: Fixed Reference Channel for sustained data-rate test (FDD 256QAM)

Parameter	Unit				Value	
Reference channel		R.68	R.68-1	R.68-2	R.68-3	
		FDD	FDD	FDD	FDD	
Channel bandwidth	MHz	20	15	10	5	
Allocated resource blocks (Note 4)		Note 5	Note 6	Note 7	Note 8	
Allocated subframes per Radio Frame		10	10	10	10	
Modulation		256QAM	256QAM	256QAM	256QAM	
Coding Rate						
For Sub-Frames 3,4,8,9		0.85	0.88	0.85	0.85	
For Sub-Frames 1,2,6,7		0.74	0.74	0.74	0.77	
For Sub-Frame 5		0.75	0.77	0.77	0.79	
For Sub-Frame 0		0.76	0.77	0.78	0.84	
Information Bit Payload (Note 4)						
For Sub-Frames 3,4,8,9	Bits	97896	75376	48936	24496	
For Sub-Frames 1,2,6,7		84760	63776	42368	21384	
For Sub-Frame 5	Bits	81176	61664	40576	19848	
For Sub-Frame 0	Bits	84760	63776	42368	21384	
Number of Code Blocks (Notes 3 and 4)						
For Sub-Frames 3,4,8,9	Bits	16	13	8	4	
For Sub-Frames 1,2,6,7		14	11	7	4	
For Sub-Frame 5	Bits	14	11	7	4	
For Sub-Frame 0	Bits	14	11	7	4	
Binary Channel Bits (Note 4)						
For Sub-Frames 3,4,8,9	Bits	115200	86400	57600	28800	
For Sub-Frames 1,2,6,7		115200	86400	57600	28800	
For Sub-Frame 5	Bits	109440	80640	52992	25344	
For Sub-Frame 0	Bits	111936	83136	54336	25536	
Number of layers		2	2	2	2	
Max. Throughput averaged over 1 frame (Note 4)	Mbp	89.656	68.205	44.816	22.475	
	S	11-12	11-12	11-12	11-12	
UE Categories		13-14	13-14		13-14	
UE DL Categories		13-14	13-14	13-14	13-14	

- Note 1: 1 symbol allocated to PDCCH for all tests.
- Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
- Note 4: Given per component carrier per codeword.
- Note 5: Resource blocks $n_{PRB} = 4..99$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..99$ in sub-frames 0,1,2,3,4,6,7,8,9.
- Note 6: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub-frames 0.1,2,3,4,6,7,8,9. Note 7: Resource blocks $n_{PRB} = 3..49$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..49$ in sub-frames 0.1,2,3,4,6,7,8,9.
- Note 8: Resource blocks $n_{PRB} = 2..24$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..24$ in sub-frames 0,1,2,3,4,6,7,8,9.

A.3.9.2 TDD

Table A.3.9.2-1: Fixed Reference Channel for sustained data-rate test (TDD 64QAM)

Parameter	Unit					Value				
Reference channel		R.31-1	R.31-2	R.31-3	R.31-	R.31-4	R.31-	R.31-5	R.31-	R.31-6
		TDD	TDD	TDD	3A	TDD	4A	TDD	5A	TDD
					TDD		TDD		TDD	
Channel bandwidth	MHz	10	10	20	15	20	20	15	15	10
Allocated resource blocks		Note 6	Note 7	Note 8	Note 9	Note 8	Note 8	Note	Note	Note 7
								11	11	
Uplink-Downlink		5	5	5	1	1	2	1	2	1
Configuration (Note 3)									_	
Number of HARQ Processes	Proce	15	15	15	7	7	10	7	10	7
per component carrier	sses				-					-
Allocated subframes per		8+1	8+1	8+1	4	4	6+2	4	6+2	4
Radio Frame (D+S)					-					-
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate										
For Sub-Frames 4,9		0.40	0.59	0.59	0.87	0.88	0.88	0.85	0.85	0.85
For Sub-Frames 3,8		0.40	0.59	0.59	N/A	N/A	0.88	N/A	0.85	N/A
For Sub-Frame 7		0.40	0.59	0.59	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frames 0		0.40	0.62	0.61	0.90	0.90	0.90	0.88	0.88	0.90
For Sub-Frames 1		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frames 5		0.40	0.64	0.62	0.88	0.87	0.87	0.87	0.87	0.88
For Sub-Frames 6		0.40	0.60	0.60	N/A	N/A	N/A	N/A	N/A	N/A
Information Bit Payload		0.40	0.00	0.00	IN/A	IN/A	IN/A	IN/A	IN/A	IN/A
For Sub-Frames 4,9	Bits	10296	25456	51024	51024	75376	75376	55056	55056	36696
For Sub-Frames 3,8		10296	25456	51024			75376		55056	
,	Bits	10296		51024	0	0		0	N/A	0
For Sub-Frame 7 For Sub-Frame 0	Bits		25456		51024		N/A			36696
	Bits	10296	25456	51024		75376	75376	55056	55056	
For Sub-Frame 1	Bits	0	0	0	0	0	0	0	0	0
For Sub-Frame 5	Bits	10296	25456	51024	51024	71112	71112	52752	52752	35160
For Sub-Frame 6	Bits	10296	25456	51024	0	0	0	0	0	0
Number of Code Blocks per										
Sub-Frame										
(Note 4)		0	_	0	0	40	40	0	0	_
For Sub-Frames 4,9	<u> </u>	2	5	9	9	13	13	9	9	6
For Sub-Frames 3,8		2	5	9	N/A	N/A	13	N/A	9	N/A
For Sub-Frame 7		2	5	9	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	<u> </u>	2	5	9	9	13	13	9	9	6
For Sub-Frame 1		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 5	D:	2	5	9	9	12	12	9	9	6
For Sub-Frame 6	Bits	2	5	9	n/a	N/A	N/A	N/A	N/A	N/A
Binary Channel Bits Per Sub-										
Frame	D.:	00155	40000	00.455	F0753	00.455	00.455	0.1000	0.1000	40000
For Sub-Frames 4,9	Bits	26100	43200	86400	58752	86400	86400	64800	64800	43200
For Sub-Frames 3,8	Bits	26100	43200	86400	0	0	86400	0	64800	0
For Sub-Frame 7	Bits	26100	43200	86400	0	0	86400	0	64800	0
For Sub-Frame 0	Bits	26100	41184	84384	56736	84384	84384	62784	62784	41184
For Sub-Frame 1	Bits	0	0	0	0	0	0	0	0	0
For Sub-Frame 5	Bits	26100	40176	82512	58320	82512	82512	60912	60912	40176
For Sub-Frame 6	Bits	26100	42768	85968	N/A	N/A	0	N/A	0	N/A
Number of layers		1	2	2	2	2	2	2	2	2
Max. Throughput averaged	Mbps	8.237	20.365	40.819	20.409	29.724	52.337	25.330	38.309	14.525
over 1 frame (Note 10)										
UE Category		≥ 1	≥ 2	≥ 2	≥ 2	≥ 3	≥ 3	≥ 3	≥ 3	≥ 2
Note 1: 1 symbol allocated to	PDCCH	for all test	s.							

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: As per Table 4.2-2 in TS 36.211 [4].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 5: Resource blocks n_{PRB} = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.

Note 6: Resource blocks n_{PRB} = 6..14,30..49 are allocated for the user data in all subframes.

Note 7: Resource blocks $n_{PRB} = 3..49$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..49$ in the available downlink sub-frames according to uplink downlink configurations used .

Note 8:	Resource blocks n _{PRB} = 499 are allocated for the user data in sub-frame 5, and resource blocks n _{PRB} = 099 in sub-
	frames 0 3 4 6 7 8 9

Note 9: Resource blocks $n_{PRB} = 4..71$ are allocated for the user data in all sub-frames

Note10: Given per component carrier per codeword.

Note11: Resource blocks $n_{PRB} = 4..74$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..74$ in other downlink sub-frames.

Table A.3.9.2-2: Fixed Reference Channel for sustained data-rate test (TDD 256QAM)

Parameter	Unit			Va	lue		
Reference channel		R.68	R.68-1	R.68-2	R.68-3	R.68-4	
		TDD	TDD	TDD	TDD	TDD	
Channel bandwidth	MHz	20	15	10	20	15	
Allocated resource blocks	PRB	Note 6	Note 7	Note 8	Note 6	Note 7	
Uplink-Downlink Configuration (Note 3)		1	1	1	[2]	[2]	
Number of HARQ Processes per	Proces	7	7	7	[10]	[10]	
component carrier	ses				' '	' '	
Allocated subframes per Radio Frame		4+2	4+2	4+2	[6+2]	[6+2]	
(D+S)							
Modulation		256QAM	256QAM	256QAM	256QAM	256QAM	
Target Coding Rate							
For Sub-Frame 0		0.76	0.77	0.78	0.76	0.77	
For Sub-Frame 1		N/A	N/A	N/A	N/A	N/A	
For Sub-Frames 3		N/A	N/A	N/A	0.74	0.79	
For Sub-Frames 4		0.74	0.79	0.74	0.74	0.79	
For Sub-Frame 5		0.74	0.76	0.76	0.74	0.76	
For Sub-Frame 6		N/A	N/A	N/A	[N/A]	[N/A]	
For Sub-Frame 7		N/A	N/A	N/A	[N/A]	[N/A]	
For Sub-Frames 8		N/A	N/A	N/A	0.85	0.88	
For Sub-Frames 9		0.85	0.88	0.85	0.85	0.88	
Information Bit Payload							
For Sub-Frame 0	Bits	84760	63776	42368	84760	63776	
For Sub-Frame 1	Bits	0	0	0	0	0	
For Sub-Frames 3	Bits	N/A	N/A	N/A	84760	63776	
For Sub-Frames 4	Bits	84760	63776	42368	84760	63776	
For Sub-Frame 5	Bits	81176	61664	40576	81176	61664	
For Sub-Frame 6	Bits	0	0	0	[0]	[0]	
For Sub-Frame 7		N/A	N/A	N/A	[N/A]	[N/A]	
For Sub-Frames 8	Bits	N/A	N/A	N/A	97896	75376	
For Sub-Frames 9	Bits	97896	75376	48936	97896	75376	
Number of Code Blocks per Sub-Frame							
(Note 4)							
For Sub-Frame 0		14	11	7	14	11	
For Sub-Frame 1		N/A	N/A	N/A	N/A	N/A	
For Sub-Frames 3		N/A	N/A	N/A	14	11	
For Sub-Frames 4		14	11	7	14	11	
For Sub-Frame 5		14	11	7	14	11	
For Sub-Frame 6		N/A	N/A	N/A	[N/A]	[11]	
For Sub-Frame 7		N/A	N/A	N/A	[N/A]	[11]	
For Sub-Frames 8		N/A	N/A	N/A	16	13	
For Sub-Frames 9		16	13	8	16	13	
Binary Channel Bits Per Sub-Frame							
For Sub-Frame 0	Bits	112512	83712	54912	112512	83712	
For Sub-Frame 1	Bits	0	0	0	0	0	
For Sub-Frames 3	Bits	N/A	N/A	N/A	115200	86400	
For Sub-Frames 4	Bits	115200	86400	57600	115200	86400	
For Sub-Frame 5		110016	81216	53568	110016	81216	
For Sub-Frame 6	Bits	0	0	0	[0]	[0]	
For Sub-Frame 7		N/A	N/A	N/A	[N/A]	[N/A]	
For Sub-Frames 8	Bits	N/A	N/A	N/A	115200	86400	
For Sub-Frames 9	Bits	115200	86400	57600	115200	86400	
Number of layers		2	2	2	2	2	
Max. Throughput averaged over 1 frame	Mbps	34.859	26.459	17.425	[53.125]	[40.374]	
(Note 5)					,		
UE Categories		11-12	11-12	11-12	11-12	11-12	
UE DL Categories		13-14	13-14	13-14	13-14	13-14	
Note 1: 1 symbol allocated to PDCCH for	r all tacts						

Note 1: 1 symbol allocated to PDCCH for all tests.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].

Note 3: As per Table 4.2-2 in TS 36.211 [4].

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 5: Given per component carrier per codeword.

Note 6: Resource blocks $n_{PRB} = 4..99$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..99$ in other

downlink sub-frames.

Note 7: Resource blocks $n_{PRB} = 4..74$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..74$ in other

downlink sub-frames.

Note 8: Resource blocks $n_{PRB} = 3..49$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..49$ in the

available downlink sub-frames according to uplink downlink configurations used.

A.3.9.3 FDD (EPDCCH scheduling)

Table A.3.9.3-1: Fixed Reference Channel for sustained data-rate test with EPDCCH scheduling (FDD)

Parameter	Unit				Value			
Reference channel		R.31E-	R.31E-	R.31E-	R.31E-	R.31E-	R.31E-	R.31E-
		1 FDD	2 FDD	3 FDD	3A FDD	3C FDD	4 FDD	4B FDD
Channel bandwidth	MHz	10	10	20	10	15	20	15
Allocated resource blocks (Note 8)		Note 5	Note 6	Note 7	Note 6	Note 9	Note 7	Note 10
Allocated subframes per Radio		10	10	10	10	10	10	10
Frame								
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Coding Rate								
(subframes with PDCCH USS								
monitoring)								
For Sub-Frame 1,2,3,4,6,7,8,9,		0.3972	0.5926	0.5933	0.8533	0.8725	0.8763	0.8533
For Sub-Frame 5		0.3972	0.6441	0.6246	0.8889	0.8855	0.8702	0.8762
For Sub-Frame 0		0.3972	0.6282	0.6106	0.9046	0.9105	0.9018	0.8868
Coding Rate								ļ
(subframes with EPDCCH USS								
monitoring)								
For Sub-Frame 1,2,3,4,6,7,8,9,		0.4114	0.6047	0.5993	0.8707	0.8855	0.8851	0.8649
For Sub-Frame 5		0.4114	0.6584	0.6312	0.9086	0.8990	0.8794	0.8889
For Sub-Frame 0		0.4114	0.6418	0.6170	0.9242	0.9246	0.9112	0.8993
Information Bit Payload (Note 8)								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	10296	25456	51024	36696	51024	75376	55056
For Sub-Frame 5	Bits	10296	25456	51024	35160	51024	71112	52752
For Sub-Frame 0	Bits	10296	25456	51024	36696	51024	75376	55056
Number of Code Blocks								
(Notes 3 and 8)								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2	5	9	6	9	13	9
For Sub-Frame 5	Bits	2	5	9	6	9	12	9
For Sub-Frame 0	Bits	2	5	9	6	9	13	9
Binary Channel Bits (Note 8)								
(subframes with PDCCH USS								
monitoring)	- D:	00400	40000	00400	10000		00400	0.4000
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	26100	43200	86400	43200	58752	86400	64800
For Sub-Frame 5	Bits	26100	39744	82080	39744	57888	82080	60480
For Sub-Frame 0	Bits	26100	40752	83952	40752	56304	83952	62352
Binary Channel Bits (Note 8)								
(subframes with EPDCCH USS								
monitoring)	D:+-	05000	40000	05500	40000	F7000	05500	00000
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	25200	42336	85536	42336	57888	85536	63936
For Sub-Frame 5	Bits	25200	38880	81216	38880	57024	81216	59616
For Sub-Frame 0	Bits	25200	39888	83088	39888	55440	83088	61488
Number of layers	N Alexandra	1 10.000	2	2	2	2	2	2
Max. Throughput averaged over 1 frame (Note 8)	Mbps	10.296	25.456	51.024	36.542	51.024	74.950	54.826
UE Categories	00117	≥ 1	≥ 2	≥2	≥ 2	≥ 3	≥ 3	≥ 4

Note 1: 1 symbol allocated to PDCCH for all tests.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211.

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 4: Resource blocks n_{PRB} = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.

Note 5: Resource blocks $n_{PRB} = 6..14,30..49$ are allocated for the user data in all sub-frames.

Note 6: Resource blocks $n_{PRB} = 3..49$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..49$ in sub-frames 0,1,2,3,4,6,7,8,9.

Note 7: Resource blocks $n_{PRB} = 4..99$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..99$ in sub-frames 0,1,2,3,4,6,7,8,9.

Note 8: Given per component carrier per codeword.

Note 9: Resource blocks $n_{PRB} = 4..71$ are allocated for the user data in sub-frames 0,1,2,3,4,5,6,7,8,9.

Note 10: Resource blocks $n_{PRB} = 4..74$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0.74$ in sub-frame 3.4.6.7.8.0

0..74 in sub-frames 0,1,2,3,4,6,7,8,9.

A.3.9.4 TDD (EPDCCH scheduling)

Table A.3.9.4-1: Fixed Reference Channel for sustained data-rate with EPDCCH scheduling (TDD)

Parameter	Unit			Value		
Reference channel		R.31E-1	R.31E-2	R.31E-3	R.31E-3A	R.31E-4
		TDD	TDD	TDD	TDD	TDD
Channel bandwidth	MHz	10	10	20	15	20
Allocated resource blocks		Note 6	Note 7	Note 8	Note 9	Note 8
Uplink-Downlink Configuration (Note		5	5	5	1	1
3)						
Number of HARQ Processes per	Processes	15	15	15	7	7
component carrier						
Allocated subframes per Radio		8+1	8+1	8+1	4	4
Frame (D+S)						
Coding Rate						
(subframes with PDCCH USS						
monitoring)		0.2072	0.5000	0.5000	0.0705	0.0700
For Sub-Frames 4,9		0.3972	0.5926	0.5933	0.8725	0.8763
For Sub-Frames 3,7,8		0.3972	0.5926	0.5933	N/A N/A	N/A
For Sub-Frames 1 For Sub-Frames 5		N/A 0.3972	N/A 0.6372	N/A 0.6213		N/A 0.8656
For Sub-Frames 5		0.3972	0.6372	0.6213	0.8790 N/A	0.8656 N/A
For Sub-Frames 0		0.3972	0.6216		0.9036	0.8972
Coding Rate		0.3972	0.0210	0.6075	0.9036	0.6972
(subframes with EPDCCH USS						
monitoring)						
For Sub-Frames 4,9		0.4114	0.6047	0.5993	0.8856	0.8851
For Sub-Frames 3,7.8		0.4114	0.6047	0.5993	N/A	N/A
For Sub-Frames 1		N/A	N/A	N/A	N/A	N/A
For Sub-Frames 5		0.4114	0.6512	0.6279	0.8922	0.8748
For Sub-Frames 6		0.4114	0.6109	0.6024	N/A	N/A
For Sub-Frames 0		0.4114	0.6349	0.6138	0.9175	0.9065
Information Bit Payload		0	0.00.0	0.0.00	0.01.0	0.000
For Sub-Frames 4,9	Bits	10296	25456	51024	51024	75376
For Sub-Frames 3,7,8	Bits	10296	25456	51024	N/A	N/A
For Sub-Frame 1	Bits	0	0	0	N/A	N/A
For Sub-Frame 5	Bits	10296	25456	51024	51024	71112
For Sub-Frame 6	Bits	10296	25456	51024	N/A	N/A
For Sub-Frame 0	Bits	10296	25456	51024	51024	75376
Number of Code Blocks per Sub-						
Frame (Note 4)						
For Sub-Frames 4,9		2	5	9	9	13
For Sub-Frames 3,7,8		2	5	9	N/A	N/A
For Sub-Frame 1		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 5		2	5	9	9	12
For Sub-Frame 6	Bits	2	5	9	N/A	N/A
For Sub-Frame 0		2	5	9	9	13
Binary Channel Bits per Sub-Frame						
(subframes with PDCCH USS						
monitoring)	5	00400	40000	00400	50750	00400
For Sub-Frames 4,9	Bits	26100	43200	86400	58752	86400
For Sub-Frames 3,7,8	Bits	26100	43200	86400	N/A	N/A
For Sub-Frame 1	Bits	0	0	0	N/A	N/A
For Sub-Frame 5 For Sub-Frame 6	Bits Bits	26100 26100	40176 42768	82512	58320 N/A	82512 N/A
For Sub-Frame 6	Bits	26100	42768	85968 84384		84384
Binary Channel Bits per Sub-Frame	DIIS	20100	41104	04304	56736	04304
(subframes with EPDCCH USS						
(Submanies with LFDCCH 033						

monitoring)						
For Sub-Frames 4,9	Bits	25200	42336	85536	57888	85536
For Sub-Frames 3,7,8	Bits	25200	42336	85536	N/A	N/A
For Sub-Frame 1	Bits	0	0	0	N/A	N/A
For Sub-Frame 5	Bits	25200	39312	81648	57456	81648
For Sub-Frame 6	Bits	25200	41904	85104	N/A	N/A
For Sub-Frame 0	Bits	25200	40320	83520	55872	83520
Number of layers		1	2	2	2	2
Max. Throughput averaged over 1	Mbps	8.237	20.365	40.819	20.409	29.724
frame (Note 10)						
UE Category		≥ 1	≥ 2	≥ 2	≥ 2	≥ 3

- Note 1: 1 symbol allocated to PDCCH for all tests.
- Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].
- Note 3: As per Table 4.2-2 in TS 36.211 [4].
- Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
- Note 5: Resource blocks $n_{PRB} = 0..2$ are allocated for SIB transmissions in sub-frame 5 for all bandwidths.
- Note 6: Resource blocks $n_{PRB} = 6..14,30..49$ are allocated for the user data in all subframes.
- Note 7: Resource blocks $n_{PRB} = 3..49$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..49$ in sub-frames 0,3,4,6,7,8,9.
- Note 8: Resource blocks $n_{PRB} = 4..99$ are allocated for the user data in sub-frame 5, and resource blocks $n_{PRB} = 0..99$ in sub-frames 0,3,4,6,7,8,9.
- Note 9: Resource blocks $n_{PRB} = 4..71$ are allocated for the user data in all sub-frames
- Note10: Given per component carrier per codeword.

A.3.10 Reference Measurement Channels for EPDCCH performance requirements

A.3.10.1 FDD

Table A.3.10.1-1: Reference Channel FDD

Parameter	Unit	Value							
Reference channel		R.55 FDD	R.56 FDD	R.57 FDD	R.58 FDD	R.59 FDD			
Number of transmitter antennas		2	2	2	2	2			
Channel bandwidth	MHz	10	10	10	10	10			
Number of OFDM symbols for PDCCH	symbols	2	2	1	1	1			
Aggregation level	ECCE	4	16	2	8	2			
DCI Format		2A	2A	2C	2C	2D			

A.3.10.2 TDD

Table A.3.10.2-1: Reference Channel TDD

Parameter	Unit	Value								
Reference channel		R.55 TDD	R.56 TDD	R.57 TDD	R.58 TDD	R.59 TDD				
Number of transmitter antennas		2	2	2	2	2				
Channel bandwidth	MHz	10	10	10	10	10				
Number of OFDM symbols for PDCCH	symbols	2	2	1	1	1				
Aggregation level	CCE	4	16	2	8	2				
DCI Format		2A	2A	2C	2C	2D				

A.4 CSI reference measurement channels

This section defines the DL signal applicable to the reporting of channel status information (Clause 9.2, 9.3 and 9.5).

In Table A.4-1 are specified the reference channels. Table A.4-13 specifies the mapping of CQI index to modulation coding scheme, which complies with the CQI definition specified in Section 7.2.3 of [6].

Table A.4-0: Void

Table A.4-1: CSI reference measurement channels

RMC Name	Duplex	CH- BW	Alloc. RB-s	UL/DL Config	Alloc. SF-s	MCS Scheme	Nr. HARQ Proc.	Max. nr HARQ Trans.	Notes
1 CRS Port									
RC.1 FDD	FDD	10	50	-		MCS.1	8	1	
RC.1A FDD	FDD	10	50			MCS.1A	8	1	
RC.1 TDD	TDD	10	50	Note 3		MCS.1	10	1	
RC.1A TDD	TDD	20	100	Note 3		MCS.1B	10	1	
RC.3 FDD	FDD	10	6	-		MCS.10	8	1	
RC.3 TDD	TDD	10	6	Note 3		MCS.10	10 or 7 (Note 9)	1	
RC.4 FDD	FDD	10	15	-		MCS.15	8	1	Note 6
RC.4 TDD	TDD	10	15	Note 3		MCS.15	10	1	Note 6
RC.5 FDD	FDD	10	3	-		MCS.17	8	1	
RC.5 TDD	TDD	10	3	Note 3		MCS.17	10	1	
RC.14 FDD	FDD	5	25	-		MCS.14	8	1	
RC.15 FDD	FDD	5	15	-		MCS.15	8	1	Note 6
RC.16 FDD	FDD/HD- FDD	10	2			MCS.20	8	1	Note 8,10
RC.16 TDD	TDD	10	2	Note 3		MCS.20	10	1	Note 8
2 CRS Port	s								
RC.2 FDD	FDD	10	50	-		MCS.2	8	1	
RC.2 TDD	TDD	10	50	Note 3		MCS.2	10 or 7 (Note 9)	1	
RC.6 FDD	FDD	10	15	-		MCS.16	8	1	Note 6
RC.6 TDD	TDD	10	15	Note 3		MCS.16	7	1	Note 6
4 CRS Port	s				ı				
RC.17 FDD	FDD	10	50	-		MCS.18	8	1	
RC.17 TDD	TDD	10	50	Note 3		MCS.18	7	1	
1 CRS Port	+ CSI-RS				T				
RC.8 FDD	FDD	10	6	-	Non CSI-RS	MCS.11	8	1	
					2 CSI-RS	MCS.12			
RC.8A	FDD	10	6	_	Non CSI-RS	MCS.11A	8	1	
FDD			_		2 CSI-RS	MCS.12A	_		
RC.8 TDD	TDD	10	6	Note 3	Non CSI-RS	MCS.11	10	1	
					2 CSI-RS	MCS.12			
RC.8A	TDD	20	8	Note 3	Non CSI-RS	MCS.11B	10	1	
TDD	100	20	Ü	11010 0	2 CSI-RS	MCS.12B		•	
RC.9 FDD	FDD	10	50	_	Non CSI-RS	MCS.3	8	1	
	. 55				2 CSI-RS	MCS.4		'	
RC.9 TDD	TDD	10	50	Note 3	Non CSI-RS	MCS.3	7	1	
				. 1010 0	2 CSI-RS	MCS.4			
2 CRS Port	+ CSI-RS								
RC.7 FDD	FDD	10	50		Non CSI-RS	MCS.5	8	1	
1.0.7 1 00	, 55				4 CSI-RS	MCS.7		1	
RC.7 TDD	TDD	10	50	Note 3	Non	MCS.5	10	1	

					CSI-RS				
					8 CSI-RS	MCS.8			
					Non	MCS.5			
RC.11 FDD	FDD	10	50	-	CSI-RS		8	1	
					2 CSI-RS Non	MCS.6			
RC.11 TDD	TDD	10	50	Note 3	CSI-RS	MCS.5	10	1	
					2 CSI-RS	MCS.6			
RC.18 FDD	FDD	10	6	_	Non CSI-RS	MCS.13	8	1	
	. 22	. •	J		4 CSI-RS	MCS.19	· ·	-	
RC.18 TDD	TDD	10	6	Note 3	Non CSI-RS	MCS.13	7	1	
110.10 155	, 55		ŭ	11010 0	4 CSI-RS	MCS.19	•	•	
RC.17 TDD	TDD	10	6	Note 3	4 ZP-CSI- RS	MCS.21	10	1	
RC.18 TDD	TDD	10	6	Note 3	4 ZP-CSI- RS	MCS.22	10	1	
RC.19 TDD	TDD	10	41	Note3	4 ZP-CSI- RS	MCS.23	10	1	Note 11
					Non CSI-RS	MCS.24			
RC.20 TDD	TDD	10	50	Note3	2 CSI-RS, 4 ZP-CSI- RS	MCS.25	10	1	
1 CRS Port	+ CSI-RS	+ CSI-IM							
					Non CSI-	MCS.3			
1 CRS Port	+ CSI-RS	+ CSI-IM	50	-	RS/IM CSI-	MCS.3	8	1	
RC.13 FDD	FDD	10		-	RS/IM CSI- RS/IM Non CSI-				
			50	- Note 3	RS/IM CSI- RS/IM Non CSI- RS/IM CSI-	N/A	8	1	
RC.13 FDD	FDD	10		- Note 3	RS/IM CSI- RS/IM Non CSI- RS/IM	N/A MCS.3			
RC.13 FDD	FDD	10		- Note 3	RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM Non	N/A MCS.3			
RC.13 FDD	FDD	10		- Note 3	RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM CSI- RS/IM Von CSI-RS 4 CSI-RS,	N/A MCS.3 N/A MCS.5			
RC.13 FDD RC.13 TDD 2 CRS Port	FDD TDD + CSI-RS	10 10 + CSI-IM	50		RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM Non CSI- RS/IM	N/A MCS.3 N/A	10	1	
RC.13 FDD RC.13 TDD 2 CRS Port	FDD TDD + CSI-RS	10 10 + CSI-IM	50		RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM ON CSI- RS/IM Von CSI-RS 4 CSI-RS, 1 CSI process Non	N/A MCS.3 N/A MCS.5	10	1	
RC.13 FDD RC.13 TDD 2 CRS Port	FDD TDD + CSI-RS	10 10 + CSI-IM	50		RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM Non CSI- RS/IM A CSI-RS 1 CSI process Non CSI-RS 8 CSI-RS,	N/A MCS.3 N/A MCS.5 MCS.8	10	1	
RC.13 FDD RC.13 TDD 2 CRS Port RC.10 FDD	FDD TDD + CSI-RS FDD	10 10 + CSI-IM	50	-	RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM Non CSI-RS 4 CSI-RS, 1 CSI process Non CSI-RS 8 CSI-RS, 1 CSI process	N/A MCS.3 N/A MCS.5 MCS.8	8	1	
RC.13 FDD RC.13 TDD 2 CRS Port RC.10 FDD RC.10 TDD	FDD TDD + CSI-RS FDD TDD	10 10 + CSI-IM 10	50	-	RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM Non CSI-RS 4 CSI-RS, 1 CSI process Non CSI-RS 1 CSI-RS Non CSI-RS Non CSI-RS	N/A MCS.3 N/A MCS.5 MCS.8	8	1 1	
RC.13 FDD RC.13 TDD 2 CRS Port RC.10 FDD	FDD TDD + CSI-RS FDD	10 10 + CSI-IM	50	-	RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM OSI- RS/IM Non CSI-RS 4 CSI-RS, 1 CSI process Non CSI-RS 8 CSI-RS, 1 CSI process Non CSI-RS 1 CSI RS/IM CSI- RS/IM	N/A MCS.3 N/A MCS.5 MCS.8 MCS.5 MCS.9	8	1	
RC.13 FDD RC.13 TDD 2 CRS Port RC.10 FDD RC.10 TDD	FDD TDD + CSI-RS FDD TDD	10 10 + CSI-IM 10	50	-	RS/IM CSI- RS/IM Non CSI- RS/IM CSI- RS/IM OSI- RS/IM Non CSI-RS 4 CSI-RS, 1 CSI process Non CSI-RS 8 CSI-RS, 1 CSI process Non CSI-RS 1 CSI Process Non CSI-RS 1 CSI Process Non CSI-RS 1 CSI Process Non CSI- RS/IM CSI-	N/A MCS.3 N/A MCS.5 MCS.8 MCS.5 MCS.9	8	1 1	

Note 1: 3 symbols allocated to PDCCH.

Note 2: For FDD only subframes 1, 2, 3, 4, 6, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.

Note 3: TDD UL-DL configuration as specified in the individual tests.

Note 4: For TDD when UL-DL configuration 1 is used only subframes 4 and 9 are allocated to avoide PBCH and synchronizaiton signal overhead.

Note 5: For TDD when UL-DL configuration 2 is used only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead.

Note 6: Centered within the Transmission Bandwidth Configuration (Figure 5.6-1).

Note 7: Only subframes 2, 3, 4, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.

Note 8: Allocate PDSCH on 5th and 6th PRBs within a subband.

Note 9: The number of HARQ processes is 10 for TDD UL/DL configuration 2 and 7 for TDD UL/DL configuration 1.

Note 10: The downlink subframes are scheduled at the 1st, 2nd, 8th, 9th, 16th, 17th, 18th, 24th, 26th, 32nd, 33rd, 34th subframes every 40ms. Information bit payload is available if downlink subframe is scheduled.(starting from 0th subframe)

Note 11: 41 resource blocks (RB0-RB20 and RB30-RB49) are allocated in subframe 0 and 5 in RC.19 TDD.

Table A.4-1a: Void

Table A.4-1b: Void

Table A.4-1c: Void

Table A.4-1d: Void

Table A.4-1e: Void

Table A.4-2: Void

Table A.4-2a: Void

Table A.4-2b: Void

Table A.4-2c: Void

Table A.4-2d: Void

Table A.4-2e: Void

Table A.4-3: Void

Table A.4-3a: Void

Table A.4-3b: Void

Table A.4-3c: Void

Table A.4-3d: Void

Table A.4-3e: Void

Table A.4-3f: Void

Table A.4-3g: Void

Table A.4-3h: Void

Table A.4-3i: Void

Table A.4-3j: Void

Table A.4-3k: Void

Table A.4-3I: Void

Table A.4-3m: Void

Table A.4-4: Void

Table A.4-4a: Void

Table A.4-4b: Void

Table A.4-5: Void

Table A.4-5a: Void

Table A.4-5b: Void

Table A.4-6: Void

Table A.4-6a: Void

Table A.4-6b: Void

Table A.4-6c: Void

Table A.4-6d: Void

Table A.4-6e: Void

Table A.4-6f: Void

Table A.4-7: Void

Table A.4-8: Void

Table A.4-9: Void

Table A.4-10: Void

Table A.4-11: Void

Table A.4-12: Void

Table A.4-13: Mapping of CQI Index to Modulation coding scheme (MCS)

CQI	Index		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Target Co	oding R	Rate	00R	0.0762	0.1172	0.1885	0.3008	0.4385	0.5879	0.3691	0.4785	0.6016	0.4551 0.6504 0.7539 0.8525 0.9258				0.9258	Notes	
Mode	ulation		OOR		ı	QP	SK	ı	ı		16QAM	·			640	QAM		I.	
MCS Scheme	PRB	Available RE-s									Imcs	6							
MCS.1	50	6300	DTX	0	0	2	4	6	8	11	13	16	18	21	23	25	27	27	
MCS.2	50	6000	DTX	0	0	2	4	6	8	11	13	15	18	20	22	24	26	27	
MCS.3	50	5700	DTX	0	0	2	4	6	8	10	13	15	17	19	21	23	25	26	
MCS.4	50	5600	DTX	0	0	2	4	6	7	10	12	14	17	19	21	23	25	26	
MCS.5	50	5400	DTX	0	0	2	3	5	7	10	12	14	17	19	21	23	24	25	
MCS.6	50	5300	DTX	0	0	1	3	5	7	10	12	14	17	19	21	22	24	25	
MCS.7	50	5200	DTX	0	0	1	3	5	7	10	12	14	17	18	20	22	24	25	
MCS.8	50	5000	DTX	0	0	1	3	5	7	10	12	13	17	18	20	22	23	24	
MCS.9	50	4800	DTX	0	0	1	3	5	7	10	12	13	17	18	20	22	23	24	
MCS.10	6	756	DTX	0	0	2	4	6	8	11	13	16	19	21	23	25	27	27	
MCS.11	6	684	DTX	0	0	2	4	6	8	11	13	14	17	20	21	23	25	27	
MCS.12	6	672	DTX	0	0	1	4	6	8	10	12	14	17	19	21	23	25	26	
MCS.13	6	648	DTX	0	0	1	3	5	7	10	12	14	17	19	21	22	24	25	
MCS.14	25	3150	DTX	0	0	2	4	6	8	11	13	16	18	21	23	25	27	27	
MCS.15	15	1890	DTX	0	0	2	4	6	8	11	13	16	18	21	23	25	27	27	
MCS.16	15	1800	DTX	0	0	2	4	6	8	11	13	15	18	20	22	24	26	27	
MCS.17	3	378	DTX	0	1	2	5	7	9	12	13	16	19	21	23	25	27	27	
MCS.18	50	5800	DTX	0	0	2	4	6	8	11	13	15	17	20	22	23	26	27	
MCS.19	6	624	DTX	0	0	1	3	5	7	10	12	14	17	18	20	22	24	25	
MCS.20	2	252	DTX	0	0	2	4	6	8	11	13	16	19	21	23	23	23	23	
MCS.21	6	696	DTX	0	0	2	4	6	8	11	13	15	18	20	21	24	25	27	

MCS.22	6	624	DTX	0	0	1	3	5	7	10	12	14	15	19	20	22	24	24	
MCS.23	41	4264	DTX	0	0	1	3	5	7	10	12	14	15	18	20	22	24	24	
MCS.24	50	5400	DTX	0	0	2	3	5	7	10	12	14	15	19	21	23	24	25	
MCS.25	50	5100	DTX	0	0	1	3	5	7	8	12	13	15	18	20	22	23	24	

Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].

Note 2: 3 symbols allocated to PDCCH.

Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement except for [MCS.23]. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions.

Table A.4-14: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS indx Table 2 and 4-bit CQI Table 2 are used)

С	QI Inde	x	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Target	Coding	g Rate	OOR	0.0762	0.1885	0.4385	0.3691	0.4785	0.6016	0.4551	0.5537	0.6504	0.7539	0.6394	0.6943	0.7783	0.8643	0.9258	Notes
Me	odulatio	n	OOR		QPSK		1	16QAM			64C	MAQ			:	256QAN	Л	•	
MCS Scheme	PRB	Available RE-s								Imcs	3								
MCS.1A	50	6300	DTX	0	1	3	5	7	10	11	14	16	18	20	22	24	26	26	
MCS.1B	100	12600	DTX	0	1	3	5	7	10	11	14	15	18	20	22	24	26	26	

Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].

Note 2: 3 symbols allocated to PDCCH.

Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions.

Table A.4-15: Mapping of CQI Index to Modulation coding scheme (Modulation and TBS indx Table 2 and 4-bit CQI Table 2 are used)

С	QI Inde	х	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Target	Codinç	g Rate	OOR	0.0762	0.1885	0.4385	0.3691	0.4785	0.6016	0.6826	0.5537	0.6504	0.7539	0.8525	0.6943	0.7783	0.8643	0.9258	Notes
Mo	odulatio	on	OOR		QPSK			16Q	AM	•		64C	MAQ	•		256	QAM		
MCS Scheme	PRB	Available RE-s								Imcs	3								
MCS.11A	6	684	DTX	0	1	3	5	7	8	10	13	14	16	18	20	22	24	25	
MCS.12A	6	672	DTX	0	1	3	5	6	8	10	12	14	16	18	20	22	24	25	
MCS.11B	8	912	DTX	0	1	3	5	7	9	10	13	14	16	18	19	22	24	26	
MCS.12B	8	896	DTX	0	1	3	5	6	8	10	12	14	16	18	19	22	24	25	

Note 1: Mapping between Imcs and TBS according to Tables 7.1.7.1-1 and 7.1.7.2.1-1 in TS 36.213 [6].

Note 2: 3 symbols allocated to PDCCH.

Note 3: Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions.

A.5 OFDMA Channel Noise Generator (OCNG)

A.5.1 OCNG Patterns for FDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test) and/or allocations used for MBSFN. The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level (γ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i _RA / OCNG _RA = PDSCH_i _RB / OCNG _RB$$

where γ_i denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels γ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a constant transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH_RA/RB and PHICH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

For the performance requirements of UE with the CA capability, the OCNG patterns apply for each CC.

A.5.1.1 OCNG FDD pattern 1: One sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

Table A.5.1.1-1: OP.1 FDD: One sided dynamic OCNG FDD Pattern

	Relative power level γ_{PRB} [dB]								
0	5	1 – 4, 6 – 9	PDSCH						
	Allocation		Data						
First unallocated PRB	First unallocated PRB	First unallocated PRB]						
Last unallocated PRB	Last unallocated PRB	Last unallocated PRB							
Last unanocated 1 ND	Last unallocated PRB Last unallocated PRB								
0	0	0	Note 1						

- Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
- Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.1.2 OCNG FDD pattern 2: Two sided dynamic OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{_{\it PR}}-1$.

Table A.5.1.2-1: OP.2 FDD: Two sided dynamic OCNG FDD Pattern

F	Relative power level γ_{PRB} [dB]							
	Subframe							
0	5	1 – 4, 6 – 9						
	Allocation		PDSCH Data					
0 – (First allocated PRB-1)	0 – (First allocated PRB-1)	0 – (First allocated PRB-1)	1 20011 2414					
and	and	and						
(Last allocated PRB+1) –	(Last allocated PRB+1) –	(Last allocated PRB+1) –						
$(N_{RB}-1)$								
0	0	0	Note 1					

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.1.3 OCNG FDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.1.3-1: OP.3 FDD: OCNG FDD Pattern 3

A.U	Re	lative power	evel $\gamma_{{\scriptscriptstyle PRB}}$ [d	B]		
Allocation		Subfi	PDSCH Data	PMCH Data		
$n_{\it PRB}$	0	5	4, 9	1 – 3, 6 – 8	Dutu	Dutu
1 – 49	0	0 (Allocation: all empty PRB-s)	0	N/A	Note 1	N/A
0 – 49	N/A	N/A	N/A	0	N/A	Note 2

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot. The parameter γ_{PRB} is used to scale the power of PMCH.

Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A: Not Applicable

A.5.1.4 OCNG FDD pattern 4: One sided dynamic OCNG FDD pattern for MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

Table A.5.1.4-1: OP.4 FDD: One sided dynamic OCNG FDD Pattern for MBMS transmission

		Re	lative power I	evel $\gamma_{\it PRB}$ [dB]		
Alloca			Subfr	ame	PDSCH Data	PMCH Data
n_{PP}	RB	0, 4, 9	5	1 – 3, 6 – 8	Dutu	Dutu
First unal PR – Last unal PR	B	0	0 (Allocation: all empty PRB-s)	N/A	Note 1	N/A
First unal PR – Last unal PR	B	N/A	N/A	N/A	N/A	Note 2
Note 1:				ssigned to an arbitrary numb ransmitted over the OCNG F		
	uncorrel	ated pseudo ra	ndom data, wh	nich is QPSK modulated. The	e paramete	er $\gamma_{{\scriptscriptstyle PRB}}$ is
Note 2:	each PRB shall be uncorrelated with data in other PRBs over th measurement. The MBSFN data shall be QPSK modulated. PM contain cell-specific Reference Signals only in the first symbol o				period of and subframe	ny es shall
	parameter γ_{PRB} is used to scale the power of PMCH.			ower of PMCH.		

Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

N/A: Not Applicable

A.5.1.5 OCNG FDD pattern 5: One sided dynamic 16QAM modulated OCNG FDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of DL sub-frames, when the unallocated area is continuous in the frequency domain (one sided).

Table A.5.1.5-1: OP.5 FDD: One sided dynamic 16QAM modulated OCNG FDD Pattern

		Relative power level $\gamma_{{\scriptscriptstyle PRB}}$ [dl	3]	
		Subframe		
	0	5	1 – 4, 6 – 9	PDSCH
		Allocation		Data
First	unallocated PRB	First unallocated PRB	First unallocated PRB	
Last (unallocated PRB	Last unallocated PRB	Last unallocated PRB	
	0	0	0	Note 1
Note 1:			arbitrary number of virtual UEs wit PDSCHs shall be uncorrelated ps	
	data, which is 16QA	AM modulated. The parameter γ	$_{PRB}$ is used to scale the power of ${ m F}$	PDSCH.
Note 2:			I in the test, the OCNG shall be tra RS according to transmission mod	
	Delay CDD). The pa	arameter $\gamma_{\scriptscriptstyle PRB}$ applies to each a	intenna port separately, so the tra	nsmit power is

A.5.1.6 OCNG FDD pattern 6: dynamic OCNG FDD pattern when user data is in 2 non-contiguous blocks

equal between all the transmit antennas with CRS used in the test. The antenna transmission

modes are specified in section 7.1 in 3GPP TS 36.213.

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in two parts by the first allocated block). The second allocated block ends with PRB $N_{RB}-1$.

Table A.5.1.6-1: OP.6 FDD: OCNG FDD Pattern when user data is in 2 non-contiguous blocks

F	Relative power level $\gamma_{\scriptscriptstyle PRB}$ [dB]								
	Subframe								
0	0 5 1-4,6-9								
	Allocation								
0 – (First allocated PRB of	0 – (First allocated PRB of	0 – (First allocated PRB of	PDSCH Data						
first block -1)	first block -1)	first block -1)							
and	and	and							
(Last allocated PRB of first	(Last allocated PRB of first	(Last allocated PRB of first							
block +1) - (First allocated	block +1) - (First allocated	block +1) - (First allocated							
PRB of second block -1)									
0	0	Note 1							
Note 1: These physical res	e 1: These physical resource blocks are assigned to an arbitrary number of vi								
LIF, the detections	mitted aver the OCNC DDCCH	s aball be uncorrelated popula	random data which is ODCK						

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.1.7 OCNG FDD pattern 7: dynamic OCNG FDD pattern when user data is in multiple non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data, EPDCCH or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in

multiple parts by the M allocated blocks for data transmission). The m-th allocated block starts with RPB $N_{Start,m}$ and ends with PRB $N_{End,m}-1$, where $m=1,\ldots,M$. The system bandwidth starts with RPB 0 and ends with $N_{RR}-1$.

Table A.5.1.7-1: OP.7 FDD: OCNG FDD Pattern when user data is in multiple non-contiguous blocks

F	Relative power level $\gamma_{\it PRB}$ [dE	3]				
	Subframe					
0	5	1 – 4, 6 – 9				
	Allocation					
0 – (PRB N _{Start,1} –1)	0 – (PRB <i>N</i> _{Start,1} –1)	0 – (PRB <i>N</i> _{Start,1} –1)				
$(PRB N_{End,(m-1)}) - (PRB$	$(PRBN_{End,(m-1)}) - (PRB$	$(PRBN_{End,(m-1)}) - (PRB$	PDSCH Data			
$N_{Start,m}-1)$	$N_{Start,m}-1$)	$N_{Start,m}-1)$				
 (PRB N _{End,M}) – (PRB	(PRB N _{End,M}) – (PRB	(PRB N _{End,M}) – (PRB				
$N_{RB}-1$)	$N_{RB}-1$)	$N_{RB}-1$)				
0	0	0	Note 1			

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.1.8 OCNG FDD pattern 8: One sided dynamic OCNG FDD pattern for TM10 transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

Table A.5.1.1-1: OP.8 FDD: One sided dynamic OCNG FDD Pattern

	Relative power level $\gamma_{{\scriptscriptstyle PRB}}$ [d	B]			
Subframe					
0 5		1 – 4, 6 – 9	PDSCH Data		
	Allocation				
First unallocated PRB	First unallocated PRB	First unallocated PRB			
 Last unallocated PRB 	– Last unallocated PRB	Last unallocated PRB			
0	0	0	Note 1,2,3		

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.

Note 2: The OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode10. The the transmit power is equal between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

Note 3: The detailed test set-up for TM10 transmission i.e PMI configuration is specified to each test case.

A.5.2 OCNG Patterns for TDD

The following OCNG patterns are used for modelling allocations to virtual UEs (which are not under test). The OCNG pattern for each sub frame specifies the allocations that shall be filled with OCNG, and furthermore, the relative power level of each such allocation.

In each test case the OCNG is expressed by parameters OCNG_RA and OCNG_RB which together with a relative power level (γ) specifies the PDSCH EPRE-to-RS EPRE ratios in OFDM symbols with and without reference symbols, respectively. The relative power, which is used for modelling boosting per virtual UE allocation, is expressed by:

$$\gamma_i = PDSCH_i RA/OCNG RA = PDSCH_i RB/OCNG RB,$$

where γ_i denotes the relative power level of the *i:th* virtual UE. The parameter settings of OCNG_RA, OCNG_RB, and the set of relative power levels γ are chosen such that when also taking allocations to the UE under test into account, as given by a PDSCH reference channel, a transmitted power spectral density that is constant on an OFDM symbol basis is targeted.

Moreover the OCNG pattern is accompanied by a PCFICH/PDCCH/PHICH reference channel which specifies the control region. For any aggregation and PHICH allocation, the PDCCH and any unused PHICH groups are padded with resource element groups with a power level given respectively by PDCCH_RA/RB and PHICH_RA/RB as specified in the test case such that a total power spectral density in the control region that is constant on an OFDM symbol basis is targeted.

A.5.2.1 OCNG TDD pattern 1: One sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

Table A.5.2.1-1: OP.1 TDD: One sided dynamic OCNG TDD Pattern

Relative power level $\gamma_{\scriptscriptstyle PRB}$ [dB]							
Subframe (only if available for DL)							
3, 4, 7, 8, 9 0 5 and 6 (as normal subframe) Note 2			1 and 6 (as special subframe) ^{Note 2}	PDSCH Data			
	Allo	cation					
First unallocated PRB	First unallocated PRB	First unallocated PRB	First unallocated PRB				
Last unallocated PRB	Last unallocated PRB	Last unallocated PRB	Last unallocated PRB				
0	0	0	0	Note 1			
Note 1: Those physic	and resource blooks are as	acianad ta an arbitrary num	مرم والمناس والمالية والمالية والمالية	- DDCCII			

- Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
- Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211
- Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.2.2 OCNG TDD pattern 2: Two sided dynamic OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is

discontinuous in frequency domain (divided in two parts by the allocated area – two sided), starts with PRB 0 and ends with PRB $N_{\rm RB}$ –1.

Table A.5.2.2-1: OP.2 TDD: Two sided dynamic OCNG TDD Pattern

Relative power level $\gamma_{\it PRB}$ [dB]					
	Subframe (only if	f available for DL)		Data	
0	5	3, 4, 6, 7, 8, 9	1,6		
		(6 as normal subframe)	(6 as special subframe)		
	Alloc	ation			
0 –	0 –	0 –	0 –		
(First allocated PRB-1)	(First allocated PRB-1)	(First allocated PRB-1)	(First allocated PRB-1)		
and	and	and	and		
(Last allocated PRB+1) -	(Last allocated PRB+1) –	(Last allocated PRB+1) –	(Last allocated PRB+1) -		
$(N_{RB}-1)$	$(N_{RB}-1)$	$(N_{RB}-1)$	$(N_{RB}-1)$		
0	0	0	0	Note 1	

- Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
- Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36 211
- Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.2.3 OCNG TDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.2.3-1: OP.3 TDD: OCNG TDD Pattern 3 for 5ms downlink-to-uplink switch-point periodicity

		Relative power					
Allocation		Subf	rame	PDSCH Data	PMCH Data		
$n_{\it PRB}$	0	5	4, 9 ^{Note 2}	1, 6			
1 – 49	0	0 (Allocation: all empty PRB-s)	N/A	0	Note 1	N/A	
0 – 49	N/A	N/A	0	N/A	N/A	Note 3	

- Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
- Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.
- Note 3: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals.
- Note 4: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.
- N/A Not Applicable

A.5.2.4 OCNG TDD pattern 4: One sided dynamic OCNG TDD pattern for MBMS transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided) and MBMS performance is tested.

Table A.5.2.4-1: OP.4 TDD: One sided dynamic OCNG TDD Pattern for MBMS transmission

		Relative power	level $\gamma_{\it PRB}$ [dB]				
Allocation		Subframe (only for DL)		PDSCH Data	PMCH Data	
$n_{\it PRB}$	0 and 6 (as normal subframe)	1 (as special subframe)	5	3, 4, 7 – 9	r DOCH Data		
First unallocate d PRB - Last unallocate d PRB	0	0 (Allocation: all empty PRB-s of DwPTS)	0 (Allocation: all empty PRB-s)	N/A	Note 1	N/A	
First unallocate d PRB - Last unallocate d PRB	N/A	N/A	N/A	N/A	N/A	Note2	
		ource blocks are a transmitted over t	•	•		•	

- which is QPSK modulated. The parameter $\gamma_{\it PRB}$ is used to scale the power of PDSCH.
- Note 2: Each physical resource block (PRB) is assigned to MBSFN transmission. The data in each PRB shall be uncorrelated with data in other PRBs over the period of any measurement. The MBSFN data shall be QPSK modulated. PMCH symbols shall not contain cell-specific Reference Signals.
- Note 3: If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.
- N/A Not Applicable

A.5.2.5 OCNG TDD pattern 5: One sided dynamic 16QAM modulated OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the sub-frames available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

Table A.5.2.5-1: OP.5 TDD: One sided dynamic 16QAM modulated OCNG TDD Pattern

		Relative power	level $\gamma_{\it PRB}$ [dB]				
Subframe (only if available for DL)							
	0 5 and		0		3, 4, 7, 8, 9 and 6 (as normal subframe) ^{Note 2}	1 and 6 (as special subframe) ^{Note 2}	PDSCH Data
		Allo	cation				
First una	llocated PRB	First unallocated PRB -	First unallocated PRB -	First unallocated PRB -			
Last unal	llocated PRB	Last unallocated PRB	Last unallocated PRB	Last unallocated PRB			
	0	0	0	0	Note 1		
Note 1:			ssigned to an arbitrary num ne OCNG PDSCHs shall b				
	which is 16Q	AM modulated. The para	meter $\gamma_{\it PRB}$ is used to scale	e the power of PDSCH.			
Note 2:	Subframes a 3GPP TS 36		ion depends on the Uplink-	Downlink configuration in	Table 4.2-2 in		
Note 3:			CRS are used in the test, to as with CRS according to				
	CDD). The parameter $\gamma_{\scriptscriptstyle PRB}$ applies to each antenna port separately, so the transmit power is equal						
		he transmit antennas with section 7.1 in 3GPP TS 36	n CRS used in the test. The 6.213.	e antenna transmission m	odes are		

A.5.2.6 OCNG TDD pattern 6: dynamic OCNG TDD pattern when user data is in 2 non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the subframes available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is discontinuous in frequency domain (divided in two parts by the first allocated block). The second allocated block ends with PRB $N_{\rm RB}-1$.

Table A.5.2.6-1: OP.6 TDD: OCNG TDD Pattern when user data is in 2 non-contiguous blocks

Relative power level γ_{PRB} [dB]					
	Subframe (only it	f available for DL)		Data	
0	5	3, 4, 6, 7, 8, 9	1,6		
		(6 as normal subframe)	(6 as special subframe)		
	Alloc	ation			
0 – (First allocated PRB	0 – (First allocated PRB	0 – (First allocated PRB	0 – (First allocated PRB		
of first block -1)	of first block -1)	of first block -1)	of first block -1)		
and	and	and	and		
(Last allocated PRB of	(Last allocated PRB of	(Last allocated PRB of	(Last allocated PRB of		
first block +1) - (First	first block +1) - (First	first block +1) - (First	first block +1) - (First		
allocated PRB of second	allocated PRB of second	allocated PRB of second	allocated PRB of second		
block -1)	block -1)	block -1)	block -1)		
0	0	0	0	Note 1	

- Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
- Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211
- Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.2.7 OCNG TDD pattern 7: dynamic OCNG TDD pattern when user data is in multiple non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data, EPDCCH or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in multiple parts by the M allocated blocks for data transmission). The m-th allocated block starts with RPB $N_{Start,m}$ and ends with PRB $N_{End,m}-1$, where m=1,...,M. The system bandwidth starts with RPB 0 and ends with $N_{RB}-1$.

Table A.5.2.7-1: OP.7 TDD: OCNG TDD Pattern when user data is in multiple non-contiguous blocks

Relative power level $\gamma_{\scriptscriptstyle PRB}$ [dB]					
	Subframe (only it	f available for DL)		Data	
0	0 5 3, 4, 6, 7, 8, 9 1,6 (6 as normal subframe) (6 as special subframe) Note 2				
	Alloc	ation]	
$0 - (PRB N_{Start,1} - 1)$	$0 - (PRB N_{Start,1} - 1)$	$0 - (PRB N_{Start,1} - 1)$	$0 - (PRB N_{Start,1} - 1)$		
$(PRB N_{End,(m-1)}) -$	$(PRB N_{End,(m-1)}) -$	$(PRB N_{End,(m-1)}) -$	$(PRB N_{End,(m-1)}) -$		
(PRB $N_{Start,m} - 1$)	(PRB $N_{Start,m} - 1$)	(PRB $N_{Start,m} - 1$)	(PRB $N_{Start,m} - 1$)		
$(PRB N_{End,M}) - (PRB$	$(PRB N_{End,M}) - (PRB$	$(PRB N_{End,M}) - (PRB$	$(PRB N_{End,M}) - (PRB$		
$N_{RB}-1$)	$N_{RB}-1$)	$N_{RB}-1$)	$N_{RB}-1$)		
0	0	0	0	Note 1	

- Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.
- Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211
- Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

A.5.2.8 OCNG TDD pattern 8: One sided dynamic OCNG TDD pattern for TM10 transmission

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the DL sub-frames, when the unallocated area is continuous in frequency domain (one sided).

	Relative power level $\gamma_{\it PRB}$ [d	IB]	
	Subframe		
0	0 5 1-4,6-9		PDSCH
	Allocation	•	- Data
First unallocated PRB	First unallocated PRB	First unallocated PRB	
_	_	_	
Last unallocated PRB	Last unallocated PRB	Last unallocated PRB	
0	0	0	Note 1,2,3

Table A.5.1.1-1: OP.8 TDD: One sided dynamic OCNG TDD Pattern

- These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH Note 1: per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter $\gamma_{\it PRB}$ is used to scale the power of PDSCH.
- Note 2: The OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode10. The the transmit power is equal between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.

The detailed test set-up for TM10 transmission i.e PMI configuration is specified to each test case. Note 3:

Sidelink reference measurement channels A.6

A.6.1General

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation

- 1. Calculate the number of channel bits $N_{\rm ch}$ that can be transmitted during the first transmission of a given subframe.
- 2. Find A such that the resulting coding rate is as close to R as possible, that is,

$$\min |R - (A + 24*(N_{CB} + 1))/N_{ch}|, where N_{CB} = \begin{cases} 0, & \text{if } C = 1\\ C, & \text{if } C > 1 \end{cases}$$

subject to

- a) A is a valid TB size according to section 7.1.7 of TS 36.213 [6] assuming an allocation of N_{RB} resource blocks.
- b) C is the number of Code Blocks calculated according to section 5.1.2 of TS 36.212 [5].
- 3. If there is more than one A that minimizes the equation above, then the larger value is chosen per default and the chosen code rate should not exceed 0.93.

A.6.2Reference measurement channel for receiver characteristics

For ProSe Direct Discovery, Table A.6.2-1 is applicable for measurements on the Receiver Characteristics (clause 7) including the requirements of subclause 7.4D (Maximum input level).

For ProSe Direct Communication, Table A.6.2-2 is applicable for measurements on the Receiver Characteristics (clause 7) with the exception of subclause 7.4D (Maximum input level). Tables A.6.2-3, A.6.2-4, are applicable for subclause 7.4D (Maximum input level).

Table A.6.2-1: Fixed Reference measurement channel for ProSe Direct Discovery receiver requirements and maximum input level

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				2	2	2	2
Subcarriers per resource block				12	12	12	12
Allocated subframes per Discovery period				1	1	1	1
DFT-OFDM Symbols per subframe (see				11	11	11	11
note)							
Modulation				QPSK	QPSK	QPSK	QPSK
Transport Block Size				232	232	232	232
Transport block CRC	Bits			24	24	24	24
Maximum number of HARQ transmissions				1	1	1	1
Binary Channel Bits (see note)	Bits			528	528	528	528
Max. Throughput averaged over 1 Discovery	kbps			0.725	0.725	0.725	0.725
period of 320ms							
UE Category				≥ 1	≥ 1	≥ 1	≥ 1

NOTE1: PSDCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.

NOTE2: Throughput is 232 bits per Discovey period. The discovery period is configured as 320ms in the test.

Table A.6.2-2: Fixed Reference measurement channel for ProSe Direct Communication receiver requirements

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	50		
Subcarriers per resource block				12	12		
Packets per SA period				1	1		
Modulation				QPSK	QPSK		
Transport Block Size				2216	4392		
Transport block CRC	Bits			24	24		
Maximum number of HARQ transmissions				4	4		
Binary Channel Bits	Bits			7200	14400		
Max. Throughput averaged over 1 SA period	kbps			55.4	109.8		
of 40ms							
UE Category				≥ 1	≥ 1		

NOTE 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.

NOTE 2: Throughput (in kbps) will depend on SA period configuration

Table A.6.2-3: Fixed Reference measurement channel for ProSe Direct Communication for maximum input power for UE categories 2-8

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	50		
Subcarriers per resource block				12	12		
Packets per SA period				1	1		
Modulation				16QAM	16QAM		
Transport Block Size				9912	18336		
Transport block CRC	Bits			24	24		
Maximum number of HARQ				4	4		
transmissions							
Binary Channel Bits	Bits			14400	28800		
Max. Throughput averaged over 1 SA period of 40ms	kbps			247.8	458.4		

NOTE 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.

NOTE 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

NOTE 3: Throughput (in kbps) will depend on SA period configuration

Table A.6.2-4: Fixed Reference measurement channel for ProSe Direct Communication for maximum input power for UE category 1

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				25	24		
Subcarriers per resource block				12	12		
Packets per SA period				1	1		
Modulation				16QAM	16QAM		
Transport Block Size				9912	10296		
Transport block CRC	Bits			24	24		
Maximum number of HARQ transmissions				4	4		
Binary Channel Bits	Bits			14400	13824		
Max. Throughput averaged over 1 SA period of 40ms	kbps			247.8	257.4		

NOTE 1: For PSSCH transmission, the last symbol shall be punctured as per TS 36.211.

NOTE 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

NOTE 3: Throughput (in kbps) will depend on SA period configuration

A.6.3 Reference measurement channels for PSDCH performance requirements

Table A.6.3-1: Fixed Reference measurement channel for PSDCH performance requirement

Parameter	Unit			Val	ue		
Reference channel				D.1 FDD /	D.1 TDD)	
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks				2	2	2	2
Subcarriers per resource block				12	12	12	12
DFT-OFDM Symbols per subframe (NOTE 1)				11	11	11	11
Modulation				QPSK	QPSK	QPSK	QPSK
Transport Block Size				232	232	232	232
Transport block CRC	Bits			24	24	24	24
Binary Channel Bits (NOTE 1)	Bits			528	528	528	528
Max. Throughput averaged over 1 Discovery	kbps			0.725	0.725	0.725	0.725
period of 320ms							
UE Category				≥ 1	≥ 1	≥ 1	≥1

NOTE1: PSDCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.

A.6.4 Reference measurement channels for PSCCH performance requirements

Table A.6.4-1: Fixed reference measurement channel for PSCCH performance requirement

	Parameter	Unit			Va	lue		
Reference ch	annel		CC.1 FDD	CC.2 FDD	CC.3 FDD	CC.4 FDD	CC.5 FDD	CC.6 FDD
Channel band	dwidth	MHz	5	10	5	10	5	10
Allocated res	ource blocks		1	1	1	1	1	1
Subcarriers p	er resource block		12	12	12	12	12	12
DFT-OFDM S (see Note 1)	Symbols per subframe		11	11	11	11	11	11
Modulation			QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Transport Blo	ck Size	Bits	41	43	41	43	41	43
	Frequency hopping flag		0	0	1	1	1	1
	RB assignment		S	Set as per PS	SCH RB all	ocation spec	ific in the tes	t
					1	(1,1)	0	(1,0)
	Hopping bits		N/A	N/A	Type 2	Type 2	Type 1	Type 1
Information					Hopping	Hopping	Hopping	Hopping
bits	Time resource pattern (I _{TRP})			8 (unles	s specified o Not)	otherwise in t e 3)	he test)	
	Modulation and coding scheme			Set as the	PSSCH MC	S specified	in the test	
	Timing advance indication			0 (unles	s specified o	therwise in t	he test)	
	Group destination ID				As set by hi	gher layers		
Transport block CRC		Bits	16	16	16	16	16	16
Maximum number of HARQ transmissions			2	2	2	2	2	2
Binary Channel Bits (see Note 1,2) B		Bits	264	264	264	264	264	264
Max. Through period (bits/so	nput averaged over one sc- c-period)		41	43	41	43	41	43

NOTE 1: PSCCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.

A.6.5 Reference measurement channels for PSSCH performance requirements

Table A.6.5-1: Fixed reference measurement channel for PSSCH performance requirement

Parameter	Unit			Value		
Reference channel		CD.1 FDD	CD.2 FDD	CD.3 FDD	CD.4 FDD	CD.5 FDD
Channel bandwidth	MHz	5 / 10	5 / 10	5	10	5 / 10
Allocated resource blocks		10	10	25	50	2
Subcarriers per resource block		12	12	12	12	12
DFT-OFDM Symbols per subframe		11	11	11	11	11
(see Note 1)		11	11	11	11	11
Modulation		QPSK	16QAM	16QAM	16QAM	QPSK
Transport Block Size		872	2536	6546	12960	328
Transport block CRC	Bits	24	24	24	24	24
Maximum number of HARQ		4	4	4	4	4
transmissions		4	4	4	4	4
Binary Channel Bits (see Note 1,2)	Bits	2640	5280	13200	26400	528
Max. Throughput averaged over one sc-period (bits/sc-period)		872	2536	6546	12960	328

NOTE 1: PSSCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.

NOTE 2: Binary channel bits per HARQ transmission.

NOTE 3: For $N_{TRP} = 8$ (FDD) and trpt-Subset = 010, $I_{TRP} = 8$ corresponds to a time repetition pattern of (1,1,0,0,0,0,0,0) as per TS 36.213.

NOTE 2: Binary channel bits per HARQ transmission.

NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Table A.6.5-2: Fixed reference measurement channel for PSSCH for maximum Sidelink processes test

Parameter	Unit	Val	lue
Reference channel		CD.6 FDD	CD.7 FDD
Channel bandwidth	MHz	5	10
Allocated resource blocks		25	50
Subcarriers per resource block		12	12
DFT-OFDM Symbols per subframe (see Note 1)		11	11
Modulation		16QAM	16QAM
Transport Block Size		15840	25456
Transport block CRC	Bits	24	24
Maximum number of HARQ transmissions		4	4
Binary Channel Bits (see Note 1,2)	Bits	13200	26400
Max. Throughput averaged over one sc-period (bits/sc-period)		15840	25456

NOTE 1: PSSCH transmissions are rate-matched for 12 DFT-OFDM symbols per subframe, and the last symbol shall be punctured as per TS 36.211.

NOTE 2: Binary channel bits per HARQ transmission.

NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

A.6.6 Reference measurement channels for PSBCH performance requirements

Table A.6.6-1: Fixed reference measurement channel for PSBCH performance requirement

Parameter	Unit	Value			
Reference channel		CP.1 FDD			
Channel bandwidth	MHz	5 / 10			
Allocated resource blocks		6			
Subcarriers per resource block		12			
DFT-OFDM Symbols per subframe		7			
(see Note 1)		7			
Modulation		QPSK			
Transport Block Size		40			
Transport block CRC	Bits	16			
Maximum number of HARQ transmissions		1			
Binary Channel Bits (see Note 1,2)	Bits	1008			
Max. Throughput averaged over 40ms kbps 1					
NOTE 1: PSBCH transmissions are rate-matched for 8 DFT-OFDM symbols per					
subframe, and the last symbol shall be punctured as per TS 36.211.					

A.7 Sidelink reference resource pool configurations

A.7.1 Reference resource pool configurations for ProSe Direct Discovery demodulation tests

A.7.1.1 FDD

Table A.7.1.1-1: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #1-FDD)

I	nformation Element	·	Value
discRxPool	cp-Len		Normal
	discPeriod		rf32
	numRetx		0
	numRepetition		1
	tf-ResourceConfig	prb-Num	12
		prb-Start	0
		prb-End	23
		offsetIndicator	160
		subframeBitmap	10000000
			00000000
			00000000
			00000000
			00000000
	txParameters		not present
	rxParameters		not present
discTxPoolCommon			not present
discTxPowerInfo			not present
SL-SyncConfig			not present
discInterFreqList			not present

Table A.7.1.1-2: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #2-FDD)

ı	nformation Element		Value
discRxPool(0)	cp-Len		Normal
	discPeriod		rf32
	numRetx		0
	numRepetition		1
	tf-ResourceConfig	prb-Num	12
	Ĭ	prb-Start	0
		prb-End	23
		offsetIndicator	150
		subframeBitmap	10000000
			00000000
			00000000
			00000000
			00000000
	txParameters		not present
	rxParameters		not present
discRxPool(1)	cp-Len		Normal
, ,	discPeriod		rf32
	numRetx		0
	numRepetition		1
	tf-ResourceConfig	prb-Num	12
		prb-Start	0
		prb-End	23
		offsetIndicator	170
		subframeBitmap	10000000
			00000000
			00000000
			00000000
			00000000
	txParameters		not present
	rxParameters	tdd-Config	not present
		syncConfigIndex	0
discTxPoolCommon			not present
discTxPowerInfo			not present
SL-SyncConfig(0)	syncCP-Len		Normal
	syncOffsetIndicator		160
	slssid		30
	txParameters		not present
	rxParamsNCell	physCellId	1
		discSyncWindow	w1
discInterFreqList			not present

Table A.7.1.1-3: ProSe Direct Discovery configuration for E-UTRA FDD (Configuration #3-FDD)

Į.	nformation Element	Value	
discRxPool(iPool), iPool = 0NPool-1	cp-Len		Normal
	discPeriod		rf32
	numRetx		3
	numRepetition		=2 if NPool > 10,
	•		=1 otherwise
	tf-ResourceConfig	prb-Num	5MHz: min{24, 2N-24*iPool} / 2
			10MHz: 25
			15MHz: min{74, 2N-74*iPool} / 2
			20MHz: 50
		prb-Start	0
		prb-End	5 MHz: min{24, 2N-24*iPool} - 1
			10 MHz: 49
			15 MHz: min{74, 2N-74*iPool} - 1
			20 MHz: 99
		offsetIndicator	160
		subframeBitmap	a(0), a(1),, a(39), s.t.
			a(i * NPool + iPool) = 1, i = 0,,K;
			a(k) = 0 otherwise
			where
			K = 1 is NPool > 10, $K = 3$ otherwise
	txParameters		not present
	rxParameters		not present
discTxPoolCommon			not present
discTxPowerInfo			not present
SL-SyncConfig			not present
discInterFreqList			not present

NOTE 1: The resource pool configuration description is parameterized using channel BW, number of configured resource pools (NPool), and maximum number of configured Sidelink UEs to be supported (N).

A.7.1.2 TDD

Table A.7.1.2-1: ProSe Direct Discovery configuration for E-UTRA TDD Config 0 (Configuration #1-TDD)

l	nformation Element		Value
discRxPool	cp-Len		Normal
	discPeriod		rf32
	numRetx		0
	numRepetition		1
	tf-ResourceConfig	prb-Num	12
		prb-Start	0
		prb-End	23
		offsetIndicator	163
		subframeBitmap	10000000
			00000000
			00000000
			00000000
			00000000
			00
	txParameters		not present
	rxParameters		not present
discTxPoolCommon			not present
discTxPowerInfo			not present
SL-SyncConfig			not present
discInterFreqList			not present

Table A.7.1.2-2: ProSe Direct Discovery configuration for E-UTRA TDD (Configuration #2-TDD)

	nformation Element		Value
discRxPool(iPool), iPool = 0NPool-1	cp-Len		Normal
	discPeriod		rf32
	numRetx		3
	numRepetition		=2 if NPool > 10,
			=1 otherwise
	tf-ResourceConfig	prb-Num	5MHz: min{24, 2N-24*iPool} / 2
			10MHz: 25
			15MHz: min{74, 2N-74*iPool} / 2
			20MHz: 50
		prb-Start	0
		prb-End	5 MHz: min{24, 2N-24*iPool} - 1
			10 MHz: 49
			15 MHz: min{74, 2N-74*iPool} - 1
			20 MHz: 99
		offsetIndicator	163
		subframeBitmap	a(0), a(1),, a(39), s.t.
			a(i * NPool + iPool) = 1, i = 0,,K;
			a(k) = 0 otherwise
			where
			K = 1 is NPool > 10, $K = 3$ otherwise
	txParameters		not present
	rxParameters		not present
discTxPoolCommon			not present
discTxPowerInfo			not present
SL-SyncConfig			not present
discInterFreqList			not present

NOTE 1: The resource pool configuration description is parameterized using channel BWs, number of configured resource pools (NPool), and maximum number of configured Sidelink UE to be supported (N).

A.7.2 Reference resource pool configurations for ProSe Direct Communication demodulation tests

A.7.2.1 FDD

Table A.7.2.1-1: ProSe Direct Communication pre-configuration for E-UTRAN FDD for out-of-network coverage operation (Configuration #1-FDD)

Description	Info	rmation Element / (BW config	juration)		Value (5MHz)	Value (10MHz)
SyncOffsetIndicator2 2 33 0 0 0 (-110dBm / 15kHz) 15kHz) filterCoefficient 5vyncRefMinHyst dB0 syncRefDiffHyst dB0 syncRefDiffHyst dB0 syncRefDiffHyst dB0 sc-Period sf40 sc-Period sc-Period sf40 sc-TF-ResourceConfig prb-Num 13 25 prb-Start 0 0 0 prb-Start 0 0 0 0 0 0 0 0 0	preconfigSync	syncCP-Len-r12			No	rmal
SyncTxParameters 23		syncOffsetIndicator1				1
SyncTxThreshOoC C-110dBm / 15kHz)		syncOffsetIndicator2				2
SyncTxThreshOoC (-110dBm / 15kHz) 15kHz) 15kHz		syncTxParameters			2	23
SyncRefMinHyst GB0						•
filterCoefficient fc0		syncTxThreshOoC			(-110	dBm /
SyncRefMinHyst SyncRefDiffHyst SyncRefDiffHyst SyncRefDiffHyst SyncRefDiffHyst Sc-CP-Len Normal Sc-CP-Len Sc-Period Sc-Period Sc-TF-ResourceConfig prb-Num 13 25 Prb-Start O O O O O O O O O						
SyncRefDiffHyst dB0 preconfigComm sc-CP-Len Sc-Period sf40 st40 sc-TF-ResourceConfig prb-Num 13 25 prb-Start 0 0 0 0 0 0 0 0 0						
Description Sc-CP-Len Sc-Period Sc-Period Sc-Period Sc-Period Sc-Period Sc-Period Sc-TF-ResourceConfig prb-Num 13 25 25 24 49 24 49 24 49 24 49 24 24		syncRefMinHyst				
Sc-Period Sf40 Sc-TF-ResourceConfig prb-Num 13 25 25 24 49 49 6 6 6 6 6 6 6 6 6					_	-
Sc-TF-ResourceConfig	preconfigComm					
prb-Start 0 0 0 0 0 0 0 0 0 0						
prb-End 24 49		sc-TF-ResourceConfig				
OffsetIndicator					_	-
subframeBitmap 00011000 00000000 00000000 00000000 000000						
subframeBitmap 00000000 00000000 00000000 00000000 data-CP-Len Normal dataHoppingConfig hoppingParameter numSubbands 504 ns2 rb-Offset 0 ue- SelectedResourceConfig data-TF- ResourceConfig prb-Num 13 25 prb-Start 0 0 0 prb-End 24 49 offsetIndicator 0 000000000 111111111 subframeBitmap 111111111			offsetIndicator			-
subframeBitmap 00000000 00000000 00000000 data-CP-Len Normal dataHoppingConfig hoppingParameter 504 numSubbands ns2 rb-Offset 0 ue- SelectedResourceConfig prb-Num 13 25 prb-Start 0 0 prb-End 24 49 offsetIndicator 0 subframeBitmap 111111111						
00000000						
00000000 0data-CP-Len			subframeBitmap			
data-CP-Len Normal dataHoppingConfig hoppingParameter 504 numSubbands ns2 rb-Offset 0 ue- data-TF- SelectedResourceConfig prb-Num 13 25 prb-Start 0 0 prb-End 24 49 offsetIndicator 0 subframeBitmap 111111111						
dataHoppingConfig hoppingParameter 504 numSubbands ns2 rb-Offset 0 ue-		100.1				
numSubbands ns2 rb-Offset 0			1 5 .			
Tb-Offset 0		dataHoppingConfig				
ue- SelectedResourceConfig data-TF- ResourceConfig prb-Num 13 25 prb-Start 0 0 prb-End 24 49 offsetIndicator 0 000000000 11111111 subframeBitmap 111111111						
SelectedResourceConfig Prb-Num 13 25						U
SelectedResourceConing Prb-Start 0 0				prb-Num	13	25
prb-End 24 49 offsetIndicator 0 00000000 11111111 subframeBitmap 11111111		SelectedResourceConfig	ResourceConfig		-	
OffsetIndicator						
00000000 11111111 subframeBitmap 11111111						
11111111 subframeBitmap 11111111				oitsetinaicator		
subframeBitmap 11111111						
				subframa Ditman		
				зирнанневшнар		
00000000						
trpt-Subset-r12 010			trnt-Subset-r12			

Table A.7.2.1-2: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #2-FDD)

Int	formation Element / (BW c	onfiguration)		Value (5MHz)	Value (10MHz)
commRxPool	sc-CP-Len			No	rmal
	sc-Period			Si	f40
	sc-TF-ResourceConfig	prb-Num		13	25
		prb-Start		0	0
		prb-End		24	49
		offsetIndicator			0
		subframeBitmap		0000 0000 0000	11100 00000 00000 00000 00000
	data-CP-Len			No	rmal
	dataHoppingConfig	hoppingParameter		5	04
		numSubbands		n	s2
		rb-Offset			0
	ue- SelectedResourceConfig	data-TF- ResourceConfig	prb-Num	13	25
			prb-Start	0	0
			prb-End	24	49
			offsetIndicator		0
			subframeBitmap	1117 1117 0000	00000 11111 11111 00000 00000
		trpt-Subset-r12			10
	rxParametersNCell	'		not p	resent
	txParameters				resent
commTxPoolNormalCommon				not present	
SL-SyncConfig				not present	

Table A.7.2.1-3: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #3-FDD)

	formation Element / (BW c	onfiguration)		Value (5MHz)	Value (10MHz)
commRxPool(0)	sc-CP-Len				mal
	sc-Period			sf	40
	sc-TF-ResourceConfig	prb-Num		13	25
	-	prb-Start		0	0
		prb-End		24	49
		offsetIndicator		()
				0011	0000
					0000
		subframeBitmap			0000
					0000
					0000
	data-CP-Len				mal
	dataHoppingConfig	hoppingParameter)4
		numSubbands			s2
		rb-Offset)
		data-TF-		')
	ue-		prb-Num	13	25
	SelectedResourceConfig	ResourceConfig	•		
			prb-Start	0	0
			prb-End	24	49
			offsetIndicator)
				0000	
					0000
			subframeBitmap		0000
				1111	1111
				0000	0000
		trpt-Subset-r12		0.	10
	rxParametersNCell			not pi	esent
	txParameters				esent
commRxPool(1)	sc-CP-Len				mal
	sc-Period			sf40	
	sc-TF-ResourceConfig	prb-Num		13	25
	30-11 - Resource Coring	prb-Nam prb-Start		0	0
		prb-Start prb-End		24	49
		offsetIndicator)
					0000
		1.6 57			0000
		subframeBitmap			0000
					0000
				0000	0000
	data-CP-Len				mal
	dataHoppingConfig	hoppingParameter)4
		numSubbands		n	s2
		rb-Offset)
	ue-	data-TF-	prb-Num	12	O.F.
	SelectedResourceConfig	ResourceConfig	ριυ-ιναιτι	13	25
			prb-Start	0	0
			prb-End	24	49
			offsetIndicator)
					1111
					0000
			subframeBitmap		1111
			amap		0000
					0000
		trpt-Subset-r12			10
	rxParametersNCell	tdd-Config	+		esent
	in didiffetersiveeli	syncConfigIndex)
	tyParamatara	aynoconnyinuex	+	,	
	txParameters				esent
commTxPoolNormalCommon	0.0.4				esent
SL-SyncConfig(0)	syncCP-Len			Nor	mal
	syncOffsetIndicator			,	1
	slssid			3	0
	txParameters				esent

rxParamsNCell	physCellId	1
	discSyncWindow	w1

Table A.7.2.1-4: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #4-FDD)

In	formation Element / (BW c	onfiguration)		Value (5MHz)	Value (10MHz)
commRxPool(0)	sc-CP-Len				rmal
	sc-Period			sf	80
	sc-TF-ResourceConfig	prb-Num		13	25
		prb-Start		0	0
		prb-End		24	49
		offsetIndicator			0
					0000
					00000
		subframeBitmap			00000
					00000
					00000
	data-CP-Len				rmal
	dataHoppingConfig	hoppingParameter			04
		numSubbands			s2
		rb-Offset			0
	ue- SelectedResourceConfig	data-TF- ResourceConfig	prb-Num	13	25
			prb-Start	0	0
			prb-End	24	49
			offsetIndicator		0
				0000	00000
				1111	1111
			subframeBitmap	0000	0000
				1111	1111
				0000	0000
		trpt-Subset-r12		0	01
	rxParametersNCell			not p	resent
	txParameters			not p	resent
commRxPool(1)	sc-CP-Len			No	rmal
	sc-Period			sf	80
	sc-TF-ResourceConfig	prb-Num		13	25
		prb-Start		0	0
		prb-End		24	49
		offsetIndicator			0
				0000)1111
				0000	0000
		subframeBitmap		0000	0000
				0000	0000
					00000
	data-CP-Len			No	rmal
	dataHoppingConfig	hoppingParameter		5	04
		numSubbands		n	s2
		rb-Offset			0
	ue- SelectedResourceConfig	data-TF- ResourceConfig	prb-Num	13	25
			prb-Start	0	0
			prb-End	24	49
			offsetIndicator		0
					00000
					00000
			subframeBitmap		1111
			'	0000	0000
					1111
		trpt-Subset-r12		0	01
	rxParametersNCell				resent
T.D. IV.	txParameters				resent
commTxPoolNormalCommon					resent
SL-SyncConfig				not p	resent

Table A.7.2.1-5: ProSe Direct Communication configuration for E-UTRA FDD (Configuration #5-FDD)

Int	formation Element / (BW c	onfiguration)		Value (5MHz)	Value (10MHz)
ommRxPool sc-CP-Len				Normal	
	sc-Period			Si	40
	sc-TF-ResourceConfig	prb-Num		13	25
		prb-Start		0	0
		prb-End		24	49
		offsetIndicator			0
		subframeBitmap		0000 0000 0000	11000 00000 00000 00000 00000
	data-CP-Len			No	rmal
	dataHoppingConfig	hoppingParameter		5	04
		numSubbands		n	s2
		rb-Offset			0
	ue- SelectedResourceConfig	data-TF- ResourceConfig	prb-Num	13	25
			prb-Start	0	0
			prb-End	24	49
			offsetIndicator		0
			subframeBitmap	111 <i>°</i> 111 <i>°</i> 111 <i>°</i>	00000 1111 1111 1111 1111
		trpt-Subset-r12	1		01
	rxParametersNCell	p. 000000112			resent
	txParameters				resent
commTxPoolNormalCommon					resent
SL-SyncConfig					resent

Annex B (normative): Propagation conditions

B.1 Static propagation condition

B.1.1 UE Receiver with 2Rx

For 1 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

For 2 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}.$$

For 4 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 - j & -j \end{bmatrix}$$

For 8 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 1 & j & j & j \\ 1 & 1 & 1 & 1 - j - j - j & -j \end{bmatrix}$$

B.1.2 UE Receiver with 4Rx

For 1 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}.$$

For 2 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & j \\ 1 & -j \\ 1 & j \\ 1 & -j \end{bmatrix}.$$

For 4 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 & -j & -j \\ 1 & -1 & j & -j \\ 1 & -1 & -j & j \end{bmatrix}.$$

For 8 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 1 & j & j & j & j \\ 1 & 1 & 1 & 1 & -j & -j & -j & -j \\ 1 & 1 & -1 & -1 & j & j & -j & -j \\ 1 & 1 & -1 & -1 & -j & -j & j & j \end{bmatrix}$$

B.2 Multi-path fading propagation conditions

The multipath propagation conditions consist of several parts:

- A delay profile in the form of a "tapped delay-line", characterized by a number of taps at fixed positions on a sampling grid. The profile can be further characterized by the r.m.s. delay spread and the maximum delay spanned by the taps.
- A combination of channel model parameters that include the Delay profile and the Doppler spectrum, that is characterized by a classical spectrum shape and a maximum Doppler frequency
- A set of correlation matrices defining the correlation between the UE and eNodeB antennas in case of multi-antenna systems.
- Additional multi-path models used for CQI (Channel Quality Indication) tests

B.2.1 Delay profiles

The delay profiles are selected to be representative of low, medium and high delay spread environments. The resulting model parameters are defined in Table B.2.1-1 and the tapped delay line models are defined in Tables B.2.1-2, B.2.1-3 and B.2.1-4.

Table B.2.1-1 Delay profiles for E-UTRA channel models

Model	Number of channel taps	Delay spread (r.m.s.)	Maximum excess tap delay (span)
Extended Pedestrian A (EPA)	7	45 ns	410 ns
Extended Vehicular A model (EVA)	9	357 ns	2510 ns
Extended Typical Urban model (ETU)	9	991 ns	5000 ns

Table B.2.1-2 Extended Pedestrian A model (EPA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.0
70	-2.0
90	-3.0
110	-8.0
190	-17.2
410	-20.8

Table B.2.1-3 Extended Vehicular A model (EVA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.5
150	-1.4
310	-3.6
370	-0.6
710	-9.1
1090	-7.0
1730	-12.0
2510	-16.9

Table B.2.1-4 Extended Typical Urban model (ETU)

Excess tap delay [ns]	Relative power [dB]
0	-1.0
50	-1.0
120	-1.0
200	0.0
230	0.0
500	0.0
1600	-3.0
2300	-5.0
5000	-7.0

B.2.2 Combinations of channel model parameters

The propagation conditions used for the performance measurements in multi-path fading environment are indicated as EVA[number], EPA[number] or ETU[number] where 'number' indicates the maximum Doppler frequency (Hz).

Table B.2.2-1 Void

B.2.3 MIMO Channel Correlation Matrices

The MIMO channel correlation matrices defined in B.2.3 apply for the antenna configuration using uniform linear arrays at both eNodeB and UE.

B.2.3.1 Definition of MIMO Correlation Matrices

Table B.2.3.1-1 defines the correlation matrix for the eNodeB

Table B.2.3.1-1 eNodeB correlation matrix

	One antenna	Two antennas	Four antennas
eNode B Correlation	$R_{eNB} = 1$	$R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & 1 \end{pmatrix}$	$R_{eNB} = \begin{pmatrix} 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} & \alpha \\ \alpha^{\frac{1}{9}^*} & 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} \\ \alpha^{\frac{4}{9}^*} & \alpha^{\frac{1}{9}^*} & 1 & \alpha^{\frac{1}{9}} \\ \alpha^* & \alpha^{\frac{4}{9}^*} & \alpha^{\frac{1}{9}^*} & 1 \end{pmatrix}$

Table B.2.3.1-2 defines the correlation matrix for the UE:

Table B.2.3.1-2 UE correlation matrix

	One antenna	Two antennas	Four antennas
UE Correlation	$R_{UE} = 1$	$R_{UE} = \begin{pmatrix} 1 & \boldsymbol{\beta} \\ \boldsymbol{\beta}^* & 1 \end{pmatrix}$	$R_{UE} = \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9} & \beta^{1/9} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9} & \beta^{1/9} & 1 \end{pmatrix}$

Table B.2.3.1-3 defines the channel spatial correlation matrix R_{spat} . The parameters, α and β in Table B.2.3.1-3 defines the spatial correlation between the antennas at the eNodeB and UE.

Table B.2.3.1-3: $R_{\it spat}$ correlation matrices

1x2 case	$R_{spat} = R_{UE} = \begin{bmatrix} 1 & eta \\ oldsymbol{eta}^* & 1 \end{bmatrix}$
1x4 case	$R_{spat} = R_{UE} = egin{pmatrix} 1 & eta^{1/9} & eta^{4/9} & eta \ eta^{1/9} & 1 & eta^{1/9} & eta^{4/9} \ eta^{4/9} & eta^{1/9} & 1 & eta^{1/9} \ eta^* & eta^{4/9} & eta^{1/9} & 1 \end{pmatrix}$
2x1 case	$R_{spat} = R_{eNB} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix}$
2x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$
2x4 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$ $R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9} & \beta^{1/9} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9} & \beta^{1/9} & 1 \end{bmatrix}$ $R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9} & 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{1/9} & \alpha^{1/9} & 1 & \alpha^{1/9} \\ \alpha^{1/9} & \alpha^{1/9} & \alpha^{1/9} \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
4x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} & \alpha \\ \alpha^{\frac{1}{9}^*} & 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} \\ \alpha^{\frac{4}{9}^*} & \alpha^{\frac{1}{9}^*} & 1 & \alpha^{\frac{1}{9}} \\ \alpha^* & \alpha^{\frac{4}{9}^*} & \alpha^{\frac{1}{9}^*} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
4x4 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9} & \alpha^{1/9} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9} & \alpha^{1/9} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9} & \beta^{1/9} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9} & \beta^{1/9} & 1 \end{bmatrix}$

For cases with more antennas at either eNodeB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of R_{eNB} and R_{UE} according to $R_{spat} = R_{eNB} \otimes R_{UE}$.

B.2.3.2 MIMO Correlation Matrices at High, Medium and Low Level

The α and β for different correlation types are given in Table B.2.3.2-1.

Table B.2.3.2-1: The α and β parameters for ULA MIMO correlation matrices

Correlation Model	α	β
Low correlation	0	0
Medium	0.3	0.9
Correlation		
Medium	0.3	0.3874
Correlation A		
High Correlation	0.9	0.9

The correlation matrices for high, medium, low and medium A correlation are defined in Table B.2.3.1-2, B.2.3.2-3, B.2.3.2-4 and B.2.3.2-5 as below.

The values in Table B.2.3.2-2 have been adjusted for the 4x2 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spatial} + aI_n]/(1+a)$$

Where the value "a" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 4x2 high correlation case, a=0.00010. For the 4x4 high correlation case, a=0.00012.

The same method is used to adjust the 4x4 medium correlation matrix in Table B.2.3.2-3 to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision with a = 0.00012.

Table B.2.3.2-2: MIMO correlation matrices for high correlation

1x2 case	$R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$											
2x1 case	$R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$											
2x2 case	$R_{high} = \begin{pmatrix} 1 & 0.9 & 0.9 & 0.81 \\ 0.9 & 1 & 0.81 & 0.9 \\ 0.9 & 0.81 & 1 & 0.9 \\ 0.81 & 0.9 & 0.9 & 1 \end{pmatrix}$											
4x2 case	$R_{high} = \begin{bmatrix} 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 & 0.8999 & 0.8099 \\ 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 & 0.8099 & 0.8999 \\ 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 \\ 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 \\ 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 \\ 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 \\ 0.8999 & 0.8099 & 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 \\ \end{bmatrix}$											
4x4 case	$R_{high} = \begin{bmatrix} 1.0000 \ 0.9882 \ 0.9541 \ 0.8999 \ 0.9882 \ 0.9767 \ 0.9430 \ 0.8894 \ 0.9541 \ 0.9430 \ 0.9105 \ 0.8587 \ 0.8999 \ 0.8894 \ 0.8587 \ 0.8099 \\ 0.9882 \ 1.0000 \ 0.9882 \ 0.9541 \ 0.9767 \ 0.9882 \ 0.9767 \ 0.9430 \ 0.9541 \ 0.9430 \ 0.9541 \ 0.9430 \ 0.8587 \ 0.8894 \ 0.8999 \ 0.8894 \\ 0.8999 \ 0.9541 \ 0.9882 \ 1.0000 \ 0.9882 \ 0.9767 \ 0.9882 \ 0.9767 \ 0.9105 \ 0.9430 \ 0.9541 \ 0.9430 \ 0.9541 \ 0.8999 \ 0.8587 \ 0.8894 \ 0.8999 \\ 0.9882 \ 0.9767 \ 0.9430 \ 0.8894 \ 1.0000 \ 0.9882 \ 0.9541 \ 0.8999 \ 0.9882 \ 0.9767 \ 0.9430 \ 0.9541 \ 0.9430 \ 0.9541 \ 0.9430 \ 0.9105 \ 0.9882 \\ 0.9767 \ 0.9882 \ 0.9767 \ 0.9430 \ 0.9882 \ 1.0000 \ 0.9882 \ 0.9541 \ 0.9767 \ 0.9882 \ 0.9767 \ 0.9430 \ 0.9541 \ 0.9430 \ 0.9541 \ 0.9430 \ 0.9541 \ 0.9882 \ 0.9767 \ 0.9430 \ 0.9767 \ 0.9882 \ 0.9767 \ 0.9430 \ 0.9541 \ 0.9430 \ 0.9767 \ 0.9882 \ 0.9767 \ 0.9882 \ 0.9541 \ 0.9882 \ 0.9767 \ 0.9882$	87 99 87 05 30 41 94 30 67 82 99 41 82										

Table B.2.3.2-3: MIMO correlation matrices for medium correlation

1x2		N/A													
case							IN/A								
2x1							N/A								
case									>						
2x2 case					Ĭ	$R_{medium} =$	0.9 1		0.3 0.9						
				1.0000	0.900	0 0.874				0.527	1 03	000	0.2700	<u> </u>	
			l												
				0.9000	1.000					0.5856		700	0.3000	'	
				0.8748	0.787	3 1.000	0.900	0.0	8748	0.7873	3 0.5	856	0.5271		
4x2				0.7873	0.874	8 0.900	00 1.000	00 0.	7873	0.8748	3 0.5	271	0.5856		
case		R_{mediun}	$_{n}=$	0.5856	0.527					0.9000			0.7873		
				0.5271	0.585					1.0000			0.8748		
				0.3000	0.270	0.58	56 0.52	71 0.	8748	0.787	3 1.0	000	0.9000)	
				0.2700	0.300	0 0.52	71 0.58	56 0.	7873	0.874	8 0.9	000	1.0000		
		1.0000 0.98	882 0.	.9541 0.8999	0.8747	0.8645 0.8	3347 0.7872	0.5855	0.5787	0.5588	0.5270	0.3000	0.2965	0.2862	0.2700
		0.9882 1.00	00 0.	.9882 0.9541	0.8645	0.8747 0.8	3645 0.8347	0.5787	0.5855	0.5787	0.5588	0.2965	0.3000	0.2965	0.2862
		0.9541 0.98	882 1.0	.0000 0.9882	0.8347	0.8645 0.8	3747 0.8645	0.5588	0.5787	0.5855	0.5787	0.2862	0.2965	0.3000	0.2965
		0.8999 0.95	641 0.	.9882 1.0000	0.7872	0.8347 0.8	3645 0.8747	0.5270	0.5588	0.5787	0.5855	0.2700	0.2862	0.2965	0.3000
		0.8747 0.86	645 0.	.8347 0.7872	1.0000	0.9882 0.9	0.8999	0.8747	0.8645	0.8347	0.7872	0.5855	0.5787	0.5588	0.5270
		0.8645 0.87	47 0.	.8645 0.8347	0.9882	1.0000 0.9	9882 0.9541	0.8645	0.8747	0.8645	0.8347	0.5787	0.5855	0.5787	0.5588
		0.8347 0.86	645 0.	.8747 0.8645	0.9541	0.9882 1.0	000 0.9882	0.8347	0.8645	0.8747	0.8645	0.5588	0.5787	0.5855	0.5787
4x4	R =	0.7872 0.83	847 0.	.8645 0.8747	0.8999	0.9541 0.9	9882 1.0000	0.7872	0.8347	0.8645	0.8747	0.5270	0.5588	0.5787	0.5855
case	R _{medium} =	0.5855 0.57	787 0.	.5588 0.5270	0.8747	0.8645 0.8	3347 0.7872	1.0000	0.9882	0.9541	0.8999	0.8747	0.8645	0.8347	0.7872
		0.5787 0.58	855 0.	.5787 0.5588	0.8645	0.8747 0.8	3645 0.8347	0.9882	1.0000	0.9882	0.9541	0.8645	0.8747	0.8645	0.8347
		0.5588 0.57	787 0.	.5855 0.5787	0.8347	0.8645 0.8	3747 0.8645	0.9541	0.9882	1.0000	0.9882	0.8347	0.8645	0.8747	0.8645
		0.5270 0.55	88 0.	.5787 0.5855	0.7872	0.8347 0.8	3645 0.8747	0.8999	0.9541	0.9882	1.0000	0.7872	0.8347	0.8645	0.8747
		0.3000 0.29	065 0.	.2862 0.2700	0.5855	0.5787 0.5	5588 0.5270	0.8747	0.8645	0.8347	0.7872	1.0000	0.9882	0.9541	0.8999
		0.2965 0.30	000 0.	.2965 0.2862	0.5787	0.5855 0.5	5787 0.5588	0.8645	0.8747	0.8645	0.8347	0.9882	1.0000	0.9882	0.9541
				.3000 0.2965											
		0.2700 0.28	362 0.	.2965 0.3000	0.5270	0.5588 0.5	5787 0.5855	0.7872	0.8347	0.8645	0.8747	0.8999	0.9541	0.9882	1.0000

Table B.2.3.2-4: MIMO correlation matrices for low correlation

1x2 case	$R_{low} = \mathbf{I}_2$
1x4 case	$R_{low} = \mathbf{I}_4$
2x1 case	$R_{low} = \mathbf{I}_2$
2x2 case	$R_{low} = \mathbf{I}_4$
2x4 case	$R_{low} = \mathbf{I}_8$
4x2 case	$R_{low} = \mathbf{I}_8$
4x4 case	$R_{low} = \mathbf{I}_{16}$

In Table B.2.3.2-4, \mathbf{I}_d is the $d \times d$ identity matrix.

Table B.2.3.2-5: MIMO correlation matrices for medium correlation A

	(1.0000	0.9000	0.6561	0.3874	0.3000	0.2700	0.1968	0.1162
		0.9000	1.0000	0.9000	0.6561	0.2700	0.3000	0.2700	0.1968
		0.6561	0.9000	1.0000	0.9000	0.1968	0.2700	0.3000	0.2700
2x4	D _	0.3874	0.6561	0.9000	1.0000	0.1162	0.1968	0.2700	0.3000
case	$K_{Medium A} =$	0.3000	0.2700	0.1968	0.1162	1.0000	0.9000	0.6561	0.3874
		0.2700	0.3000	0.2700	0.1968	0.9000	1.0000	0.9000	0.6561
		0.1968	0.2700	0.3000	0.2700	0.6561	0.9000	1.0000	0.9000
		0.1162	0.1968	0.2700	0.3000	0.3874	0.6561	0.9000	1.0000

B.2.3A MIMO Channel Correlation Matrices using cross polarized antennas

The MIMO channel correlation matrices defined in B.2.3A apply for the antenna configuration using cross polarized (XP/X-pol) antennas at both eNodeB and UE. The cross-polarized antenna elements with +/-45 degrees polarization slant angles are deployed at eNB and cross-polarized antenna elements with +90/0 degrees polarization slant angles are deployed at UE.

For the cross-polarized antennas, the N antennas are labelled such that antennas for one polarization are listed from 1 to N/2 and antennas for the other polarization are listed from N/2+1 to N, where N is the number of transmit or receive antennas.

B.2.3A.1 Definition of MIMO Correlation Matrices using cross polarized antennas

For the channel spatial correlation matrix, the following is used:

$$R_{spat} = P(R_{eNB} \otimes \Gamma \otimes R_{UE})P^{T}$$

where

- R_{UE} is the spatial correlation matrix at the UE with same polarization,
- R_{eNB} is the spatial correlation matrix at the eNB with same polarization,
- Γ is a polarization correlation matrix, and
- $(\bullet)^T$ denotes transpose.

The matrix Γ is defined as

$$\Gamma = \begin{bmatrix}
1 & 0 & -\gamma & 0 \\
0 & 1 & 0 & \gamma \\
-\gamma & 0 & 1 & 0 \\
0 & \gamma & 0 & 1
\end{bmatrix}$$

A permutation matrix P elements are defined as

$$P(a,b) = \begin{cases} 1 & \text{for } a = (j-1)Nr + i & \text{and } b = 2(j-1)Nr + i, & i = 1, \dots, Nr, j = 1, \dots Nt/2 \\ 1 & \text{for } a = (j-1)Nr + i & \text{and } b = 2(j-Nt/2)Nr - Nr + i, & i = 1, \dots, Nr, j = Nt/2 + 1, \dots, Nt \\ 0 & \text{otherwise} \end{cases}$$

where N_t and N_r is the number of transmitter and receiver respectively. This is used to map the spatial correlation coefficients in accordance with the antenna element labelling system described in B.2.3A.

B.2.3A.2 Spatial Correlation Matrices using cross polarized antennas at eNB and UE sides

B.2.3A.2.1 Spatial Correlation Matrices at eNB side

For 2-antenna transmitter using one pair of cross-polarized antenna elements, $R_{\scriptscriptstyle eNR}=1$.

For 4-antenna transmitter using two pairs of cross-polarized antenna elements, $R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & 1 \end{pmatrix}$.

For 8-antenna transmitter using four pairs of cross-polarized antenna elements, $R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9} & \alpha^{1/9} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9} & \alpha^{1/9} & 1 \end{pmatrix}.$

B.2.3A.2.2 Spatial Correlation Matrices at UE side

For 2-antenna receiver using one pair of cross-polarized antenna elements, $R_{UE}=1$.

For 4-antenna receiver using two pairs of cross-polarized antenna elements, $R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & 1 \end{pmatrix}$.

B.2.3A.3 MIMO Correlation Matrices using cross polarized antennas

The values for parameters α , β and γ for the cross polarized antenna models are given in Table B.2.3A.3-1.

Table B.2.3A.3-1: The α and β parameters for cross-polarized MIMO correlation matrices

Correlation Mod	del	α	β	γ
Medium		0.2	0.6	0.2
Correlation A				
High Correlation	0.9	0.9	0.3	
pair of at eNE Note 2: Value	cros sid of β cros	applies wh	d antenna en more th	elements nan one

The correlation matrices for high spatial correlation and medium correlation A are defined in Table B.2.3A.3-2 and Table B.2.3A.3-3 as below.

The values in Table B.2.3A.3-2 have been adjusted to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spat} + aI_n]/(1+a)$$

Where the value "a" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 8x2 high spatial correlation case, a=0.00010.

Table B.2.3A.3-2: MIMO correlation matrices for high spatial correlation

				1.00	000	0.0000	0.90	00 (0.0000	-0.30	000 (0.0000	-0.27	700 (0.0000		
				0.0	000 1	.0000	0.00	00 (0.9000	0.00	000 (0.3000	0.00	000	0.2700		
				0.9	000 (0.0000	1.00	00 (0.0000	-0.27	00 (0.0000	-0.30	000 (0.0000		
				0.0	000 (0.9000	0.00	000 1	1.0000	0.00	000 (0.2700	0.00	00 (0.3000		
4x2 case			$R_{high} =$			0.0000				1.000		0.0000	0.90		0.0000		
						0.3000			0.2700			.0000			0.9000		
										0.00			0.00				
						0.0000			0.0000	0.90		.0000	1.00		0.0000		
				0.0	000 (0.2700	0.0	000 (0.3000	0.00	00 0	.9000	0.00	000 1	.0000		
		1.0000	0.0000	0.9883	0.0000	0.9542	0.0000	0.8999	0.0000	-0.3000	0.0000	-0.2965	0.0000	-0.2862	0.0000	-0.2700	0.0000
		0.0000	1.0000	0.0000	0.9883	0.0000	0.9542	0.0000	0.8999	0.0000	0.3000	0.0000	0.2965	0.0000	0.2862	0.0000	0.2700
		0.9883	0.0000		0.0000				0.0000								
		0.0000		0.0000	1.0000				0.9542							0.0000	
		0.9542			0.0000				0.0000							0.2, 00	
				0.0000					0.9883							0.0000	
		0.8999	0.0000	0.9542	0.0000				0.0000						0.0000		
8x2 case	$R_{high} =$	0.0000	0.8999	0.0000					1.0000					0.0000		0.0000	
		0.0000		0, 00	0.2965				0.2700					0.9342		0.0000	
		-0.2965	0.0000		0, 00				2 0.0000		0.0000			0.0000		0.0000	
									0.2862					0.0000		0.0000	
		-0.2862	0.0000						0.0000					1.0000		0.9883	
		0.0000		0.0000					0.2965	0.0000				0.0000		0.0000	
		-0.2700	0.0000	-0.2862	0.0000	-0.2965	0.0000	-0.3000	0.0000	0.8999	0.0000	0.9542	0.0000	0.9883	0.0000	1.0000	0.0000
		0.0000	0.2700	0.0000	0.2862	0.0000	0.2965	0.0000	0.3000	0.0000	0.8999	0.0000	0.9542	0.0000	0.9883	0.0000	1.0000

Table B.2.3A.3-3: MIMO correlation matrices for medium correlation A

		(1.0000	0.6000	0.0000	0.0000	0.2000	0.1200	0.0000	0.0000	- 0.2000	- 0.1200	0.0000	0.0000	- 0.0400	- 0.0240	0.0000	0.0000
		0.6000	1.0000	0.0000	0.0000	0.1200	0.2000	0.0000	0.0000	- 0.1200	- 0.2000	0.0000	0.0000	- 0.0240	- 0.0400	0.0000	0.0000
		0.0000	0.0000	1.0000	0.6000	0.0000	0.0000	0.2000	0.1200	0.0000	0.0000	0.2000	0.1200	0.0000	0.0000	0.0400	0.0240
		0.0000	0.0000	0.6000	1.0000	0.0000	0.0000	0.1200	0.2000	0.0000	0.0000	0.1200	0.2000	0.0000	0.0000	0.0240	0.0400
		1.0000	0.6000	0.0000	0.0000	1.0000	0.6000	0.0000	0.0000	- 0.2000	- 0.1200	0.0000	0.0000	- 0.2000	- 0.1200	0.0000	0.0000
		0.6000	1.0000	0.0000	0.0000	0.6000	1.0000	0.0000	0.0000	- 0.1200	- 0.2000	0.0000	0.0000	- 0.1200	- 0.2000	0.0000	0.0000
		0.0000	0.0000	1.0000	0.6000	0.0000	0.0000	1.0000	0.6000	0.0000	0.0000	0.2000	0.1200	0.0000	0.0000	0.2000	0.1200
AveA	D _	0.0000	0.0000	0.6000	1.0000	0.0000	0.0000	0.6000	1.0000	0.0000	0.0000	0.1200	0.2000	0.0000	0.0000	0.1200	0.2000
4x4	$R_{Medium A} =$	- 0.2000	- 0.1200	0.0000	0.0000	- 0.0400	- 0.0240	0.0000	0.0000	1.0000	0.6000	0.0000	0.0000	0.2000	0.1200	0.0000	0.0000
		- 0.1200	- 0.2000	0.0000	0.0000	- 0.0240	- 0.0400	0.0000	0.0000	0.6000	1.0000	0.0000	0.0000	0.1200	0.2000	0.0000	0.0000
		0.0000	0.0000	0.2000	0.1200	0.0000	0.0000	0.0400	0.0240	0.0000	0.0000	1.0000	0.6000	0.0000	0.0000	0.2000	0.1200
		0.0000	0.0000	0.1200	0.2000	0.0000	0.0000	0.0240	0.0400	0.0000	0.0000	0.6000	1.0000	0.0000	0.0000	0.1200	0.2000
		- 0.2000	- 0.1200	0.0000	0.0000	- 0.2000	- 0.1200	0.0000	0.0000	1.0000	0.6000	0.0000	0.0000	1.0000	0.6000	0.0000	0.0000
		- 0.1200	- 0.2000	0.0000	0.0000	- 0.1200	- 0.2000	0.0000	0.0000	0.6000	1.0000	0.0000	0.0000	0.6000	1.0000	0.0000	0.0000
		0.0000	0.0000	0.2000	0.1200	0.0000	0.0000	0.2000	0.1200	0.0000	0.0000	1.0000	0.6000	0.0000	0.0000	1.0000	0.6000
		0.0000	0.0000	0.1200	0.2000	0.0000	0.0000	0.1200	0.2000	0.0000	0.0000	0.6000	1.0000	0.0000	0.0000	0.6000	1.0000

B.2.3A.4 Beam steering approach

Given the channel spatial correlation matrix in B.2.3A.1, the corresponding random channel matrix \mathbf{H} can be calculated. The signal model for the k-th subframe is denoted as

$$y = HD_{\theta_h}Wx + n$$

Where

- H is the Nr xNt channel matrix per subcarrier.
- $D_{\theta_{k}}$ is the steering matrix,

For 8 transmission antennas,
$$D_{\theta_k} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & e^{j\theta_k} & 0 & 0 \\ 0 & 0 & e^{j2\theta_k} & 0 \\ 0 & 0 & 0 & e^{j3\theta_k} \end{bmatrix};$$

For 4 transmission antennas, $D_{\theta_k} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & 0 \\ 0 & e^{j\theta_k} \end{bmatrix}$.

- θ_k controls the phase variation, and the phase for k-th subframe is denoted by $\theta_k = \theta_0 + \Delta\theta \cdot k$, where θ_0 is the random start value with the uniform distribution, i.e., $\theta_0 \in [0,2\pi]$, $\Delta\theta$ is the step of phase variation, which is defined in Table B.2.3A.4-1, and k is the linear increment of 1 for every subframe throughout the simulation,
- W is the precoding matrix for Nt transmission antennas,
- y is the received signal, x is the transmitted signal, and n is AWGN.

Table B.2.3A.4-1: The step of phase variation

Variation Step	Value (rad/subframe)
$\Delta heta$	1.2566×10 ⁻³

B.2.4 Propagation conditions for CQI tests

For Channel Quality Indication (CQI) tests, the following additional multi-path profile is used:

$$h(t,\tau) = \delta(\tau) + a \exp(-i2\pi f_D t)\delta(\tau - \tau_d),$$

in continuous time (t, τ) representation, with τ_d the delay, a a constant and f_D the Doppler frequency. The same $h(t, \tau)$ is used to describe the fading channel between every pair of Tx and Rx.

B.2.4.1 Propagation conditions for CQI tests with multiple CSI processes

For CQI tests with multiple CSI processes, the following additional multi-path profile is used for 2 port transmission:

$$H = \begin{bmatrix} 1 & j \\ 1 & -j \end{bmatrix} \circ H_{MP}$$

Where \circ represents Hadamard product, H_{MP} indicates the 2x2 propagation channel generated in the manner defined in Clause B.2.4.

B.2.5 Void

B.2.6 MBSFN Propagation Channel Profile

Table B.2.6-1 shows propagation conditions that are used for the MBSFN performance requirements in multi-path fading environment in an extended delay spread environment.

Table B.2.6-1: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment

Extended Delay Spread						
Maximum Doppler frequency [5Hz]						
Relative Delay [ns] Relative Mean Power [dB]						
0	0					
30	-1.5					
150	-1.4					
310	-3.6					
370	-0.6					
1090	-7.0					
12490	-10					
12520	-11.5					
12640	-11.4					
12800	-13.6					
12860	-10.6					
13580	-17.0					
27490	-20					
27520	-21.5					
27640	-21.4					
27800	-23.6					
27860	-20.6					
28580	-27.0					

B.3 High speed train scenario

The high speed train condition for the test of the baseband performance is a non fading propagation channel with one tap. Doppler shift is given by

$$f_s(t) = f_d \cos \theta(t) \tag{B.3.1}$$

where $f_s(t)$ is the Doppler shift and f_d is the maximum Doppler frequency. The cosine of angle $\theta(t)$ is given by

$$\cos\theta(t) = \frac{D_s/2 - vt}{\sqrt{D_{\min}^2 + (D_s/2 - vt)^2}}, \ 0 \le t \le D_s/v$$
(B.3.2)

$$\cos \theta(t) = \frac{-1.5D_s + vt}{\sqrt{D_{\min}^2 + (-1.5D_s + vt)^2}}, \ D_s/v < t \le 2D_s/v$$
(B.3.3)

$$\cos\theta(t) = \cos\theta(t \mod (2D_s/v)), \ t > 2D_s/v \tag{B.3.4}$$

where $D_s/2$ is the initial distance of the train from eNodeB, and D_{\min} is eNodeB Railway track distance, both in meters; v is the velocity of the train in m/s, t is time in seconds.

Doppler shift and cosine angle are given by equation B.3.1 and B.3.2-B.3.4 respectively, where the required input parameters listed in table B.3-1 and the resulting Doppler shift shown in Figure B.3-1 are applied for all frequency bands.

Table B.3-1: High speed train scenario

Parameter	Value
D_s	300 m
$D_{ m min}$	2 m
ν	300 km/h
f_d	750 Hz

NOTE 1: Parameters for HST conditions in table B.3-1 including f_d and Doppler shift trajectories presented on figure B.3-1 were derived from Band 7 and are applied for performance verification in all frequency bands.

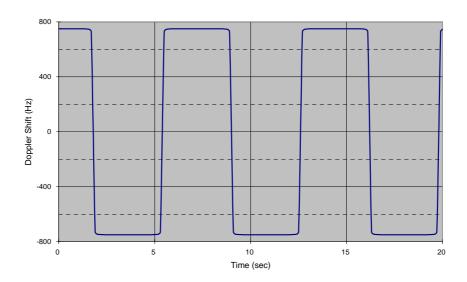


Figure B.3-1: Doppler shift trajectory

For 1x2 antenna configuration, the same $h(t,\tau)$ is used to describe the channel between every pair of Tx and Rx.

For 2x2 antenna configuration, the same $h(t,\tau)$ is used to describe the channel between every pair of Tx and Rx with phase shift according to $\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}$.

B.4 Beamforming Model

B.4.1 Single-layer random beamforming (Antenna port 5, 7, or 8)

Single-layer transmission on antenna port 5 or on antenna port 7 or 8 without a simultaneous transmission on the other antenna port, is defined by using a precoder vector W(i) of size 2×1 randomly selected with the number of layers v=1 from Table 6.3.4.2.3-1 in [4] as beamforming weights. This precoder takes as an input the signal $y^{(p)}(i)$, $i=0,1,...,M_{\mathrm{symb}}^{\mathrm{ap}}-1$, for antenna port $p\in\{5,7,8\}$, with $M_{\mathrm{symb}}^{\mathrm{ap}}$ the number of modulation symbols including the user-specific reference symbols (DRS), and generates a block of signals $y_{bf}(i)=\begin{bmatrix}y_{bf}(i) & \widetilde{y}_{bf}(i)\end{bmatrix}^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \widetilde{y}_{bf}(i) \end{bmatrix} = W(i)y^{(p)}(i)$$

Single-layer transmission on antenna port 7 or 8 with a simultaneous transmission on the other antenna port, is defined by using a pair of precoder vectors $W_1(i)$ and $W_2(i)$ each of size 2×1 , which are not identical and randomly selected with the number of layers v=1 from Table 6.3.4.2.3-1 in [4], as beamforming weights, and normalizing the transmit power as follows:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = \frac{1}{\sqrt{2}} (W_1(i)y^{(7)}(i) + W_2(i)y^{(8)}(i))$$

The precoder update granularity is specific to a test case.

The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \mod 2 = 1$, $p \in \{15,16,...,22\}$, are transmitted on the same physical antenna element as the modulation symbols $y_{bf}(i)$. The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \mod 2 = 0$, $p \in \{15,16,...,22\}$, are transmitted on the same physical antenna element as the modulation symbols $\widetilde{y}_{bf}(i)$.

B.4.2 Dual-layer random beamforming (antenna ports 7 and 8)

Dual-layer transmission on antenna ports 7 and 8 is defined by using a precoder matrix W(i) of size 2×2 randomly selected with the number of layers v=2 from Table 6.3.4.2.3-1 in [4] as beamforming weights. This precoder takes as an input a block of signals for antenna ports 7 and 8, $y(i) = \begin{bmatrix} y^{(7)}(i) & y^{(8)}(i) \end{bmatrix}^T$, $i=0,1,...,M_{\text{symb}}^{\text{ap}}-1$, with $M_{\text{symb}}^{\text{ap}}$ being the number of modulation symbols per antenna port including the user-specific reference symbols, and generates a block of signals $y_{bf}(i) = \begin{bmatrix} y_{bf}(i) & \widetilde{y}_{bf}(i) \end{bmatrix}^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \widetilde{y}_{bf}(i) \end{bmatrix} = W(i) \begin{bmatrix} y^{(7)}(i) \\ y^{(8)}(i) \end{bmatrix},$$

The precoder update granularity is specific to a test case.

The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \mod 2 = 1$, $p \in \{15,16,...,22\}$, are transmitted on the same physical antenna element as the modulation symbols $y_{bf}(i)$. The CSI reference symbols $a_{k,l}^{(p)}$ satisfying $p \mod 2 = 0$, $p \in \{15,16,...,22\}$, are transmitted on the same physical antenna element as the modulation symbols $\widetilde{y}_{bf}(i)$.

B.4.3 Generic beamforming model (antenna ports 7-14)

The transmission on antenna port(s) $p=7,8,...,\upsilon+6$ is defined by using a precoder matrix W(i) of size $N_{CSI}\times\upsilon$, where N_{CSI} is the number of CSI reference signals configured per test and υ is the number of spatial layers. This precoder takes as an input a block of signals for antenna port(s) $p=7,8,...,\upsilon+6$, $y^{(p)}(i)=\left[y^{(7)}(i)\quad y^{(8)}(i)\quad \cdots\quad y^{(6+\upsilon)}(i)\right],\ i=0,1,...,M_{\text{symb}}^{\text{ap}}-1,\ \text{with}\ M_{\text{symb}}^{\text{ap}}\ \text{being the number of modulation}$ symbols per antenna port including the user-specific reference symbols (DM-RS), and generates a block of signals $y_{bf}^{(q)}(i)=\left[y_{bf}^{(0)}(i)\quad y_{bf}^{(1)}(i)\quad \dots\quad y_{bf}^{(N_{CSI}-1)}(i)\right]^T$ the elements of which are to be mapped onto the same time-frequency index pair (k,l) but transmitted on different physical antenna elements:

$$\begin{bmatrix} y_{bf}^{(0)}(i) \\ y_{bf}^{(1)}(i) \\ \vdots \\ y_{bf}^{(N_{CSI}-1)}(i) \end{bmatrix} = W(i) \begin{bmatrix} y^{(7)}(i) \\ y^{(8)}(i) \\ \vdots \\ y^{(6+\nu)}(i) \end{bmatrix}$$

The precoder matrix W(i) is specific to a test case.

The physical antenna elements are identified by indices $j = 0,1,...,N_{ANT}-1$, where $N_{ANT}=N_{CSI}$ is the number of physical antenna elements configured per test.

Modulation symbols $y_{bf}^{(q)}(i)$ with $q \in \{0,1,...,N_{CSI}-1\}$ (i.e. beamformed PDSCH and DM-RS) are mapped to the physical antenna index j=q.

Modulation symbols $y^{(p)}(i)$ with $p \in \{0,1,...,P-1\}$ (i.e. PBCH, PDCCH, PHICH, PCFICH) are mapped to the physical antenna index j=p, where P is the number of cell-specific reference signals configured per test.

Modulation symbols $a_{k,l}^{(p)}$ with $p \in \{0,1,...,P-1\}$ (i.e. CRS) are mapped to the physical antenna index j=p, where P is the number of cell-specific reference signals configured per test.

Modulation symbols $a_{k,l}^{(p)}$ with $p \in \{15,16,...,14+N_{CSI}\}$ (i.e. CSI-RS) are mapped to the physical antenna index j=p-15, where N_{CSI} is the number of CSI reference signals configured per test.

B.4.4 Random beamforming for EPDCCH distributed transmission (Antenna port 107 and 109)

EPDCCH distributed transmission on antenna port 107 and antenna port 109 is defined by using a pair of precoder vectors $W_1(i)$ and $W_2(i)$ each of size 2×1 , which are not identical and randomly selected per EPDCCH PRB pair with the number of layers v=1 from Table 6.3.4.2.3-1 in [4], as beamforming weights. This precoder takes as an input the signal $y^{(p)}(i)$, $i=0,1,...,M_{\text{symb}}^{\text{ap}}-1$, for antenna port $p\in\{107,109\}$, with $M_{\text{symb}}^{\text{ap}}$ the number of modulation symbols including the user-specific reference symbols (DMRS), and generates a block of signals $y_{bf}(i)=\left[y_{bf}(i) \quad \widetilde{y}_{bf}(i)\right]^T$. When EPDCCH is associated with port 107, the transmitted block of signals is deonted as

$$\begin{bmatrix} y_{bf}(i) \\ \widetilde{y}_{bf}(i) \end{bmatrix} = W_1(i)y^{(107)}(i).$$

When EPDCCH is associated with port 109, the transmitted block of signals is denoted as

$$\begin{bmatrix} y_{bf}(i) \\ \widetilde{y}_{bf}(i) \end{bmatrix} = W_2(i) y^{(109)}(i).$$

B.4.5 Random beamforming for EPDCCH localized transmission (Antenna port 107, 108, 109 or 110)

EPDCCH localized transmission on antenna port 107, 108, 109 or 110 is defined by using a precoder vector w(i) of size 2×1 randomly selected with the number of layers v=1 from Table 6.3.4.2.3-1 in [4] as beamforming weights. This precoder takes as an input the signal $y^{(p)}(i)$, $i=0,1,...,M_{\text{symb}}^{\text{ap}}-1$, for antenna port $p \in \{107,108,109,110\}$, with

 $M_{\text{symb}}^{\text{ap}}$ the number of modulation symbols including the user-specific reference symbols (DMRS), and generates a block of signals $y_{bf}(i) = \begin{bmatrix} y_{bf}(i) & \widetilde{y}_{bf}(i) \end{bmatrix}^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \widetilde{y}_{bf}(i) \end{bmatrix} = W(i)y^{(p)}(i).$$

B.5 Interference models for enhanced performance requirements Type-A

This clause provides a description for the modelling of interfering cell transmissions for enhanced performance requirements Type-A including: definition of dominant interferer proportion, transmission mode 3, 4 and 9 type of interference modelling.

B.5.1 Dominant interferer proportion

Each interfering cell involved in enhanced performance requirements Type-A is characterized by its associated dominant interferer proportion (DIP) value:

$$DIP_i = \frac{\hat{I}_{or(i+1)}}{N_{oc}}$$

where is $\hat{I}_{or(i+1)}$ is the average received power spectral density from the i-th strongest interfering cell involved in the requirement scenario ($\hat{I}_{or(1)}$ is assumed to be the power spectral density associated with the serving cell) and

$$N_{oc}' = \sum_{j=2}^{N} \hat{I}_{or(j)} + N_{oc}$$
 where N_{oc} is the average power spectral density of a white noise source consistent with the

definition provided in subclause 3.2 and N is the total number of cells involved in a given requirement scenario.

B.5.2 Transmission mode 3 interference model

This subclause provides transmission mode 3 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth. Transmitted physical channels shall include PSS, SSS and PBCH.

For each subframe and each CQI subband as defined in subclause 7.2 of [6], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For rank-1 transmission over a subband, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4].

For rank-2 transmission over a subband, precoding for spatial multiplexing with large delay CDD over two layers for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.2 of [4].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.5.3 Transmission mode 4 interference model

This subclause provides transmission mode 4 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth according to the probabilities of occurrence. Transmitted physical channels shall include PSS, SSS and PBCH. Probabilities of occurrence in each subframe are as specified in the requirement scenario. If the probabilities of occurrence in each subframe are not specified in the requirement scenario, as default, they are equal to 1.

For each subframe and each CQI subband as defined in subclause 7.2 of [6], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For each subframe and CQI subband, a precoding matrix for the number of layers v associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [4]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is v = 2.

Precoding for spatial multiplexing with cell-specific reference signals for the number of antenna ports in the requirement scenario shall be applied to 16QAM randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of [4] with the selected precoding matrices for each subframe and each CQI subband.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.5.4 Transmission mode 9 interference model

This subclause provides transmission mode 9 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the entire PDSCH region and the full transmission bandwidth according to the probabilities of occurrence. Transmitted physical channels shall include PSS, SSS and PBCH. Probabilities of occurrence in each subframe are as specified in the requirement scenario. If the probabilities of occurrence in each subframe are not specified in the requirement scenario, as default, they are equal to 1.

For each subframe and each CQI subband as defined in subclause 7.2 of [6], a transmission rank shall be randomly determined independently from other CQI subbands as well as other interfering cells. Probabilities of occurrence of each possible transmission rank are as specified in the requirement scenario.

For each subframe and each CQI subband, a precoding matrix for the number of layers v associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-2 of [4].

The generic beamforming model in subclause B.4.3 shall be applied assuming cell-specific reference signals and CSI reference signals as specified in the requirement scenario. Random precoding with selected rank and precoding matrices for each subframe and each CQI subband shall be applied to 16QAM randomly modulated layer symbols including the user-specific reference symbols over antenna port 7 when the rank is one and antenna ports 7, 8 when the rank is two.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.6 Interference models for enhanced performance requirements Type-B

This clause provides a description for the modelling of interfering cell transmissions for enhanced performance requirements Type-B including: transmission mode 2, 3, 4 and 9 type of interference modelling and a definition of the random interference model.

B.6.1 Transmission mode 2 interference model

This subclause provides transmission mode 2 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

Precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.6.2 Transmission mode 3 interference model

This subclause provides transmission mode 3 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined for each user defined in section B.6.6 with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For rank-1 transmission, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4].

For rank-2 transmission, precoding for spatial multiplexing with large delay CDD over two layers for the number of antenna ports in the requirement scenario shall be applied to the randomly modulated layer symbols, as specified in subclause 6.3.4.2.2 of [4].

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.6.3 Transmission mode 4 interference model

This subclause provides transmission mode 4 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For each TTI, for each user defined in B.6.6, a single precoding matrix for the number of layers v associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [4]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is v = 2.

Precoding for spatial multiplexing with cell-specific reference signals for the number of antenna ports in the requirement scenario shall be applied to randomly modulated layer symbols, as specified in subclause 6.3.4.2.1 of [4] with the selected precoding matrices as specified in subclause B.6.6.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.6.4 Transmission mode 9 interference model

This subclause provides transmission mode 9 interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe, each interfering cell shall transmit randomly modulated data over the PDSCH region as specified in subclause B.6.6. Transmitted physical channels shall include PSS, SSS and PBCH.

The transmission rank shall be randomly determined with probabilities of occurrence of each possible transmission rank as specified in subclause B.6.6.

The MCS shall be randomly determined with probabilities of occurrence of each possible MCS as specified in subclause B.6.6.

For each TTI, for each user defined in B.6.6, a single precoding matrix for the number of layers v associated to the selected rank shall be selected randomly from Table 6.3.4.2.3-1 of [4]. Note that codebook index 0 shall be excluded from random precoder selection when the number of layers is v = 2.

The generic beamforming model in subclause B.4.3 shall be applied assuming cell-specific reference signals and CSI reference signals as specified in the requirement scenario. Random precoding with selected rank and precoding matrices for each subframe shall be applied to randomly modulated layer symbols including the user-specific reference symbols over antenna port 7 when the rank is one and antenna ports 7, 8 when the rank is two.

For each TTI, for each user defined in B.6.6, the scrambling ID value nSCID is randomly assigned from the set of $\{0,1\}$.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.6.5 CRS interference model

This subclause provides for the CRS interference modelling for each explicitly modelled interfering cell in the requirement scenario. In each subframe there is no PDSCH transmitted. Transmitted physical channels shall include PSS, SSS and PBCH.

For unallocated REs in the control region, precoding for transmit diversity for the number of antenna ports in the requirement scenario shall be applied to QPSK randomly modulated layer symbols, as specified in subclause 6.3.4.3 of [4]. The EPRE ratio for these REs shall be as defined for PDCCH in Annex C.3.2.

B.6.6 Random interference model

This subclause presents the interference model which defines the resource allocation, MCS and rank for the two interference cells. The model includes approximately 10% DTX on these interference cells. Table B.6.6-1 shows the resource allocation for four users in two different configurations for each of the two interferers. Table B.6.6-2 shows the resource allocation to be used for special subframes with TM9 interference. Table B.6.6-3 shows the probabilities for the MSC and rank for these users.

Table B.6.6-1: Resource allocation for the random interference model

Resource		Resourc					
allocation	User	Resource	Bitmap	for resource al	location (Note 1)	Probability	
configurations Indexes	Index	allocation type	1st field bitmap	2nd field bitmap	3rd field bitmap	Frodability	
Configuration 1	User 0	1	00	0	10101000101010		
	User 1	1	00	0	01010101010101	50%	
	User 2	0		30%			
	User 3	0					
Configuration 2	User 0	1	00	0	10101010101010		
	User 1	1	00 1 01010100010101		01010100010101	F00/	
	User 2	0	01001001001001			50%	
ot -	User 3	0		00100100100	100100		

Note 1: The 1st, 2nd, and 3rd field bitmaps are only valid for resource allocation type 1 which was defined in [6]. Note 2: The resource allocation model is used for both 1st and 2nd interfering cells and the resource allocation is independent for each interfering cell.

Table B.6.6-2: Resource allocation for the random interference model for TM9 special subframes

Resource		Resourc				
allocation	User	Resource	Bitmap	for resource al	location (Note 1)	Probability
configurations Indexes	Index	allocation type	1st field bitmap	2nd field bitmap	3rd field bitmap	Trobability
Configuration 1	User 0	1	00	0	10101000101010	
	User 1	1	00	0	01010101000001	50%
	User 2	0		30 %		
	User 3	0				
Configuration 2	User 0	1	00	0	10101000101010	
	User 1	1	00 1 01010000010		01010000010101	F00/
	User 2	0	01001000001001001			50%
	User 3	0	•	00100100000	100100	

Note 1: The 1st, 2nd, and 3rd field bitmaps are only valid for resource allocation type 1 which was defined in [6]. Note 2: The resource allocation model is used for both 1st and 2nd interfering cells and the resource allocation is independent for each interfering cell.

Table B.6.6-3 MCS and rank configuration for the random interference model

	MC	S probability	Rank probability					
MCS5 MCS14 MCS25			Rank 1	Rank 2				
	50% 25% 25%				20%			
Note 1:	The MCS and rank should follow the probability indicated in the table randomly per UE per TTI.							
Note 2:	The probabilities for MCS and rank configuration are used for both 1 st and 2 nd interfering cells.							
	The MCS and rank configurations are independent for each interfering cell.							

Annex C (normative): Downlink Physical Channels

C.1 General

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.2 Set-up

Table C.2-1 describes the downlink Physical Channels that are required for connection set up.

Table C.2-1: Downlink Physical Channels required for connection set-up

Physical Channel
PBCH
SSS
PSS
PCFICH
PDCCH
EPDCCH
PHICH
PDSCH

C.3 Connection

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

C.3.1 Measurement of Receiver Characteristics

Table C.3.1-1 is applicable for measurements on the Receiver Characteristics (clause 7).

Table C.3.1-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio
PBCH	PBCH_RA = 0 dB
	PBCH_RB = 0 dB
PSS	$PSS_RA = 0 dB$
SSS	$SSS_RA = 0 dB$
PCFICH	PCFICH_RB = 0 dB
PDCCH	PDCCH_RA = 0 dB
	PDCCH_RB = 0 dB
PDSCH	PDSCH_RA = 0 dB
	PDSCH_RB = 0 dB
OCNG	OCNG_RA = 0 dB
	OCNG_RB = 0 dB

NOTE 1: No boosting is applied.

Table C.3.1-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference		0 dB	
signal power ratio $E_{\it RS}$ / $I_{\it or}$			

C.3.2 Measurement of Performance requirements

Table C.3.2-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels.

Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio
PBCH	PBCH_RA = ρ_A + σ
	PBCH_RB = ρ_B + σ
PSS	PSS_RA = 0 (Note 3)
SSS	SSS_RA = 0 (Note 3)
PCFICH	PCFICH_RB = ρ_B + σ
PDCCH	PDCCH_RA = ρ_A + σ
	PDCCH_RB = ρ_B + σ
EPDCCH	EPDCCH_RA = $\rho_A + \delta$
	EPDCCH_RB = $\rho_B + \delta$
PDSCH	PDSCH_RA = ρ_A
	PDSCH_RB = ρ_B
PMCH	$PMCH_RA = \rho_A$
	$PMCH_RB = \rho_B$
MBSFN RS	MBSFN RS_RA = ρ_A
	MBSFN RS_RB = ρ_B
OCNG	OCNG_RA = ρ_A + σ
	OCNG_RB = ρ_B + σ

NOTE 1: $\rho_A = \rho_B = 0$ dB means no RS boosting.

NOTE 2: MBSFN RS and OCNG are not defined downlink physical channels in [4].

NOTE 3: Assuming PSS and SSS transmitted on a single antenna port.

NOTE 4: ρ_A , ρ_B , σ , and δ are test specific.

NOTE 5: For TM 8, TM 9 and TM10 ρ_A , ρ_B are used for the purpose of the test set up only.

Table C.3.2-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Total transmitted power	dBm/15 kHz	Test specific	1. I_{or} shall be kept
spectral density $I_{\it or}$			constant throughout all OFDM symbols
Cell-specific reference		Test specific	1. Applies for antenna
signal power ratio $E_{\it RS}$ / $I_{\it or}$			port p
Energy per resource element EPRE		Test specific	1. The complex-valued symbols $y^{(p)}(i)$ and
			$a_{k,l}^{(p)}$ defined in [4] shall
			conform to the given EPRE value. 2. For TM8, TM9 and TM10 the reference point for EPRE is before the precoder in Annex B.4.

C.3.3 Aggressor cell power allocation for Measurement of Performance Requirements when ABS is Configured

For the performance requirements and channel state information reporting when ABS is configured, the power allocation for the physical channels of the aggressor cell in non-ABS and ABS is listed in Table C.3.3-1.

Table C.3.3-1: Downlink physical channels transmitted in aggressor cell when ABS is configured in this cell

Physical Channel	Parameters	Parameters Unit EPRE		RE Ratio	
Physical Channel			Non-ABS	ABS	
PBCH	PBCH_RA	dB	ρΑ	Note 1	
РВСП	PBCH_RB	dB	ρ_{B}	Note 1	
PSS	PSS_RA	dB	ρΑ	Note 1	
SSS	SSS_RA	dB	ρΑ	Note 1	
PCFICH	PCFICH_RB	dB	ρ_{B}	Note 1	
PHICH	PHICH_RA	dB	ρΑ	Note 1	
PHICH	PHICH_RB	dB	ρв	Note 1	
PDCCH	PDCCH_RA	dB	ρΑ	Note 1	
PDCCH	PDCCH_RB	dB	ρ_{B}	Note 1	
PDSCH	PDSCH_RA	dB	N/A	Note 1	
PDSCH	PDSCH_RB	dB	N/A	Note 1	
OCNG	OCNG_RA	dB	ρΑ	Note 1	
OCNG	OCNG_RB	dB	ρв	Note 1	
Note 1: -∞ dB is allocated for this channel in this test.					

Table C.3.3-2: Downlink physical channels transmitted in aggressor cell when ABS is configured in this cell when the CRS assistance information is provided

Dhysical Channel	Parameters	Unit	EP	RE Ratio		
Physical Channel		Unit	Non-ABS	ABS		
PBCH	PBCH_RA	dB	ρΑ	ρΑ		
PBCH	PBCH_RB	dB	ρв	ρ _Β		
PSS	PSS_RA	dB	ρΑ	ρΑ		
SSS	SSS_RA	dB	ρΑ	ρΑ		
PCFICH	PCFICH_RB	dB	ρв	Note 1		
PHICH	PHICH_RA	dB	ρΑ	Note 1		
PHICH	PHICH_RB	dB	ρв	Note 1		
PDCCH	PDCCH_RA	dB	ρΑ	Note 1		
PDCCH	PDCCH_RB	dB	ρв	Note 1		
PDSCH	PDSCH_RA	dB	N/A	Note 1		
PDSCH	PDSCH_RB	dB	N/A	Note 1		
OCNG	OCNG_RA	dB	ρΑ	Note 1		
CONG	OCNG_RB	dB	ρв	Note 1		
Note 1: -∞ dB is allocated for this channel in this test.						

C.3.4 Power Allocation for Measurement of Performance Requirements when Quasi Co-location Type B: same Cell ID

For the performance requirements related to quasi-colocation type B behaviour when transmission points share the same Cell ID, the power allocation for the physical channels of the serving cell is listed in Table C.3.4-1 and the power allocation for the physical channels of the cell transmitting PDSCH is listed in Table C.3.4-2

Table C.3.4-1: Downlink physical channels transmitted in the serving cell (TP1)

Physical Channel	EPRE Ratio
PBCH	PBCH_RA = ρ_A + σ
	PBCH_RB = ρ_B + σ
PSS	$PSS_RA = 0 (Note 2)$
SSS	$SSS_RA = 0 $ (Note 2)
PDSCH	PDSCH_RA = ρ_A
	PDSCH_RB = ρ_B
PCFICH	PCFICH_RB = ρ_B + σ
PDCCH	PDCCH_RA = ρ_A + σ
	PDCCH_RB = ρ_B + σ

NOTE 1: $\rho_A = \rho_B = 0$ dB means no RS boosting.

NOTE 2: Assuming PSS and SSS transmitted on a single antenna port.

NOTE 3: ρ_A , ρ_B and σ are test specific.

Table C.3.4-2: Downlink physical channels for the transmission point transmitting PDSCH (TP2)

Physical Channel	Value
PDSCH	Test Specific

C.3.5 Simplified CA testing method

For CA tests which require more than 16 independent faders, if a test system cannot support a throughput measurement with fading on all carriers simultaneously, the simplified CA testing method shall be used.

In the simplified CA testing method, the resulting propagation channel(s) shall be generated by considering a number of independent faders needed for one carrier and connecting them to the signal of randomly chosen carrier(s). The maximum number of channel faders on the test will be less than or equal to 16. The remaining carrier(s) shall be connected without a channel fader but with AWGN. The throughput is then collected only for the carrier(s) connected to channel faders.

In the simplified CA testing method, the test shall be repeated by choosing carrier(s) excluding already chosen carrier(s) until all the carrier(s) are tested under fading conditions. All the collected throughtputs from each carrier shall be compared against the reference value of the requirements.

All supported carriers shall be configured and activated during the test.

Annex D (normative): Characteristics of the interfering signal

D.1 General

When the channel band width is wider or equal to 5MHz, a modulated 5MHz full band width E-UTRA down link signal and CW signal are used as interfering signals when RF performance requirements for E-UTRA UE receiver are defined. For channel band widths below 5MHz, the band width of modulated interferer should be equal to band width of the received signal.

D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel band width options.

Table D.2-1: Description of modulated E-UTRA interferer

	Channel bandwidth						
	1.4 MHz	1.4 MHz 3 MHz 5 MHz 10 MHz 15 MHz 20 MHz					
BW _{Interferer}	1.4 MHz	3 MHz	5 MHz	5 MHz	5 MHz	5 MHz	
RB	6	15	25	25	25	25	

Annex E (normative): Environmental conditions

E.1 General

This normative annex specifies the environmental requirements of the UE. Within these limits the requirements of the present documents shall be fulfilled.

E.2 Environmental

The requirements in this clause apply to all types of UE(s).

E.2.1 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table E.2.1-1

+15°C to +35°	°C	for normal conditions (with relative humidity of 25 % to 75 %)
-10°C to +55°	С	for extreme conditions (see IEC publications 68-2-1 and 68-2-2)

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation.

E.2.2 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher, and the higher extreme voltage shall not be lower than that specified below.

Table E.2.2-1

Power source	Lower extreme voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0,9 * nominal	1,1 * nominal	nominal
Regulated lead acid battery	0,9 * nominal	1,3 * nominal	1,1 * nominal
Non regulated batteries:			
Leclanché	0,85 * nominal	Nominal	Nominal
Lithium	0,95 * nominal	1,1 * Nominal	1,1 * Nominal
Mercury/nickel & cadmium	0,90 * nominal		Nominal

Outside this voltage range the UE if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in clause 6.2 for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

E.2.3 Vibration

The UE shall fulfil all the requirements when vibrated at the following frequency/amplitudes.

Table E.2.3-1

Frequency	ASD (Acceleration Spectral Density) random vibration			
5 Hz to 20 Hz	$0.96 \text{ m}^2/\text{s}^3$			
20 Hz to 500 Hz	0,96 m ² /s ³ at 20 Hz, thereafter –3 dB/Octave			

Outside the specified frequency range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in TS 36.101 for extreme operation.

Annex F (normative): Transmit modulation

F.1 Measurement Point

Figure F.1-1 shows the measurement point for the unwanted emission falling into non-allocated RB(s) and the EVM for the allocated RB(s).

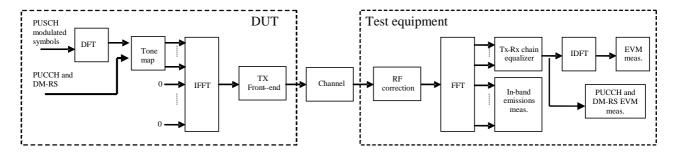


Figure F.1-1: EVM measurement points

F.2 Basic Error Vector Magnitude measurement

The EVM is the difference between the ideal waveform and the measured waveform for the allocated RB(s)

$$EVM = \sqrt{\frac{\sum_{v \in T_m} |z'(v) - i(v)|^2}{|T_m| \cdot P_0}},$$

where

 T_m is a set of $|T_m|$ modulation symbols with the considered modulation scheme being active within the measurement period,

z'(v) are the samples of the signal evaluated for the EVM,

i(v) is the ideal signal reconstructed by the measurement equipment, and

 P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

The basic EVM measurement interval is defined over one slot in the time domain for PUCCH and PUSCH and over one preamble sequence for the PRACH.

F.3 Basic in-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks. The in-band emission requirement is evaluated for PUCCH and PUSCH transmissions. The in-band emission requirement is not evaluated for PRACH transmissions.

The in-band emissions are measured as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \frac{1}{|T_{s}|} \sum_{t \in T_{s}} \sum_{\substack{\text{max}(f_{\min}, f_{t}+12 \cdot \Delta_{RB} * \Delta f) \\ \text{min}(f_{\max}, f_{h}+12 \cdot \Delta_{RB} * \Delta f)}} |Y(t, f)|^{2}, \Delta_{RB} < 0 \\ \frac{1}{|T_{s}|} \sum_{t \in T_{s}} \sum_{\substack{f_{h}+(12 \cdot \Delta_{RB} - 11) * \Delta f \\ f_{h}+(12 \cdot \Delta_{RB} - 11) * \Delta f}} |Y(t, f)|^{2}, \Delta_{RB} > 0 \end{cases}$$

where

 T_s is a set of $|T_s|$ SC-FDMA symbols with the considered modulation scheme being active within the measurement period,

 Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB}=1$ or $\Delta_{RB}=-1$ for the first adjacent RB),

 f_{\min} (resp. f_{\max}) is the lower (resp. upper) edge of the UL system BW,

 f_l and f_h are the lower and upper edge of the allocated BW, and

Y(t, f) is the frequency domain signal evaluated for in-band emissions as defined in the subsection (ii)

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = \frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{\left|T_{s}\right| \cdot N_{RB}} \sum_{t \in T_{s}}^{f_{t} + (12 \cdot N_{RB} - 1) \Delta f} \left|Y(t, f)\right|^{2}}$$

where

 N_{RR} is the number of allocated RBs

The basic in-band emissions measurement interval is defined over one slot in the time domain. When the PUSCH or PUCCH transmission slot is shortened due to multiplexing with SRS, the in-band emissions measurement interval is reduced by one SC-FDMA symbol, accordingly.

In the evaluation of in-band emissions, the timing is set according to $\Delta \tilde{t} = \Delta \tilde{c}$, where sample time offsets $\Delta \tilde{t}$ and $\Delta \tilde{c}$ are defined in subclause F.4.

F.4 Modified signal under test

Implicit in the definition of EVM is an assumption that the receiver is able to compensate a number of transmitter impairments.

The PUSCH data or PRACH or Physical Sidelink Channel signal under test is modified and, in the case of PUSCH or Physical Sidelink Channel data signal, decoded according to:

$$Z'(t,f) = IDFT \left\{ \frac{FFT \left\{ z(v - \Delta \widetilde{t}) \cdot e^{-j2\pi\Delta \widetilde{f}v} \right\} e^{j2\pi f\Delta \widetilde{t}}}{\widetilde{a}(t,f) \cdot e^{j\widetilde{\varphi}(t,f)}} \right\}$$

where

z(v) is the time domain samples of the signal under test.

The PUCCH or PUSCH or Physical Sidelink Channel demodulation reference signal or PUCCH data signal under test is equalised and, in the case of PUCCH data signal decoded according to:

$$Z'(t,f) = \frac{FFT\left\{z(v - \Delta \tilde{t}) \cdot e^{-j2\pi\Delta \tilde{f}v}\right\}e^{j2\pi j\Delta \tilde{t}}}{\tilde{a}(t,f) \cdot e^{j\tilde{\varphi}(t,f)}}e^{j2\pi j\Delta \tilde{t}}$$

where

z(v) is the time domain samples of the signal under test.

To minimize the error, the signal under test should be modified with respect to a set of parameters following the procedure explained below.

Notation:

 $\Delta \tilde{t}$ is the sample timing difference between the FFT processing window in relation to nominal timing of the ideal signal.

 $\Delta \tilde{f}$ is the RF frequency offset.

 $\widetilde{\varphi}(t,f)$ is the phase response of the TX chain.

 $\tilde{a}(t, f)$ is the amplitude response of the TX chain.

In the following $\Delta \tilde{c}$ represents the middle sample of the EVM window of length W (defined in the next subsections) or the last sample of the first window half if W is even.

The EVM analyser shall

- ightharpoonup detect the start of each slot and estimate $\Delta \widetilde{t}$ and $\Delta \widetilde{f}$,
- \blacktriangleright determine $\Delta \tilde{c}$ so that the EVM window of length W is centred
 - on the time interval determined by the measured cyclic prefix minus 16 samples of the considered OFDM symbol for symbol 0 for normal CP, i.e. the first 16 samples of the CP should not be taken into account for this step. In the determination of the number of excluded samples, a sampling rate of 30.72MHz was assumed. If a different sampling rate is used, the number of excluded samples is scaled linearly.
 - on the measured cyclic prefix of the considered OFDM symbol symbol for symbol 1 to 6 for normal CP and for symbol 0 to 5 for extended CP.
 - on the measured preamble cyclic prefix for the PRACH

To determine the other parameters a sample timing offset equal to $\Delta \tilde{c}$ is corrected from the signal under test. The EVM analyser shall then

- ightharpoonup correct the RF frequency offset $\Delta \widetilde{f}$ for each time slot, and
- > apply an FFT of appropriate size. The chosen FFT size shall ensure that in the case of an ideal signal under test, there is no measured inter-subcarrier interference.

The carrier leakage shall be removed from the evaluated signal before calculating the EVM and the in-band emissions; however, the removed relative carrier leakage power also has to satisfy the applicable requirement.

At this stage the allocated RBs shall be separated from the non-allocated RBs. In the case of PUCCH and PUSCH EVM, the signal on the non-allocated RB(s), Y(t, f), is used to evaluate the in-band emissions.

Moreover, the following procedure applies only to the signal on the allocated RB(s).

- In the case of PUCCH and PUSCH and Physical Sidelink Channel, the UL EVM analyzer shall estimate the TX chain equalizer coefficients $\tilde{a}(t,f)$ and $\tilde{\varphi}(t,f)$ used by the ZF equalizer for all subcarriers by time averaging at each signal subcarrier of the amplitude and phase of the reference and data symbols. The time-averaging length is 1 slot. This process creates an average amplitude and phase for each signal subcarrier used by the ZF equalizer. The knowledge of data modulation symbols may be required in this step because the determination of symbols by demodulation is not reliable before signal equalization.
- In the case of PRACH, the UL EVM analyzer shall estimate the TX chain coefficients $\widetilde{a}(t)$ and $\widetilde{\varphi}(t)$ used for phase and amplitude correction and are seleted so as to minimize the resulting EVM. The TX chain coefficients are not dependent on frequency, i.e. $\widetilde{a}(t,f)=\widetilde{a}(t)$ and $\widetilde{\varphi}(t,f)=\widetilde{\varphi}(t)$. The TX chain coefficient are chosen independently for each preamble transmission and for each $\Delta \widetilde{t}$.

At this stage estimates of $\Delta \widetilde{f}$, $\widetilde{\alpha}(t,f)$, $\widetilde{\varphi}(t,f)$ and $\Delta \widetilde{c}$ are available. $\Delta \widetilde{t}$ is one of the extremities of the window W, i.e. $\Delta \widetilde{t}$ can be $\Delta \widetilde{c} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$ or $\Delta \widetilde{c} + \left\lfloor \frac{W}{2} \right\rfloor$, where $\alpha = 0$ if W is odd and $\alpha = 1$ if W is even. The EVM analyser shall then

- ightharpoonup calculate EVM₁ with $\Delta \tilde{t}$ set to $\Delta \tilde{c} + \alpha \left| \frac{W}{2} \right|$,
- ightharpoonup calculate EVM_h with $\Delta \tilde{t}$ set to $\Delta \tilde{c} + \left\lfloor \frac{W}{2} \right\rfloor$.

F.5 Window length

F.5.1 Timing offset

As a result of using a cyclic prefix, there is a range of $\Delta \tilde{t}$, which, at least in the case of perfect Tx signal quality, would give close to minimum error vector magnitude. As a first order approximation, that range should be equal to the length of the cyclic prefix. Any time domain windowing or FIR pulse shaping applied by the transmitter reduces the $\Delta \tilde{t}$ range within which the error vector is close to its minimum.

F.5.2 Window length

The window length W affects the measured EVM, and is expressed as a function of the configured cyclic prefix length. In the case where equalization is present, as with frequency domain EVM computation, the effect of FIR is reduced. This is because the equalization can correct most of the linear distortion introduced by the FIR. However, the time domain windowing effect can't be removed.

F.5.3 Window length for normal CP

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for normal CP. The nominal window length for 3 MHz is rounded down one sample to allow the window to be centered on the symbol.

Table F.5.3-1 EVM window length for normal CP

Channel Bandwidth MHz	Cyclic prefix length N_{cp} for symbol 0		Nominal FFT size	Cyclic prefix for symbols 1 to 6 in FFT samples	EVM window length W in FFT samples	Ratio of W to CP for symbols 1 to 6 2
1.4			128	9	5	55.6
3			256	18	12	66.7
5	160	144	512	36	32	88.9
10	100	144	1024	72	66	91.7
15			1536	108	102	94.4
20			2048	144	136	94.4

Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed.

Note 2: These percentages are informative and apply to symbols 1 through 6. Symbol 0 has a longer CP and therefore a lower percentage.

F.5.4 Window length for Extended CP

The table below specifies the EVM window length at channel bandwidths 1.4, 3, 5, 10, 15, 20 MHz, for extended CP. The nominal window lengths for 3 MHz and 15 MHz are rounded down one sample to allow the window to be centered on the symbol.

Table F.5.4-1 EVM window length for extended CP

Channel Bandwidth MHz	$\begin{array}{c} \text{Cyclic} \\ \text{prefix} \\ \text{length}^1 N_{cp} \end{array}$	Nominal FFT size	Cyclic prefix in FFT samples	EVM window length W in FFT samples	Ratio of W to CP ²
1.4		128	32	28	87.5
3		256	64	58	90.6
5	512	512	128	124	96.9
10	312	1024	256	250	97.4
15		1536	384	374	97.4
20		2048	512	504	98.4

Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed.

Note 2: These percentages are informative

F.5.5 Window length for PRACH

The table below specifies the EVM window length for PRACH preamble formats 0-4.

Table F.5.5-1 EVM window length for PRACH

Preamble format	$\begin{array}{c} {\rm Cyclic} \\ {\rm prefix} \\ {\rm length}^1 \ N_{cp} \end{array}$	Nominal FFT size ²	EVM window length W in FFT samples	Ratio of <i>W</i> to CP*
0	3168	24576	3072	96.7%
1	21024	24576	20928	99.5%
2	6240	49152	6144	98.5%
3	21024	49152	20928	99.5%
4	448	4096	432	96.4%

Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed

Note 2: The use of other FFT sizes is possible as long as appropriate scaling of the window length is applied

Note 3: These percentages are informative

F.6 Averaged EVM

The general EVM is averaged over basic EVM measurements for n slots in the time domain.

$$\overline{EVM} = \sqrt{\frac{1}{n} \sum_{i=1}^{n} EVM_{i}^{2}},$$

where n is

n = 20 for PUCCH, PUSCH, PSDCH, PSCCH, and PSSCH,

n = 48 for PBSCH.

The EVM requirements shall be tested against the maximum of the RMS average at the window W extremities of the EVM measurements:

Thus $\overline{\text{EVM}}_1$ is calculated using $\Delta \tilde{t} = \Delta \tilde{t}_1$ in the expressions above and $\overline{\text{EVM}}_h$ is calculated using $\Delta \tilde{t} = \Delta \tilde{t}_h$.

Thus we get:

$$EVM = \max(\overline{EVM}_1, \overline{EVM}_h)$$

The calculation of the EVM for the demodulation reference signal, EVM_{DMRS} , follows the same procedure as calculating the general EVM, with the exception that the modulation symbol set T_m defined in clause F.2 is restricted to symbols containing uplink demodulation reference signals.

The basic EVM_{DMRS} measurements are first averaged over 20 slots in the time domain to obtain an intermediate average EVM_{DMRS} .

$$\overline{EVM}_{DMRS} = \sqrt{\frac{1}{20} \sum_{i=1}^{20} EVM_{DMRS,i}^2}$$

In the determination of each $EVM_{DMRS,i}$, the timing is set to $\Delta \tilde{t} = \Delta \tilde{t}_l$ if $\overline{EVM}_l > \overline{EVM}_h$, and it is set to $\Delta \tilde{t} = \Delta \tilde{t}_l$ otherwise, where \overline{EVM}_l and \overline{EVM}_h are the general average EVM values calculated in the same 20 slots over which the intermediate average \overline{EVM}_{DMRS} is calculated. Note that in some cases, the general average EVM may be calculated only for the purpose of timing selection for the demodulation reference signal EVM.

Then the results are further averaged to get the EVM for the demodulation reference signal, EVM_{DMRS} ,

$$EVM_{DMRS} = \sqrt{\frac{1}{6} \sum_{j=1}^{6} \overline{EVM}_{DMRS,j}^{2}}$$

The PRACH EVM, EVM_{PRACH} , is averaged over two preamble sequence measurements for preamble formats 0, 1, 2, 3, and it is averaged over 10 preamble sequence measurements for preamble format 4.

The EVM requirements shall be tested against the maximum of the RMS average at the window W extremities of the EVM measurements:

Thus $\overline{\text{EVM}}_{\text{PRACH,h}}$ is calculated using $\Delta \widetilde{t} = \Delta \widetilde{t}_l$ and $\overline{\text{EVM}}_{\text{PRACH,h}}$ is calculated using $\Delta \widetilde{t} = \Delta \widetilde{t}_h$.

Thus we get:

$$EVM_{PRACH} = \max(\overline{EVM}_{PRACH,1}, \overline{EVM}_{PRACH,h})$$

F.7 Spectrum Flatness

The data shall be taken from FFT coded data symbols and the demodulation reference symbols of the allocated resource block.

Annex G (informative): Reference sensitivity level in lower SNR

This annex contains information on typical receiver sensitivity when HARQ transmission is enabled allowing operation in lower SNR regions (HARQ is disabled in conformance testing), thus representing the configuration normally used in live network operation under noise-limited conditions.

G.1 General

The reference sensitivity power level P_{SENS} with HARQ retransmission enabled (operation in lower SNR) is the minimum mean power applied to both the UE antenna ports at which the residual BLER after HARQ shall meet the requirements for the specified reference measurement channel. The residual BLER after HARQ transmission is defined as follows:

$$BLER_{residual} = 1 - \frac{A}{B}$$

A: Number of correctly decoded MAC PDUs

B: Number of transmitted MAC PDUs (Retransmitted MAC PDUs are not counted)

G.2 Typical receiver sensitivity performance (QPSK)

The residual BLER after HARQ shall be lower than 1% for the reference measurement channels as specified in Annexes G.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table G.2-1 and Table G.2-2

Table G.2-1: Reference sensitivity QPSK PSENS

			annel bar				
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
1	,		Ì	[-102]	,	, ,	FDD
2				TBD			FDD
3				TBD			FDD
4				TBD			FDD
5				TBD			FDD
6				TBD			FDD
7				TBD			FDD
8				TBD			FDD
9				TBD			FDD
10				TBD			FDD
11				TBD			FDD
12				TBD			FDD
13				TBD			FDD
14				TBD			FDD
17				TBD			FDD
18				TBD			FDD
19				TBD			FDD
20				TBD			FDD
21				TBD			FDD
22				TBD			FDD
23				TBD			FDD
26				TBD			FDD
27				TBD			FDD
28				TBD			FDD
30				TBD			FDD
31			TBD				FDD
33				[-102]			TDD
34				[-102]			TDD
35				[-102]			TDD
36				[-102]			TDD
37				[-102]			TDD
38				[-102]			TDD
39				[-102]			TDD
40				[-102]			TDD
42				[-102]			TDD
43				[-102]			TDD
44				[-102]			TDD
45				[-102]			TDD
65				TBD			FDD

Note 1: The transmitter shall be set to P_{UMAX} as defined in clause 6.2.5

Note 2: Reference measurement channel is G.3 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1

Note 3: The signal power is specified per port

Note 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level is FFS.

Note 5: For the UE which supports both Band 11 and Band 21 the reference sensitivity level is FFS.

Table G.2-2 specifies the minimum number of allocated uplink resource blocks for which the reference receive sensitivity requirement in lower SNR must be met.

Table G.2-2: Minimum uplink configuration for reference sensitivity

E-UTRA Band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex Mode
1				[6] ¹			FDD
2				[6] ¹			FDD
3				[6] ¹			FDD
4				[6] ¹			FDD
5				[6] ¹			FDD
6				[6] ¹			FDD
7				[6] ¹			FDD
8				[6] ¹			FDD
9				[6] ¹			FDD
10				[6] ¹			FDD
11				[6] ¹			FDD
12				[6] ¹			FDD
13				[6] ¹			FDD
14				[6] ¹			FDD
17				[6] ¹			FDD
18				[6] ¹			FDD
19				[6] ¹			FDD
20				[6] ¹			FDD
22				[6] ¹			FDD
21				[6] ¹			FDD
23				[6] ¹			FDD
26				[6] ¹			FDD
27				[6] ¹			FDD
28				[6] ¹			FDD
30				[6] ¹			FDD
31			[5] ⁴				FDD
33				50			TDD
34				50			TDD
35				50			TDD
36				50			TDD
37				50			TDD
38				50			TDD
39				50			TDD
40				50			TDD
42				50			TDD
43				50			TDD
44				50			TDD
45				50			TDD
65				[6] ¹			FDD

Note 1: The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1).

Note 2: For the UE which supports both Band 11 and Band 21 the minimum uplink configuration for reference sensitivity is FFS.

Note 3: For Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart _11 and in the case of 20MHz channel bandwidth, the UL resource blocks shall be located at RBstart _16

Note 4: For Band 31; in the case of 5MHz channel bandwidth, the UL resource

blocks shall be located at RBstart _10

Unless given by Table G.2-3, the minimum requirements specified in Tables G.2-1 and G.2-2 shall be verified with the network signalling value NS_01 (Table 6.2.4-1) configured.

Table G.2-3: Network Signalling Value for reference sensitivity

E-UTRA Band	Network Signalling value
2	NS_03
4	NS_03
10	NS_03
12	NS_06
13	NS_06
14	NS_06
17	NS_06
19	NS_08
21	NS_09
23	NS_03
30	NS_21
35	NS_03
36	NS_03

G.3 Reference measurement channel for REFSENSE in lower SNR

 $Tables\ G.3-1\ and\ G.3-2\ are\ applicable\ for\ Annex\ G.2\ (Reference\ sensitivity\ level\ in\ lower\ SNR).$

Table G.3-1 Fixed Reference Channel for Receiver Requirements (FDD)

Parameter	Unit	Value
Channel bandwidth	MHz	5 10
Allocated resource blocks		25 50
Subcarriers per resource block		12 12
Allocated subframes per Radio Frame		9 9
Modulation		QPSK QPSK
Target Coding Rate		1/3 1/3
Number of HARQ Processes	Processes	8 8
Maximum number of HARQ transmissions		[4] [4]
Information Bit Payload per Sub-Frame		
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2216 4392
For Sub-Frame 5	Bits	N/A N/A
For Sub-Frame 0	Bits	1800 4392
Transport block CRC	Bits	24 24
Number of Code Blocks per Sub-Frame		
(Note 4)		
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1 1 1
For Sub-Frame 5	Bits	N/A N/A
For Sub-Frame 0	Bits	1 1 1
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	6300 13800
For Sub-Frame 5	Bits	N/A N/A
For Sub-Frame 0	Bits	5460 12960
Max. Throughput averaged over 1 frame	kbps	1952. 3952.
		8 8
UE Category		1-8 1-8

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Note 4: Redundancy version coding sequence is {0, 1, 2, 3} for QPSK.

Table G.3-2 Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit	Value		
Channel Bandwidth	MHz	10		
Allocated resource blocks		50		
Uplink-Downlink Configuration (Note 5)		1		
Allocated subframes per Radio Frame		4+2		
(D+S)				
Number of HARQ Processes	Processes	7		
Maximum number of HARQ transmission		[4]		
Modulation		QPSK		
Target coding rate		1/3		
Information Bit Payload per Sub-Frame	Bits			
For Sub-Frame 4, 9		4392		
For Sub-Frame 1, 6		3240		
For Sub-Frame 5		N/A		
For Sub-Frame 0		4392		
Transport block CRC	Bits	24		
Number of Code Blocks per Sub-Frame				
(Note 5)				
For Sub-Frame 4, 9		1		
For Sub-Frame 1, 6		1		
For Sub-Frame 5		N/A		
For Sub-Frame 0		1		
Binary Channel Bits Per Sub-Frame	Bits			
For Sub-Frame 4, 9		13800		
For Sub-Frame 1, 6		11256		
For Sub-Frame 5		N/A		
For Sub-Frame 0		13104		
Max. Throughput averaged over 1 frame	kbps	1965.		
	<u> </u>	6		
UE Category		1-5		

- For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz Note 1: channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
- For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with Note 2: insufficient PDCCH performance
- Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3:
- If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to Note 4: each Code Block (otherwise L = 0 Bit). As per Table 4.2-2 in TS 36.211 [4]
- Note 5:
- Redundancy version coding sequence is {0, 1, 2, 3} for QPSK. Note 6:

Annex H (normative): Modified MPR behavior

H.1 Indication of modified MPR behavior

This annex contains the definitions of the bits in the field *modifiedMPRbehavior* indicated in the IE UE Radio Access Capability [7] by a UE supporting an MPR or A-MPR modified in a later release of this specification.

Table H.1-1: Definitions of the bits in the field modifiedMPRbehavior

Index of field	Definition	Notes
(bit number)	(description of the supported functionality if indicator	
	set to one)	
0 (leftmost bit)	- The MPR for intra-band contiguous carrier	- This bit shall be set to 1 by
	aggregation bandwidth class C with non-contiguous	a UE supporting intra-band
	resource allocation specified in Clause 6.2.3A in	contiguous CA bandwidth
	version 12.5.0 of this specification	class C
1	- The A-MPR associated with NS_05 for Band 1 in	- This bit shall be set to 1 by
	Clause 6.2.4 in version 12.10.0 of this specification.	a UE supporting A-MPR
		associated to NS_05 for
		Band 1.

Annex I (informative): Change history

Table I.1: Change History

Date	TSG#	TSG Doc.	CR	Subject	Old	New
11-2007	R4#45	R4-72206		TS36.101V0.1.0 approved by RAN4	-	
12-2007	RP#38	RP-070979		Approved version at TSG RAN #38	1.0.0	8.0.0
03-2008	RP#39	RP-080123	3	TS36.101 - Combined updates of E-UTRA UE requirements	8.0.0	8.1.0
05-2008	RP#40	RP-080325	4	TS36.101 - Combined updates of E-UTRA UE requirements	8.1.0	8.2.0
09-2008	RP#41	RP-080638	5r1	Addition of Ref Sens figures for 1.4MHz and 3MHz Channel bandwiidths	8.2.0	8.3.0
09-2008	RP#41	RP-080638	7r1	Transmitter intermodulation requirements	8.2.0	8.3.0
09-2008	RP#41	RP-080638	10	CR for clarification of additional spurious emission requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080638	15	Correction of In-band Blocking Requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080638	18r1	TS36.101: CR for section 6: NS_06	8.2.0	8.3.0
09-2008	RP#41	RP-080638	19r1	TS36.101: CR for section 6: Tx modulation	8.2.0	8.3.0
09-2008	RP#41	RP-080638	20r1	TS36.101: CR for UE minimum power	8.2.0	8.3.0
09-2008	RP#41	RP-080638	21r1	TS36.101: CR for UE OFF power	8.2.0	8.3.0
09-2008	RP#41	RP-080638	24r1	TS36.101: CR for section 7: Band 13 Rx sensitivity	8.2.0	8.3.0
09-2008	RP#41	RP-080638	26	UE EVM Windowing	8.2.0	8.3.0
09-2008	RP#41	RP-080638	29	Absolute ACLR limit	8.2.0	8.3.0
09-2008	RP#41	RP-080731	23r2	TS36.101: CR for section 6: UE to UE co-existence	8.2.0	8.3.0
09-2008	RP#41	RP-080731	30	Removal of [] for UE Ref Sens figures	8.2.0	8.3.0
09-2008	RP#41	RP-080731	31	Correction of PA, PB definition to align with RAN1 specification	8.2.0	8.3.0
09-2008	RP#41	RP-080731	37r2	UE Spurious emission band UE co-existence	8.2.0	8.3.0
09-2008	RP#41	RP-080731	44	Definition of specified bandwidths	8.2.0	8.3.0
09-2008	RP#41	RP-080731	48r3	Addition of Band 17	8.2.0	8.3.0
09-2008	RP#41	RP-080731	50	Alignment of the UE ACS requirement	8.2.0	8.3.0
09-2008	RP#41	RP-080731	52r1	Frequency range for Band 12	8.2.0	8.3.0
09-2008	RP#41	RP-080731	54r1	Absolute power tolerance for LTE UE power control	8.2.0	8.3.0
09-2008	RP#41	RP-080731	55	TS36.101 section 6: Tx modulation	8.2.0	8.3.0
09-2008	RP#41	RP-080732	6r2	DL FRC definition for UE Receiver tests	8.2.0	8.3.0
09-2008	RP#41	RP-080732	46	Additional UE demodulation test cases	8.2.0	8.3.0
09-2008	RP#41	RP-080732	47	Updated descriptions of FRC	8.2.0	8.3.0
09-2008	RP#41	RP-080732	49	Definition of UE transmission gap	8.2.0	8.3.0
09-2008	RP#41	RP-080732	51	Clarification on High Speed train model in 36.101	8.2.0	8.3.0
09-2008	RP#41	RP-080732	53	Update of symbol and definitions	8.2.0	8.3.0
09-2008	RP#41	RP-080743	56	Addition of MIMO (4x2) and (4x4) Correlation Matrices	8.2.0	8.3.0
12-2008	RP#42	RP-080908	94r2	CR TX RX channel frequency separation	8.3.0	8.4.0
12-2008	RP#42	RP-080909	105r1	UE Maximum output power for Band 13	8.3.0	8.4.0
12-2008	RP#42	RP-080909	60	UL EVM equalizer definition	8.3.0	8.4.0
12-2008	RP#42	RP-080909	63	Correction of UE spurious emissions	8.3.0	8.4.0
12-2008	RP#42	RP-080909	66	Clarification for UE additional spurious emissions	8.3.0	8.4.0
12-2008	RP#42	RP-080909	72	Introducing ACLR requirement for coexistance with UTRA 1.6MHZ channel from 36.803	8.3.0	8.4.0
12-2008	RP#42	RP-080909	75	Removal of [] from Section 6 transmitter characteristcs	8.3.0	8.4.0
12-2008	RP#42	RP-080909	81	Clarification for PHS band protection	8.3.0	8.4.0
12-2008	RP#42	RP-080909	101	Alignement for the measurement interval for transmit signal quality	8.3.0	8.4.0
12-2008	RP#42	RP-080909	98r1	Maximum power	8.3.0	8.4.0
12-2008	RP#42	RP-080909	57r1	CR UE spectrum flatness	8.3.0	8.4.0
12-2008	RP#42	RP-080909	71r1	UE in-band emission	8.3.0	8.4.0
12-2008	RP#42	RP-080909	58r1	CR Number of TX exceptions	8.3.0	8.4.0
12-2008	RP#42	RP-080951	99r2	CR UE output power dynamic	8.3.0	8.4.0
12-2008	RP#42	RP-080951	79r1	LTE UE transmitter intermodulation	8.3.0	8.4.0
12-2008	RP#42	RP-080910	91	Update of Clause 8	8.3.0	8.4.0
12-2008	RP#42	RP-080950	106r1	Structure of Clause 9 including CSI requirements for PUCCH mode 1-0	8.3.0	8.4.0
12-2008	RP#42	RP-080911	59	CR UE ACS test frequency offset	8.3.0	8.4.0
12-2008	RP#42	RP-080911	65	Correction of spurious response parameters	8.3.0	8.4.0
12-2008	RP#42	RP-080911	80	Removal of LTE UE narrowband intermodulation	8.3.0	8.4.0
12-2008	RP#42	RP-080911	90r1	Introduction of Maximum Sensitivity Degradation	8.3.0	8.4.0

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12-2008	RP#42	RP-080911	103	Removal of [] from Section 7 Receiver characteristic	8.3.0	8.4.0
12-2008	RP#42	RP-080912	62	Alignement of TB size n Ref Meas channel for RX characteristics	8.3.0	8.4.0
12-2008	RP#42	RP-080912	78	TDD Reference Measurement channel for RX characterisctics	8.3.0	8.4.0
12-2008	RP#42	RP-080912	73r1	Addition of 64QAM DL referenbce measurement channel	8.3.0	8.4.0
12-2008	RP#42	RP-080912	74r1	Addition of UL Reference Measurement Channels	8.3.0	8.4.0
12-2008	RP#42	RP-080912	104	Reference measurement channels for PDSCH performance requirements (TDD)	8.3.0	8.4.0
12-2008	RP#42	RP-080913	68	MIMO Correlation Matrix Corrections	8.3.0	8.4.0
12-2008	RP#42	RP-080915	67	Correction to the figure with the Transmission Bandwidth configuration	8.3.0	8.4.0
12-2008	RP#42	RP-080916	77	Modification to EARFCN	8.3.0	8.4.0
12-2008	RP#42	RP-080917	85r1	New Clause 5 outline	8.3.0	8.4.0
12-2008	RP#42	RP-080919	102	Introduction of Bands 12 and 17 in 36.101	8.3.0	8.4.0
12-2008	RP#42	RP-080927	84r1	Clarification of HST propagation conditions	8.3.0	8.4.0
03-2009	RP#43	RP-090170	156r2	A-MPR table for NS_07	8.4.0	8.5.0
03-2009	RP#43	RP-090170	170	Corrections of references (References to tables and figures)	8.4.0	8.5.0
03-2009	RP#43	RP-090170	108	Removal of [] from Transmitter Intermodulation	8.4.0	8.5.0
03-2009	RP#43	RP-090170	155	E-UTRA ACLR for below 5 MHz bandwidths	8.4.0	8.5.0
03-2009	RP#43	RP-090170	116	Clarification of PHS band including the future plan	8.4.0	8.5.0
03-2009	RP#43	RP-090170	119	Spectrum emission mask for 1.4 MHz and 3 MHz bandwidhts	8.4.0	8.5.0
03-2009	RP#43	RP-090170	120	Removal of "Out-of-synchronization handling of output power" heading	8.4.0	8.5.0
03-2009	RP#43	RP-090170	126	UE uplink power control	8.4.0	8.5.0
03-2009	RP#43	RP-090170	128	Transmission BW Configuration	8.4.0	8.5.0
03-2009	RP#43	RP-090170	130	Spectrum flatness	8.4.0	8.5.0
03-2009	RP#43	RP-090170	132r2	PUCCH EVM	8.4.0	8.5.0
03-2009	RP#43	RP-090170	134	UL DM-RS EVM	8.4.0	8.5.0
03-2009	RP#43	RP-090170	140	Removal of ACLR2bis requirements	8.4.0	8.5.0
03-2009	RP#43	RP-090171	113	In-band blocking	8.4.0	8.5.0
03-2009	RP#43	RP-090171	127	In-band blocking and sensitivity requirement for band 17	8.4.0	8.5.0
03-2009	RP#43	RP-090171	137r1	Wide band intermodulation	8.4.0	8.5.0 8.5.0
03-2009 03-2009	RP#43 RP#43	RP-090171 RP-090172	141 109	Correction of reference sensitivity power level of Band 9	8.4.0 8.4.0	8.5.0
03-2009	RP#43	RP-090172	124	AWGN level for UE DL demodulation performance tests Update of Clause 8: additional test cases	8.4.0	8.5.0
03-2009	RP#43	RP-090172	139r1	Performance requirement structure for TDD PDSCH	8.4.0	8.5.0
03-2009	RP#43	RP-090172	142r1	Performance requirements and reference measurement channels for TDD PDSCH demodulation with UE-specific reference symbols	8.4.0	8.5.0
03-2009	RP#43	RP-090172	145	Number of information bits in DwPTS	8.4.0	8.5.0
03-2009	RP#43	RP-090172	160r1	MBSFN-Unicast demodulation test case	8.4.0	8.5.0
03-2009	RP#43	RP-090172	163r1	MBSFN-Unicast demodulation test case for TDD	8.4.0	8.5.0
03-2009	RP#43	RP-090173	162	Clarification of EARFCN for 36.101	8.4.0	8.5.0
03-2009	RP#43	RP-090369	110	Correction to UL Reference Measurement Channel	8.4.0	8.5.0
03-2009	RP#43	RP-090369	114	Addition of MIMO (4x4, medium) Correlation Matrix	8.4.0	8.5.0
03-2009	RP#43	RP-090369	121	Correction of 36.101 DL RMC table notes	8.4.0	8.5.0
03-2009	RP#43	RP-090369	125	Update of Clause 9	8.4.0	8.5.0
03-2009	RP#43	RP-090369	138r1	Clarification on OCNG	8.4.0	8.5.0
03-2009	RP#43	RP-090369	161	CQI reference measurement channels	8.4.0	8.5.0
03-2009	RP#43	RP-090369	164	PUCCH 1-1 Static Test Case	8.4.0	8.5.0
03-2009	RP#43	RP-090369	111	Reference Measurement Channel for TDD	8.4.0	8.5.0
03-2009	RP#44			Editorial correction in Table 6.2.4-1	8.5.0	8.5.1
05-2009	RP#44	RP-090540	167	Boundary between E-UTRA fOOB and spurious emission domain for 1.4 MHz and 3 MHz bandwiths. (Technically Endorsed CR in R4-50bis - R4-091205)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	168	EARFCN correction for TDD DL bands. (Technically Endorsed CR in R4-50bis - R4-091206)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	169	Editorial correction to in-band blocking table. (Technically Endorsed CR in R4-50bis - R4-091238)	8.5.1	8.6.0
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05-2009	RP#44	RP-090540	171	CR PRACH EVM. (Technically Endorsed CR in R4-50bis - R4-091308)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	172	CR EVM correction. (Technically Endorsed CR in R4-50bis - R4-091309)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	177	CR power control accuracy. (Technically Endorsed CR in R4-50bis - R4-091418)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	179	Correction of SRS requirements. (Technically Endorsed CR in R4-50bis - R4-091426)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	186	Clarification for EVM. (Technically Endorsed CR in R4-50bis - R4-091512)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	187	Removal of [] from band 17 Refsens values and ACS offset frequencies	8.5.1	8.6.0
05-2009	RP#44	RP-090540	191	Completion of band17 requirements	8.5.1	8.6.0
05-2009	RP#44	RP-090540	192	Removal of 1.4 MHz and 3 MHz bandwidths from bands 13, 14 and 17.	8.5.1	8.6.0
05-2009	RP#44	RP-090540	223	CR: 64 QAM EVM	8.5.1	8.6.0
05-2009	RP#44	RP-090540	201	CR In-band emissions	8.5.1	8.6.0
05-2009	RP#44	RP-090540	203	CR EVM exclusion period	8.5.1	8.6.0
05-2009	RP#44	RP-090540	204	CR In-band emissions timing	8.5.1	8.6.0
05-2009	RP#44	RP-090540	206	CR Minimum Rx exceptions	8.5.1	8.6.0
05-2009	RP#44	RP-090540	207	CR UL DM-RS EVM	8.5.1	8.6.0
05-2009	RP#44	RP-090540	218r1	A-MPR table for NS 07	8.5.1	8.6.0
05-2009	RP#44	RP-090540	205r1	CR In-band emissions in shortened subframes	8.5.1	8.6.0
05-2009	RP#44	RP-090540	200r1	CR PUCCH EVM	8.5.1	8.6.0
				No additional emission mask indication. (Technically Endorsed		
05-2009	RP#44	RP-090540	178r2	CR in R4-50bis - R4-091421)	8.5.1	8.6.0 8.6.0
05-2009	RP#44	RP-090540	220r1	Spectrum emission requirements for band 13	8.5.1	1
05-2009	RP#44	RP-090540	197r2	CR on aggregate power tolerance	8.5.1	8.6.0
05-2009	RP#44	RP-090540	196r2	CR: Rx IP2 performance	8.5.1	8.6.0
05-2009	RP#44	RP-090541	198r1	Maximum output power relaxation	8.5.1	8.6.0
05-2009	RP#44	RP-090542	166	Update of performance requirement for TDD PDSCH with MBSFN configuration. (Technically Endorsed CR in R4-50bis - R4-091180)	8.5.1	8.6.0
05-2009	RP#44	RP-090542	175	Adding AWGN levels for some TDD DL performance requirements. (Technically Endorsed CR in R4-50bis - R4-091406)	8.5.1	8.6.0
05-2009	RP#44	RP-090542	182	OCNG Patterns for Single Resource Block FRC Requirements. (Technically Endorsed CR in R4-50bis - R4-091504)	8.5.1	8.6.0
05-2009	RP#44	RP-090542	170r1	Update of Clause 8: PHICH and PMI delay. (Technically Endorsed CR in R4-50bis - R4-091275)	8.5.1	8.6.0
05-2009	RP#44	RP-090543	183	Requirements for frequency-selective fading test. (Technically Endorsed CR in R4-50bis - R4-091505)	8.5.1	8.6.0
05-2009	RP#44	RP-090543	199	CQI requirements under AWGN conditions	8.5.1	8.6.0
05-2009	RP#44	RP-090543	188r1	Adaptation of UL-RMC-s for supporting more UE categories	8.5.1	8.6.0
05-2009	RP#44	RP-090543	193r1	Correction of the LTE UE downlink reference measurement channels	8.5.1	8.6.0
05-2009	RP#44	RP-090543	184r1	Requirements for frequency non-selective fading tests. (Technically Endorsed CR in R4-50bis - R4-091506)	8.5.1	8.6.0
05-2009	RP#44	RP-090543	185r1	Requirements for PMI reporting. (Technically Endorsed CR in R4-50bis - R4-091510)	8.5.1	8.6.0
05-2009	RP#44	RP-090543	221r1	Correction to DL RMC-s for Maximum input level for supporting more UE-Categories	8.5.1	8.6.0
05-2009	RP#44	RP-090543	216	Addition of 15 MHz and 20 MHz bandwidths into band 38	8.5.1	8.6.0
05-2009	RP#44	RP-090559	180	Introduction of Extended LTE800 requirements. (Technically Endorsed CR in R4-50bis - R4-091432)	8.6.0	9.0.0
09-2009	RP#45	RP-090826	239	A-MPR for Band 19	9.0.0	9.1.0
09-2009	RP#45	RP-090822	225	LTE UTRA ACLR1 centre frequency definition for 1.4 and 3 MHz BW	9.0.0	9.1.0
09-2009	RP#45	RP-090822	227	Harmonization of text for LTE Carrier leakage	9.0.0	9.1.0
09-2009	RP#45	RP-090822	229	Sensitivity requirements for Band 38 15 MHz and 20 MHz bandwidths	9.0.0	9.1.0
09-2009	RP#45	RP-090822	236	Operating band edge relaxation of maximum output power for Band 18 and 19	9.0.0	9.1.0
09-2009	RP#45	RP-090822	238	Addition of 5MHz channel bandwidth for Band 40	9.0.0	9.1.0
09-2009	RP#45	RP-090822	245	Removal of unnecessary requirements for 1.4 and 3 MHz bandwidths on bands 13 and 17	9.0.0	9.1.0
09-2009	RP#45	RP-090877	261	Correction of LTE UE ACS test parameter	9.0.0	9.1.0
09-2009	RP#45	RP-090877	263R1	Correction of LTE UE ACLR test parameter	9.0.0	9.1.0
09-2009	RP#45	RP-090877	286	Uplink power and RB allocation for receiver tests	9.0.0	9.1.0
09-2009	RP#45	RP-090877	320	CR Sensitivity relaxation for small BW	9.0.0	9.1.0
35 2555	RP#45	RP-090877	324	Correction of Band 3 spurious emission band UE co-existence	9.0.0	9.1.0

09-2009	RP#45	RP-090877	249R1	CR Pemay definition (working assumption)	9.0.0	9.1.0
09-2009	RP#45	RP-090877 RP-090877	330	CR Pcmax definition (working assumption) Spectrum flatness clarification	9.0.0	9.1.0
09-2009	RP#45	RP-090877	332	Transmit power: removal of TC and modification of REFSENS note	9.0.0	9.1.0
09-2009	RP#45	RP-090877	282R1	Additional SRS relative power requirement and update of measurement definition	9.0.0	9.1.0
09-2009	RP#45	RP-090877	284R1	Power range applicable for relative tolerance	9.0.0	9.1.0
09-2009	RP#45	RP-090878	233	TDD UL/DL configurations for CQI reporting	9.0.0	9.1.0
09-2009	RP#45	RP-090878	235	Further clarification on CQI test configurations	9.0.0	9.1.0
09-2009	RP#45	RP-090878	243	Corrections to UL- and DL-RMC-s	9.0.0	9.1.0
09-2009	RP#45	RP-090878	247	Reference measurement channel for multiple PMI requirements	9.0.0	9.1.0
09-2009	RP#45	RP-090878	290	CQI reporting test for a scenario with frequency-selective interference	9.0.0	9.1.0
09-2009	RP#45	RP-090878	265R2	CQI reference measurement channels	9.0.0	9.1.0
09-2009	RP#45	RP-090878	321R1	CR RI Test	9.0.0	9.1.0
09-2009	RP#45	RP-090875	231	Correction of parameters for demodulation performance requirement	9.0.0	9.1.0
09-2009	RP#45	RP-090875	241R1	UE categories for performance tests and correction to RMC references	9.0.0	9.1.0
09-2009	RP#45	RP-090875	333	Clarification of Ês definition in the demodulation requirement	9.0.0	9.1.0
09-2009	RP#45	RP-090875	326	Editorial corrections and updates to PHICH PBCH test cases.	9.0.0	9.1.0
09-2009	RP#45	RP-090875	259R3	Test case numbering in section 8 Performance tests	9.0.0	9.1.0
				Test case numbering in TDD PDSCH performance test		
12-2009	RP-46	RP-091264	335	(Technically endorsed at RAN 4 52bis in R4-093523)	9.1.0	9.2.0
12-2009	RP-46	RP-091261	337	Adding beamforming model for user-specfic reference signal	9.1.0	9.2.0
12-2009	1(1 -40	1091201	337	(Technically endorsed at RAN 4 52bis in R4-093525)	3.1.0	9.2.0
12-2009	RP-46	RP-091263	339R1	Adding redundancy sequences to PMI test (Technically endorsed at RAN 4 52bis in R4-093581)	9.1.0	9.2.0
12-2009	RP-46	RP-091264	341	Throughput value correction at FRC for Maximum input level (Technically endorsed at RAN 4 52bis in R4-093660)	9.1.0	9.2.0
12-2009	RP-46	RP-091261	343	Correction to the modulated E-UTRA interferer (Technically endorsed at RAN 4 52bis in R4-093662)	9.1.0	9.2.0
12-2009	RP-46	RP-091264	345R1	OCNG: Patterns and present use in tests (Technically endorsed at RAN 4 52bis in R4-093664)	9.1.0	9.2.0
12-2009	RP-46	RP-091264	347	OCNG: Use in receiver and performance tests (Technically endorsed at RAN 4 52bis in R4-093666)	9.1.0	9.2.0
12-2009	RP-46	RP-091263	349	Miscellaneous corrections on CSI requirements (Technically endorsed at RAN 4 52bis in R4-093676)	9.1.0	9.2.0
12-2009	RP-46	RP-091261	351	Removal of RLC modes (Technically endorsed at RAN 4 52bis in R4-093677)	9.1.0	9.2.0
12-2009	RP-46	RP-091261	353	CR Rx diversity requirement (Technically endorsed at RAN 4 52bis in R4-093703)	9.1.0	9.2.0
12-2009	RP-46	RP-091261	355	A-MPR notation in NS_07 (Technically endorsed at RAN 4 52bis in R4-093706)	9.1.0	9.2.0
12-2009	RP-46	RP-091263	359	Single- and multi-PMI requirements (Technically endorsed at RAN 4 52bis in R4-093846)	9.1.0	9.2.0
12-2009	RP-46	RP-091263	363	CQI reference measurement channel (Technically endorsed at RAN 4 52bis in R4-093970)	9.1.0	9.2.0
12-2009	RP-46	RP-091292	364	LTE MBSFN Channel Model (Technically endorsed at RAN 4 52bis in R4-094020)	9.1.0	9.2.0
12-2009	RP-46	RP-091264	367	Numbering of PDSCH (User-Specific Reference Symbols) Demodulation Tests	9.1.0	9.2.0
12-2009	RP-46	RP-091264	369	Numbering of PDCCH/PCFICH, PHICH, PBCH Demod Tests	9.1.0	9.2.0
12-2009 12-2009	RP-46	RP-091261 RP-091264	371 373R1	Remove [] from Reference Measurement Channels in Annex A Corrections to RMC-s for Maximum input level test for low UE	9.1.0 9.1.0	9.2.0
12-2009	RP-46	RP-091261	377	categories Correction of UE-category for R.30	9.1.0	9.2.0
12-2009	RP-46	RP-091286	378	Introduction of Extended LTE1500 requirements for TS36.101	9.1.0	9.2.0
12-2009	RP-46	RP-091262	384	CR: Removal of 1.4 MHz and 3 MHz channel bandwidths from additional spurious emissions requirements for Band 1 PHS protection	9.1.0	9.2.0
					ı	
12-2009	RP-46	RP-091262	386R3	Clarification of measurement conditions of spurious emission	9.1.0	9.2.0
		RP-091262 RP-091262	386R3 390		9.1.0 9.1.0	9.2.0
12-2009	RP-46			Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain Spurious emission table correction for TDD bands 33 and 38. 36.101 Symbols and abreviations for Pcmax		
12-2009 12-2009	RP-46 RP-46	RP-091262	390	Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain Spurious emission table correction for TDD bands 33 and 38. 36.101 Symbols and abreviations for Pcmax UTRAACLR1 requirement definition for 1.4 and 3 MHz BW completed	9.1.0	9.2.0
12-2009 12-2009 12-2009 12-2009 12-2009	RP-46 RP-46 RP-46 RP-46	RP-091262 RP-091262 RP-091262 RP-091263	390 392R2 394 396	Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain Spurious emission table correction for TDD bands 33 and 38. 36.101 Symbols and abreviations for Pcmax UTRAACLR1 requirement definition for 1.4 and 3 MHz BW completed Introduction of the ACK/NACK feedback modes for TDD requirements	9.1.0 9.1.0 9.1.0 9.1.0	9.2.0 9.2.0 9.2.0 9.2.0
12-2009 12-2009 12-2009 12-2009 12-2009 12-2009	RP-46 RP-46 RP-46 RP-46 RP-46	RP-091262 RP-091262 RP-091262 RP-091263 RP-091262	390 392R2 394 396 404R3	Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain Spurious emission table correction for TDD bands 33 and 38. 36.101 Symbols and abreviations for Pcmax UTRAACLR1 requirement definition for 1.4 and 3 MHz BW completed Introduction of the ACK/NACK feedback modes for TDD requirements CR Power control exception R8	9.1.0 9.1.0 9.1.0 9.1.0 9.1.0	9.2.0 9.2.0 9.2.0 9.2.0 9.2.0
12-2009 12-2009 12-2009 12-2009 12-2009	RP-46 RP-46 RP-46 RP-46	RP-091262 RP-091262 RP-091262 RP-091263	390 392R2 394 396	Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain Spurious emission table correction for TDD bands 33 and 38. 36.101 Symbols and abreviations for Pcmax UTRAACLR1 requirement definition for 1.4 and 3 MHz BW completed Introduction of the ACK/NACK feedback modes for TDD requirements	9.1.0 9.1.0 9.1.0 9.1.0	9.2.0 9.2.0 9.2.0 9.2.0

40.0000	DD 40	DD 004004	405	Editorial corrections and updates to Clause 8.2.1 FDD	0.4.0	0.00
12-2009	RP-46	RP-091264	425	demodulation test cases	9.1.0	9.2.0
12-2009	RP-46	RP-091262	427	CR: time mask	9.1.0	9.2.0
12-2009	RP-46	RP-091264	430	Correction of the payload size for PDCCH/PCFICH performance requirements	9.1.0	9.2.0
12-2009	RP-46	RP-091263	432	Transport format and test point updates to RI reporting test cases	9.1.0	9.2.0
				Transport format and test setup updates to frequency-selective		
12-2009	RP-46	RP-091263	434	interference CQI tests	9.1.0	9.2.0
12-2009	RP-46	RP-091263	436	CR RI reporting configuration in PUCCH 1-1 test	9.1.0	9.2.0
12-2009	RP-46	RP-091261	438	Addition of R.11-1 TDD references	9.1.0	9.2.0
12-2009 12-2009	RP-46 RP-46	RP-091292 RP-091262	439 442R1	Performance requirements for LTE MBMS In Band Emissions Requirements Correction CR	9.1.0 9.1.0	9.2.0 9.2.0
12-2009	RP-46	RP-091262	444R1	PCMAX definition	9.1.0	9.2.0
03-2010	RP-47	RP-100246	453r1	Corrections of various errors in the UE RF requirements	9.2.0	9.3.0
03-2010	RP-47	RP-100246	462r1	UTRA ACLR measurement bandwidths for 1.4 and 3 MHz	9.2.0	9.3.0
03-2010	RP-47	RP-100246	493	Band 8 Coexistence Requirement Table Correction	9.2.0	9.3.0
03-2010 03-2010	RP-47 RP-47	RP-100246 RP-100246	489r1 485r1	Rel 9 CR for Band 14 CR Band 1- PHS coexistence	9.2.0 9.2.0	9.3.0
03-2010	RP-47	RP-100246 RP-100247	501	Fading CQI requirements for FDD mode	9.2.0	9.3.0 9.3.0
03-2010	RP-47	RP-100247	499	CR correction to RI test	9.2.0	9.3.0
03-2010	RP-47	RP-100249	451	Reporting mode, Reporting Interval and Editorial corrections for demodulation	9.2.0	9.3.0
03-2010	RP-47	RP-100249	464r1	Corrections to 1PRB PDSCH performance test in presence of MBSFN.	9.2.0	9.3.0
03-2010	RP-47	RP-100249	458r1	OCNG corrections	9.2.0	9.3.0
03-2010	RP-47	RP-100249	467	Addition of ONCG configuration in DRS performance test	9.2.0	9.3.0
03-2010 03-2010	RP-47	RP-100249 RP-100250	465r1 460r1	PDSCH performance tests for low UE categories Use of OCNG in CSI tests	9.2.0 9.2.0	9.3.0 9.3.0
03-2010	RP-47	RP-100250	491r1	Corrections to CQI test configurations	9.2.0	9.3.0
03-2010	RP-47	RP-100250	469r1	Corrections of some CSI test parameters	9.2.0	9.3.0
03-2010	RP-47	RP-100251	456r1	TBS correction for RMC UL TDD 16QAM full allocation BW 1.4 MHz	9.2.0	9.3.0
03-2010	RP-47	RP-100262	449	Editorial corrections on Band 19 REFSENS	9.2.0	9.3.0
03-2010	RP-47	RP-100263	470r1	Band 20 UE RF requirements	9.2.0	9.3.0
03-2010 03-2010	RP-47 RP-47	RP-100264 RP-100264	446r1 448	A-MPR for Band 21 RF requirements for UE in later releases	9.2.0 9.2.0	9.3.0 9.3.0
03-2010	RP-47	RP-100268	445	36.101 CR: Editorial corrections on LTE MBMS reference measurement channels	9.2.0	9.3.0
03-2010	RP-47	RP-100268	454	The definition of the Doppler shift for LTE MBSFN Channel Model	9.2.0	9.3.0
03-2010	RP-47	RP-100239	478r3	Modification of the spectral flatness requirement and some editorial corrections	9.2.0	9.3.0
06-2010	RP-48	RP-100619	559	Corrections of tables for Additional Spectrum Emission Mask	9.3.0	9.4.0
06-2010	RP-48	RP-100619	538	Correction of transient time definition for EVM requirements	9.3.0	9.4.0
06-2010 06-2010	RP-48	RP-100619 RP-100619	557r2 547r1	CR on UE coexistence requirement Correction of antenna configuration and beam-forming model for DRS	9.3.0	9.4.0
06-2010	RP-48	RP-100619	536r1	CR: Corrections on MIMO demodulation performance requirements	9.3.0	9.4.0
06-2010	RP-48	RP-100619	528r1	Corrections on the definition of PCMAX	9.3.0	9.4.0
06-2010				Relaxation of the PDSCH demodulation requirements due to	9.3.0	9.4.0
	RP-48	RP-100619	568	control channel errors		
06-2010	RP-48	RP-100619	566 505r1	Correction of the UE output power definition for RX tests	9.3.0	9.4.0
06-2010 06-2010	RP-48 RP-48	RP-100620 RP-100620	505r1 521	Fading CQI requirements for TDD mode Correction to FRC for CQI index 0	9.3.0 9.3.0	9.4.0 9.4.0
06-2010	RP-48	RP-100620	521 516r1	Correction to CQI test configuration	9.3.0	9.4.0
06-2010	RP-48	RP-100620	532	Correction of CQI and PMI delay configuration description for TDD	9.3.0	9.4.0
06-2010	RP-48	RP-100620	574	Correction to FDD and TDD CSI test configurations	9.3.0	9.4.0
06-2010	RP-48	RP-100620	571	Minimum requirements for Rank indicator reporting	9.3.0	9.4.0
06-2010	RP-48	RP-100628	563	LTE MBMS performance requirements (FDD)	9.3.0	9.4.0
06-2010 06-2010	RP-48 RP-48	RP-100628 RP-100629	564 553r2	LTE MBMS performance requirements (TDD) Performance requirements for dual-layer beamforming	9.3.0 9.3.0	9.4.0 9.4.0
06-2010	RP-48	RP-100629	524r2	CR: low Category CSI requirement	9.3.0	9.4.0
06-2010	RP-48	RP-100630	519	Correction of FRC reference and test case numbering	9.3.0	9.4.0
06-2010	RP-48	RP-100630	526	Correction of carrier frequency and EARFCN of Band 21 for TS36.101	9.3.0	9.4.0
06-2010	RP-48	RP-100630	508r1	Addition of PDSCH TDD DRS demodulation tests for Low UE categories	9.3.0	9.4.0
06-2010	RP-48	RP-100630	539	Specification of minimum performance requirements for low UE category	9.3.0	9.4.0
06-2010	RP-48	RP-100630	569	Addition of minimum performance requirements for low UE category TDD CRS single-antenna port tests	9.3.0	9.4.0
06-2010	DD 40	DD 400004	E40-0	Introduction of sustained downlink data-rate performance	9.3.0	9.4.0
06-2010	RP-48	RP-100631	549r3	requirements Band 20 Rx requirements		
06-2010	RP-48	RP-100683	530r1	Danu Zu KX requirements	9.3.0	9.4.0

09-2010	DD 40	DD 400000	04.4-0	A dd OONO to MPMO mandana anda	0.40	0.5.0
	RP-49	RP-100920	614r2	Add OCNG to MBMS requirements	9.4.0	9.5.0
09-2010	RP-49	RP-100916	599	Correction of PDCCH content for PHICH test	9.4.0	9.5.0
09-2010	RP-49	RP-100920	597r1	Beamforming model for transmission on antenna port 7/8	9.4.0	9.5.0
		DD 400000				
09-2010	RP-49	RP-100920	600r1	Correction of full correlation in frequency-selective CQI test	9.4.0	9.5.0
00 0040				Correction on single-antenna transmission fixed reference		
09-2010	RP-49	RP-100920	601	channel	9.4.0	9.5.0
	111 10	141 100020	001		0.1.0	0.0.0
09-2010				Reference sensitivity requirements for the 1.4 and 3 MHz		
00 2010	RP-49	RP-100914	605	bandwidths	9.4.0	9.5.0
09-2010	RP-49	RP-100920	608r1	CR for DL sustained data rate test	9.4.0	9.5.0
09-2010	1	1 100020	000		00	0.0.0
09-2010				Correction of references in section 10 (MBMS performance		
	RP-49	RP-100919	611	requirements)	9.4.0	9.5.0
09-2010	RP-49	RP-100914	613	Band 13 and Band 14 spurious emission corrections	9.4.0	9.5.0
09-2010	RP-49	RP-100919	617r1	Rx Requirements	9.4.0	9.5.0
09-2010	RP-49	RP-100926	576r1	Clarification on DL-BF simulation assumptions	9.4.0	9.5.0
09-2010	RP-49	RP-100920	582r1	Introduction of additional Rel-9 scenarios	9.4.0	9.5.0
09-2010	RP-49	RP-100925	575r1	Correction to band 20 ue to ue Co-existence table	9.4.0	9.5.0
09-2010	RP-49	RP-100916	581r1	Test configuration corrections to CQI reporting in AWGN	9.4.0	9.5.0
09-2010	RP-49	RP-100916	595	Corrections to RF OCNG Pattern OP.1 and 2	9.4.0	9.5.0
09-2010	RP-49	RP-100919	583	Editorial corrections of 36.101	9.4.0	9.5.0
	1(1 -43	100313	303		3.4.0	3.3.0
09-2010				Addition of minimum performance requirements for low UE		
	RP-49	RP-100920	586	category TDD tests	9.4.0	9.5.0
09-2010	RP-49	RP-100914	590r1	Downlink power for receiver tests	9.4.0	9.5.0
09-2010	RP-49	RP-100920	591	OCNG use and power in beamforming tests	9.4.0	9.5.0
09-2010	RP-49	RP-100916	593	Throughput for multi-datastreams transmissions	9.4.0	9.5.0
09-2010	RP-49	RP-100914	588	Missing note in Additional spurious emission test with NS_07	9.4.0	9.5.0
09-2010	RP-49	RP-100927	596r2	CR LTE_TDD_2600_US spectrum band definition additions to TS	9.5.0	10.0.0
				36.101		
12-2010	RP-50	RP-101309	680	Demodulation performance requirements for dual-layer	10.0.0	10.1.0
12-2010	KF-50	KF-101309	000		10.0.0	10.1.0
				beamforming		
12-2010	RP-50	RP-101325	672	Correction on the statement of TB size and subband selection in	10.0.0	10.1.0
				CSI tests		
10.0010	55.50	DD 10100=				
12-2010	RP-50	RP-101327	652	Correction to Band 12 frequency range	10.0.0	10.1.0
12-2010	RP-50	RP-101329	630	Removal of [] from TDD Rank Indicator requirements	10.0.0	10.1.0
12-2010	RP-50	RP-101329	635r1	Test configuration corrections to CQI TDD reporting in AWGN	10.0.0	10.1.0
12-2010	KF-50	KF-101329	03311		10.0.0	10.1.0
				(Rel-10)		
12-2010	RP-50	RP-101330	645	EVM window length for PRACH	10.0.0	10.1.0
12-2010	RP-50	RP-101330	649	Removal of NS signalling from TDD REFSENS tests	10.0.0	10.1.0
12-2010	RP-50	RP-101330	642r1	Correction of Note 4 In Table 7.3.1-1: Reference sensitivity QPSK	10.0.0	10.1.0
				PREFSENS		
12-2010	RP-50	RP-101341	627	Add 20 RB UL Ref Meas channel	10.0.0	10.1.0
12-2010	RP-50	RP-101341	654r1	Additional in-band blocking requirement for Band 12	10.0.0	10.1.0
12-2010	RP-50	RP-101341	678	Further clarifications for the Sustained Downlink Data Rate Test	10.0.0	10.1.0
12-2010	RP-50	RP-101341	673r1	Correction on MBMS performance requirements	10.0.0	10.1.0
12-2010	RP-50	RP-101349	667r3	CR Removing brackets of Band 41 reference sensitivity to TS	10.0.0	10.1.0
				36.101		
12-2010	RP-50	RP-101356	666r2	Band 42 and 43 parameters for UMTS/LTE 3500 (TDD) for TS	10.0.0	10.1.0
12-2010	111 -30	141 - 10 1330	00012	l == .=. '	10.0.0	10.1.0
				36.101		
12-2010	RP-50	RP-101359	646r1	CR for CA, UL-MIMO, eDL-MIMO, CPE	10.0.0	10.1.0
12-2010	RP-50	RP-101361	620r1	Introduction of L-band in TS 36.101	10.0.0	10.1.0
12-2010	RP-50	RP-101379	670r1	Correction on the PMI reporting in Multi-Laye Spatial Multiplexing	10.0.0	10.1.0
	<u> </u>			performance test	<u> </u>	
12-2010	RP-50	RP-101380	679r1	Adding antenna configuration in CQI fading test case	10.0.0	10.1.0
01-2011	1 50			Clause numbering correction	10.1.0	10.1.1
	 		+			
			695	Removal of E-UTRA ACLR for CA	10.1.1	10.2.0
03-2011	RP-51	RP-110359				10.2.0
					10,1.1	
03-2011	RP-51	RP-110338	699	PDCCH and PHICH performance: OCNG and power settings	10.1.1	
03-2011 03-2011	RP-51 RP-51	RP-110338 RP-110336	699 706r1	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty	10.1.1	10.2.0
03-2011 03-2011 03-2011	RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352	699 706r1 707r1	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR	10.1.1 10.1.1	10.2.0 10.2.0
03-2011 03-2011 03-2011	RP-51 RP-51	RP-110338 RP-110336 RP-110352	699 706r1 707r1	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR	10.1.1	10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338	699 706r1 707r1 710	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity	10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359	699 706r1 707r1 710 715r2	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10	10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338	699 706r1 707r1 710	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image	10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359	699 706r1 707r1 710 715r2	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image	10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359 RP-110359	699 706r1 707r1 710 715r2 717	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359 RP-110359	699 706r1 707r1 710 715r2 717	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359 RP-110359	699 706r1 707r1 710 715r2 717	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359 RP-110359	699 706r1 707r1 710 715r2 717	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359 RP-110359 RP-110343 RP-110343	699 706r1 707r1 710 715r2 717 719 723	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359 RP-110359 RP-110343 RP-110343	699 706r1 707r1 710 715r2 717 719 723	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110343 RP-110338	699 706r1 707r1 710 715r2 717 719 723	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10 Removing the square bracket for TS36.101	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110343 RP-110338	699 706r1 707r1 710 715r2 717 719 723	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110338 RP-110359 RP-110359 RP-110343 RP-110343	699 706r1 707r1 710 715r2 717 719 723 726r1 730	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10 Removing the square bracket for TS36.101 Removal of square brackets for dual-layer beamforming	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110343 RP-110349	699 706r1 707r1 710 715r2 717 719 723 726r1 730 739	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10 Removal of square bracket for TS36.101 Removal of square brackets for dual-layer beamforming demodulation performance requirements	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110343 RP-110349	699 706r1 707r1 710 715r2 717 719 723 726r1 730 739	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10 Removing the square bracket for TS36.101 Removal of square brackets for dual-layer beamforming demodulation performance requirements CR: Maximum input level for intra band CA	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110343 RP-110349	699 706r1 707r1 710 715r2 717 719 723 726r1 730 739	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10 Removing the square bracket for TS36.101 Removal of square brackets for dual-layer beamforming demodulation performance requirements CR: Maximum input level for intra band CA	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110343 RP-110349 RP-110349	699 706r1 707r1 710 715r2 717 719 723 726r1 730 739 751 754r2	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10 Removing the square bracket for TS36.101 Removal of square brackets for dual-layer beamforming demodulation performance requirements CR: Maximum input level for intra band CA UE category coverage for dual-layer beamforming	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110343 RP-110349 RP-110349 RP-110349 RP-110343	699 706r1 707r1 710 715r2 717 719 723 726r1 730 739 751 754r2 756r1	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for ReI-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional ReI-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for ReI-10 Removing the square bracket for TS36.101 Removal of square brackets for dual-layer beamforming demodulation performance requirements CR: Maximum input level for intra band CA UE category coverage for dual-layer beamforming Further clarifications for the Sustained Downlink Data Rate Test	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110349 RP-110349 RP-110343 RP-110349 RP-110343 RP-110349 RP-110343	699 706r1 707r1 710 715r2 717 719 723 726r1 730 739 751 754r2 756r1 759	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10 Removing the square bracket for TS36.101 Removal of square brackets for dual-layer beamforming demodulation performance requirements CR: Maximum input level for intra band CA UE category coverage for dual-layer beamforming Further clarifications for the Sustained Downlink Data Rate Test Removal of square brackets in sustained data rate tests	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110349 RP-110349 RP-110343 RP-110349 RP-110343 RP-110349 RP-110343	699 706r1 707r1 710 715r2 717 719 723 726r1 730 739 751 754r2 756r1 759	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for Rel-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional Rel-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for Rel-10 Removing the square bracket for TS36.101 Removal of square brackets for dual-layer beamforming demodulation performance requirements CR: Maximum input level for intra band CA UE category coverage for dual-layer beamforming Further clarifications for the Sustained Downlink Data Rate Test Removal of square brackets in sustained data rate tests	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0
03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011 03-2011	RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51 RP-51	RP-110338 RP-110336 RP-110352 RP-110359 RP-110359 RP-110343 RP-110343 RP-110343 RP-110343 RP-110349 RP-110349 RP-110349 RP-110343	699 706r1 707r1 710 715r2 717 719 723 726r1 730 739 751 754r2 756r1	PDCCH and PHICH performance: OCNG and power settings Spurious emissions measurement uncertainty REFSENSE in lower SNR PMI performance: Power settings and precoding granularity Definition of configured transmitted power for ReI-10 Introduction of requirement for adjacent intraband CA image rejection Minimum requirements for the additional ReI-9 scenarios Corrections to power settings for Single layer beamforming with simultaneous transmission Correction to the PUSCH3-0 subband tests for ReI-10 Removing the square bracket for TS36.101 Removal of square brackets for dual-layer beamforming demodulation performance requirements CR: Maximum input level for intra band CA UE category coverage for dual-layer beamforming Further clarifications for the Sustained Downlink Data Rate Test	10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1 10.1.1	10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0 10.2.0

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03-2011	RP-51	RP-110343	765	Verification framework for PUSCH 2-2 and PUCCH 2-1 reporting	10.1.1	10.2.0
04-2011				Editorial: Spec Title correction, removal of "Draft"	10.2.0	10.2.1
06-2011	RP-52	RP-110804	766	Add Expanded 1900MHz Band (Band 25) in 36.101	10.2.1	10.3.0
06-2011	RP-52	RP-110795	768	Fixing Band 24 inclusion in TS 36.101	10.2.1	10.3.0
06-2011	RP-52	RP-110788	772	CR: Corrections for UE to UE co-existence requirements of Band	10.2.1	10.3.0
00 2011	111 02	111 110700	1112	3	10.2.1	10.0.0
06 2011	DD 50	DD 440040	774		10.2.1	10 2 0
06-2011	RP-52	RP-110812		Add 2GHz S-Band (Band 23) in 36.101		10.3.0
06-2011	RP-52	RP-110789	782	CR: Band 19 A-MPR refinement	10.2.1	10.3.0
06-2011	RP-52	RP-110796	787	REFSENS in lower SNR	10.2.1	10.3.0
06-2011	RP-52	RP-110789	805	Clarification for MBMS reference signal levels	10.2.1	10.3.0
06-2011	RP-52	RP-110792	810	FDD MBMS performance requirements for 64QAM mode	10.2.1	10.3.0
06-2011	RP-52	RP-110787	814	Correction on CQI mapping index of RI test	10.2.1	10.3.0
06-2011	RP-52	RP-110789	824	Corrections to in-band blocking table	10.2.1	10.3.0
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06-2011	RP-52	RP-110794	826	Correction of TDD Category 1 DRS and DMRS RMCs	10.2.1	10.3.0
06-2011	RP-52	RP-110794	828	TDD MBMS performance requirements for 64QAM mode	10.2.1	10.3.0
06-2011	RP-52	RP-110796	829	Correction of TDD RMC for Low SNR Demodulation test	10.2.1	10.3.0
06-2011	RP-52	RP-110796	830	Informative reference sensitivity requirements for Low SNR for	10.2.1	10.3.0
				TDD		
06-2011	RP-52	RP-110787	778r1	Minor corrections to DL-RMC-s for Maximum input level	10.2.1	10.3.0
06-2011	RP-52	RP-110789	832	PDCCH and PHICH performance: OCNG and power settings	10.2.1	10.3.0
06-2011	RP-52	RP-110789	818r1	Correction on 2-X PMI test for R10	10.2.1	10.3.0
06-2011	RP-52	RP-110791	816r1	Addition of performance requirements for dual-layer beamforming	10.2.1	10.3.0
]	category 1 UE test		
06-2011	RP-52	RP-110789	834	Performance requirements for PUCCH 2-0, PUCCH 2-1 and	10.2.1	10.3.0
	52	1		PUSCH 2-2 tests		. 3.0.0
06-2011	RP-52	RP-110807	835r1	CR for UL MIMO and CA	10.2.1	10.3.0
09-2011	RP-53	RP-111248	862r1	Removal of unnecessary channel bandwidths from REFSENS	10.3.0	10.4.0
			L	tables		
09-2011	RP-53	RP-111248	869r1	Clarification on BS precoding information field for RI FDD and	10.3.0	10.4.0
			1	PUCCH 2-1 PMI tests		
09-2011	RP-53	RP-111248	872r1	CR for B14Rx requirement Rrel 10	10.3.0	10.4.0
09-2011	RP-53	RP-111248	890r1	CR to TS36.101: Correction on the accuracy test of CQI.	10.3.0	10.4.0
09-2011	RP-53	RP-111248	893	CR to TS36.101: Correction on CQI mapping index of TDD RI test	10.3.0	10.4.0
09-2011	RP-53	RP-111248	904	Correction of code block numbers for some RMCs	10.3.0	10.4.0
09-2011	RP-53	RP-111248	907	Correction to UL RMC for FDD and TDD	10.3.0	10.4.0
09-2011	RP-53	RP-111248	914r1	Adding codebook subset restriction for single layer closed-loop	10.3.0	10.4.0
				spatial multiplexing test		
09-2011	RP-53	RP-111251	883	Sustained data rate: Correction of the ACK/NACK feedback mode	10.3.0	10.4.0
09-2011	RP-53	RP-111251	929	36.101 CR on MBSFN FDD requirements(R10)	10.3.0	10.4.0
09-2011	RP-53	RP-111251	938	TDD MBMS performance requirements for 64QAM mode	10.3.0	10.4.0
09-2011	RP-53		895	Further clarification for the dual-layer beamforming demodulation	10.3.0	10.4.0
09-2011	RP-53	RP-111252	895	, ,	10.3.0	10.4.0
				requirements		
09-2011	RP-53	RP-111255	908r1	Introduction of Band 22	10.3.0	10.4.0
09-2011	RP-53	RP-111255	939	Modifications of Band 42 and 43	10.3.0	10.4.0
09-2011	RP-53	RP-111260	944	CR for TS 36.101 Annex B: Static channels for CQI tests	10.3.0	10.4.0
09-2011	RP-53	RP-111262	878r1	Correction of CSI reference channel subframe description	10.3.0	10.4.0
09-2011	RP-53	RP-111262	887	Correction to UL MIMO	10.3.0	10.4.0
09-2011	RP-53	RP-111262	926r1	Power control accuracy for intra-band carrier aggregation	10.3.0	10.4.0
	1					
09-2011	RP-53	RP-111262	927r1	In-band emissions requirements for intra-band carrier aggregation	10.3.0	10.4.0
09-2011	RP-53	RP-111262	930r1	Adding the operating band for UL-MIMO	10.3.0	10.4.0
09-2011	RP-53	RP-111265	848	Corrections to intra-band contiguous CA RX requirements	10.3.0	10.4.0
09-2011	RP-53	RP-111265	863	Intra-band contiguos CA MPR requirement refinement	10.3.0	10.4.0
					10.0.0	
09-2011	RP-53			Intra-band contiguous CA EVM	10.3.0	10.4.0
09-2011		RP-111265	866r1	Intra-band contiguous CA EVM Introduction of the downlink CA demodulation requirements	10.3.0	10.4.0
09-2011 09-2011	RP-53	RP-111265 RP-111266	866r1 935	Introduction of the downlink CA demodulation requirements	10.3.0 10.3.0	10.4.0
09-2011 09-2011 09-2011	RP-53 RP-53	RP-111265	866r1	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD	10.3.0 10.3.0 10.3.0	10.4.0 10.4.0
09-2011 09-2011	RP-53	RP-111265 RP-111266 RP-111266	866r1 935 936r1	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF	10.3.0 10.3.0	10.4.0
09-2011 09-2011 09-2011 12-2011	RP-53 RP-53 RP-54	RP-111265 RP-111266	866r1 935	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements	10.3.0 10.3.0 10.3.0 10.4.0	10.4.0 10.4.0 10.5.0
09-2011 09-2011 09-2011	RP-53 RP-53	RP-111265 RP-111266 RP-111266 RP-111684	866r1 935 936r1 947	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band	10.3.0 10.3.0 10.3.0	10.4.0 10.4.0
09-2011 09-2011 09-2011 12-2011	RP-53 RP-53 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684	935 936r1 947 948	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for	10.3.0 10.3.0 10.3.0 10.4.0	10.4.0 10.4.0 10.5.0
09-2011 09-2011 09-2011 12-2011	RP-53 RP-53 RP-54	RP-111265 RP-111266 RP-111266 RP-111684	866r1 935 936r1 947	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR	10.3.0 10.3.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011	RP-53 RP-53 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684	935 936r1 947 948	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR	10.3.0 10.3.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011	RP-53 RP-53 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111686	935 936r1 947 948 949	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI	10.3.0 10.3.0 10.3.0 10.4.0	10.4.0 10.4.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111686 RP-111680	935 936r1 947 948 949	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111686 RP-111680 RP-111734	947 948 949 950 953r1	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111686 RP-111680 RP-111734 RP-111680	947 947 948 949 950 953r1 956	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111686 RP-111680 RP-111680 RP-111680 RP-111682	947 947 948 949 950 953r1 956 959	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111686 RP-111680 RP-111734 RP-111680 RP-111682 RP-111690	947 948 949 950 953r1 956 959 960r1	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test P-MPR definition	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111686 RP-111680 RP-111680 RP-111680 RP-111682	947 947 948 949 950 953r1 956 959	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111686 RP-111680 RP-111734 RP-111680 RP-111680 RP-111680 RP-111690 RP-111693	947 948 949 950 953r1 950 953r1 956 959 960r1 962	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test P-MPR definition Pcmax,c Computation Assumptions	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111686 RP-111680 RP-111734 RP-111680 RP-111682 RP-111690	947 948 949 950 953r1 956 959 960r1	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test P-MPR definition	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111686 RP-111680 RP-111734 RP-111680 RP-111680 RP-111680 RP-111690 RP-111693	947 948 949 950 953r1 950 953r1 956 959 960r1 962	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test P-MPR definition Pcmax,c Computation Assumptions	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111680 RP-111680 RP-111680 RP-111680 RP-111690 RP-111693 RP-111693 RP-111693 RP-111733 RP-111680	948 949 950 950 953r1 956 959 960r1 962 963r1 966	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test P-MPR definition Pcmax,c Computation Assumptions Correction of frequency range for spurious emission requirements General review of the reference measurement channels	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111686 RP-111680 RP-111680 RP-111680 RP-111690 RP-111693 RP-111693	948 949 950 950 953r1 950 953r1 956 959 960r1 962 963r1	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test P-MPR definition Pcmax,c Computation Assumptions Correction of frequency range for spurious emission requirements General review of the reference measurement channels Corrections of Rel-10 demodulation performance requirements	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111680 RP-111680 RP-111680 RP-111680 RP-111690 RP-111693 RP-111693 RP-111693 RP-111733 RP-111680	948 949 950 950 953r1 956 959 960r1 962 963r1 966	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test P-MPR definition Pcmax,c Computation Assumptions Correction of frequency range for spurious emission requirements General review of the reference measurement channels Corrections of Rel-10 demodulation performance requirements This CR is only partially implemented due to confliction with CR	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0
09-2011 09-2011 09-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011 12-2011	RP-53 RP-53 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54 RP-54	RP-111265 RP-111266 RP-111266 RP-111684 RP-111684 RP-111680 RP-111680 RP-111680 RP-111680 RP-111690 RP-111693 RP-111693 RP-111693 RP-111733 RP-111680	948 949 950 950 953r1 956 959 960r1 962 963r1 966	Introduction of the downlink CA demodulation requirements Introduction of CA UE demodulation requirements for TDD Corrections of UE categories of Rel-10 reference channels for RF requirements Alternative way to define channel bandwidths per operating band for CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10 Corrections for Band 42 and 43 introduction UE spurious emissions Add scrambling identity n_SCID for MU-MIMO test P-MPR definition Pcmax,c Computation Assumptions Correction of frequency range for spurious emission requirements General review of the reference measurement channels Corrections of Rel-10 demodulation performance requirements	10.3.0 10.3.0 10.3.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0 10.4.0	10.4.0 10.4.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0 10.5.0

				This CR is only partially implemented due to confliction with CR 966		
12-2011	RP-54	RP-111691	982r2	Introduction of SDR TDD test scenario for CA UE demodulation This CR is only partially implemented due to confliction with CR 966	10.4.0	10.5.0
12-2011	RP-54	RP-111693	971r1	CR on Colliding CRS for non-MBSFN ABS	10.4.0	10.5.0
12-2011	RP-54	RP-111693	972r1	Introduction of eICIC demodulation performance requirements for FDD and TDD	10.4.0	10.5.0
12-2011	RP-54			Adding missing UL configuration specification in some UE	10.4.0	10.5.0
12-2011	RP-54	RP-111686	985	receiver requirements for case of 1 CC UL capable UE Correction and maintenance on CQI and PMI requirements (Rel-	10.4.0	10.5.0
		RP-111684	998	10)		
12-2011	RP-54	RP-111735	1004	MPR for CA Multi-cluster	10.4.0	10.5.0
12-2011	RP-54	RP-111691	1005	CA demodulation performance requirements for LTE FDD	10.4.0	10.5.0
12-2011	RP-54	RP-111692	1006	CQI reporting accuracy test on frequency non-selective scheduling on eDL MIMO	10.4.0	10.5.0
12-2011	RP-54	RP-111692	1007	CQI reporting accuracy test on frequency-selective scheduling on eDL MIMO	10.4.0	10.5.0
12-2011	RP-54	RP-111692	1008	PMI reporting accuracy test for TDD on eDL MIMO	10.4.0	10.5.0
12-2011	RP-54	RP-111692	1009r1	CR for TS 36.101: RI performance requirements	10.4.0	10.5.0
12-2011	RP-54	RP-111692	1010r1	CR for TS 36.101: Introduction of static CQI tests (Rel-10)	10.4.0	10.5.0
03-2012	RP-55	RP-120291	1014	RF: Updates and corrections to the RMC-s related annexes (Rel-10)	10.5.0	10.6.0
03-2012	RP-55	RP-120300	1015r1	On elCIC ABS pattern	10.5.0	10.6.0
03-2012	RP-55	RP-120300	1016r1	On elCIC interference models	10.5.0	10.6.0
03-2012	RP-55	RP-120299	1017r1	TS36.101 CR: on eDL-MIMO channel model using cross- polarized antennas	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1020r1	TS36.101 CR: Correction to MBMS Performance Test Parameters	10.5.0	10.6.0
03-2012	RP-55	RP-120304	102011	Harmonic exceptions in LTE UE to UE co-ex tests	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1021	Unified titles for Rel-10 CSI tests	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1023 1033r1	Introduction of reference channel for eICIC demodulation	10.5.0	10.6.0
03-2012	RP-55	RP-120300	103311 1040r1	Correction of Actual code rate for CSI RMCs	10.5.0	10.6.0
03-2012	RP-55	RP-120304	104011 1041r1		10.5.0	
				Definition of synchronized operation		10.6.0
03-2012	RP-55	RP-120296	1048r1	Intra band contiguos CA Ue to Ue Co-ex	10.5.0	10.6.0
03-2012	RP-55	RP-120296	1049r1	REL-10 CA specification editorial consistency	10.5.0	10.6.0
03-2012	RP-55	RP-120299	1053	Beamforming model for TM9	10.5.0	10.6.0
03-2012	RP-55	RP-120296	1054	Requirement for CA demodulation with power imbalance	10.5.0	10.6.0
03-2012	RP-55	RP-120298	1057	Updating Band 23 duplex specifications	10.5.0	10.6.0
03-2012	RP-55	RP-120298	1058r1	Correcting UE Coexistence Requirements for Band 23	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1059r1	CA demodulation performance requirements for LTE TDD	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1061	Requirement for CA SDR FDD test scenario	10.5.0	10.6.0
03-2012	RP-55	RP-120293	1064r1	TS36.101 RF editorial corrections Rel 10	10.5.0	10.6.0
03-2012	RP-55	RP-120299	1067r1	Introduction of TM9 demodulation performance requirements Introduction of a CA demodulation test for UE soft buffer	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1071r1	management testing	10.5.0	10.6.0
03-2012	RP-55	RP-120296	1072	MPR formula correction For intra-band contiguous CA Bandwidth Class C	10.5.0	10.6.0
03-2012	RP-55	RP-120303	1077r1	CR for 36.101: B41 REFSENS and MOP changes to accommodate single filter architecture	10.5.0	10.6.0
03-2012	RP-55	RP-120300	1082	TM3 tests for elCIC	10.5.0	10.6.0
03-2012	RP-55	RP-120300	1083r1	Introduction of requirements of CQI reporting definition for eclCIC	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1084	eDL MIMO CSI requirements	10.5.0	10.6.0
03-2012	RP-55	RP-120306	1070r1	Introduction of Band 26/XXVI to TS 36.101	10.6.0	11.0.0
03-2012	RP-55	RP-120310	1074	Band 41 CA CR for TS36.101, section 5	10.6.0	11.0.0
03-2012	RP-55	RP-120310	1075r1	Band 41 CA CR for TS36.101, section 6	10.6.0	11.0.0
03-2012	RP-55	RP-120310	1076	Band 41 CA CR for TS36.101, section 7	10.6.0	11.0.0
06-2012	RP-56	RP-120795	1085r2	Modulator specification tightening	11.0.0	11.1.0
06-2012	RP-56	RP-120777	1087r1	Carrier aggregation Relative power tolerance, removal of TBD.	11.0.0	11.1.0
06-2012	RP-56	RP-120783	1089	UE spurious emissions for Band 7 and Band 38 coexistence	11.0.0	11.1.0
06-2012	RP-56	RP-120780	1092	Deleting square brackets in Reference Measurement Channels CR to TS36.101: Correction on parameters for the eDL-MIMO	11.0.0	11.1.0
06-2012	RP-56	RP-120779	1097	CQI and PMI tests CR to TS36.101: Fixed reference channel for PDSCH	11.0.0	11.1.0
				demodulation performance requirements on eDL-MIMO – NOT		
06-2012	RP-56	RP-120780	1098r1	implemented as it is based on a wrong version of the spec	11.0.0	11.1.0
06-2012	RP-56	RP-120774	1107	RMC correction on eDL-MIMO RI test	11.0.0	11.1.0
06-2012	RP-56	RP-120774	1108r1	FRC correction on frequency selective CQI and PMI test (Rel-11)	11.0.0	11.1.0
06-2012	RP-56	RP-120774	1111	Correction on test point for PMI test (Rel-11)	11.0.0	11.1.0
00 0040	RP-56	RP-120784	1114r1	Corrections and clarifications on eICIC demodulation test	11.0.0	11.1.0
06-2012	RP-56	RP-120784	1117r1	Corrections and clarifications on eICIC CSI tests	11.0.0	11.1.0
06-2012				· - · · · - · · · · · · · · · · · · · ·		1446
06-2012 06-2012	RP-56	RP-120783	1119r1	Corrections on UE performance requirements	11.0.0	11.1.0
06-2012			1119r1 1120	Introduction of CA band combination Band1 + Band19 to TS 36.101	11.0.0	11.1.0

06-2012	RP-56	RP-120773	1140	Addition of Maximum Throughput for R.30-1 TDD RMC	11.0.0	11.1.0
06-2012	RP-56	RP-120779	1141	CR for 36.101: The clarification of MPR and A-MPR for CA	11.0.0	11.1.0
06-2012	RP-56	RP-120784	1142	Corrections for elCIC demod test case with MBSN ABS	11.0.0	11.1.0
06-2012	RP-56	RP-120785	1144	Removing brackets of contiguous allocation A-MPR for CA_NS_04	11.0.0	11.1.0
06-2012	RP-56	RP-120784	1149r1	Introduction of PDCCH test with colliding RS on MBSFN-ABS	11.0.0	11.1.0
06-2012	RP-56	RP-120784	1153r1	Some clarifications and OCNG pattern for eICIC demodulation	11.0.0	11.1.0
00.0040	DD 50	DD 400770	4455	requirements	44.0.0	44.4.0
06-2012	RP-56	RP-120773	1155	Introduction of TDD CA Soft Buffer Limitation	11.0.0	11.1.0
06-2012	RP-56	RP-120795	1156	B26 and other editorial corrections	11.0.0	11.1.0
06-2012	RP-56	RP-120779	1161	Corrections on CQI and PMI test	11.0.0	11.1.0
06-2012	RP-56	RP-120780	1163	FRC for TDD PMI test	11.0.0	11.1.0
06-2012	RP-56	RP-120778	1165r1	Clean-up of UL-MIMO for TS36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120782	1171	Removal of unnecessary references to single carrier requirements from Interband CA subclauses	11.0.0	11.1.0
06-2012	RP-56	RP-120781	1174	PDCCH wrong detection in receiver spurious emissions test	11.0.0	11.1.0
06-2012	RP-56	RP-120776	1184	Corrections to 3500 MHz	11.0.0	11.1.0
06-2012	RP-56	RP-120793	1189r2	Introduction of Band 44	11.0.0	11.1.0
06-2012	RP-56	RP-120784	1193r1	Target SNR setting for eICIC demodulation requirement	11.0.0	11.1.0
06-2012	RP-56	RP-120780	1196	Editorial simplification to CA REFSENS UL allocation table	11.0.0	11.1.0
06-2012	RP-56	RP-120778	1199	Correction of wrong table refernces in CA receiver tests	11.0.0	11.1.0
06-2012	RP-56	RP-120791	1200r1	Introduction of e850_LB (Band 27) to TS 36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120764	1212	Correction of PHS protection requirements for TS 36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120793	1213r1	Introduction of Band 28 into TS36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120781	1215r1	Proposed revision of subclause 4.3A for TS36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120781	1217r1	Proposed revision on subclause 6.3.4A for TS36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120795	121711 1219r1	Aligning requirements between Band 18 and Band 26 in TS36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120793	121911	SNR definition	11.0.0	11.1.0
06-2012	RP-56	RP-120782	1223	Correction of CSI configuration for CA TM4 tests R11	11.0.0	11.1.0
	RP-56		1223		11.0.0	
06-2012		RP-120773		CR on CA UE receiver timing window R11		11.1.0
06-2012	RP-56	RP-120784	1226	Extension of static elCIC CQI test	11.0.0	11.1.0
09-2012	RP-57	RP-121294	1230	Correct Transport Block size in 9RB 16QAM Uplink Reference Measurement Channel	11.1.0	11.2.0
09-2012	RP-57	RP-121313	1233r1	RF: Corrections to power allocation parameters for transmission mode 8 (Rel-11)	11.1.0	11.2.0
09-2012	RP-57	RP-121304	1235	RF-CA: non-CA notation and applicability of test points in scenarios without and with CA operation (Rel-11)	11.1.0	11.2.0
09-2012	RP-57	RP-121305	1237	ACK/NACK feedback modes for FDD and TDD TM4 CA demodulation requirements (Rel-11)	11.1.0	11.2.0
09-2012	RP-57	RP-121305	1239	Correction of feedback mode for CA TDD demodulation requirements (resubmission of R4-63AH-0194 for Rel-11)	11.1.0	11.2.0
09-2012	RP-57	RP-121302	1241	ABS pattern setup for MBSFN ABS test (resubmission of R4-63AH-0204 for Rel-11)	11.1.0	11.2.0
09-2012	RP-57	RP-121302	1243	CR on elCIC CQI definition test (resubmission of R4-63AH-0205 for Rel-11)	11.1.0	11.2.0
09-2012	RP-57	RP-121302	1245	Transmission of CQI feedback and other corrections (Rel-11)	11.1.0	11.2.0
09-2012	RP-57	RP-121302 RP-121302	1245	Target SNR setting for eICIC MBSFN-ABS demodulation	11.1.0	11.2.0
00.0015	DD	DD 404655	40.40	requirements (Rel-11)	44.4.5	44.5.7
09-2012	RP-57	RP-121335	1248	Introduction of CA_1_21 RF requirements into TS36.101	11.1.0	11.2.0
09-2012	RP-57	RP-121300	1251	Corrections of spurious emission band UE co-existence applicable in Japan	11.1.0	11.2.0
09-2012	RP-57	RP-121306	1253	Correction on RMC for frequency non-selective CQI test	11.1.0	11.2.0
09-2012	RP-57	RP-121306	1255	Requirements for the eDL-MIMO CQI test	11.1.0	11.2.0
09-2012	RP-57	RP-121302	1257	Clarification on PDSCH test setup under MBSFN ABS	11.1.0	11.2.0
09-2012	RP-57	RP-121316	1258	Update of Band 28 requirements	11.1.0	11.2.0
09-2012	RP-57	RP-121313	1262	Applicabilty of statement allowing RBW < Meas BW for spurious	11.1.0	11.2.0
09-2012	RP-57	RP-121298	1265	Clarification of RB allocation for DRS demodulation tests	11.1.0	11.2.0
09-2012	RP-57	RP-121304	1267	Removal of brackets for CA Tx	11.1.0	11.2.0
09-2012	RP-57	RP-121337	1268r1	TS 36.101 CR for CA_38	11.1.0	11.2.0
09-2012	RP-57	RP-121327	1269	Introduction of CA_B7_B20 in 36.101	11.1.0	11.2.0
09-2012	RP-57	RP-121313	1271	Corrections of FRC subframe allocations and other minor problems	11.1.0	11.2.0
09-2012	RP-57	RP-121305	1274	Introduction of requirements for TDD CA Soft Buffer Limitation	11.1.0	11.2.0
09-2012	RP-57	RP-121305 RP-121307	1274	Correction of eDL-MIMIO CSI RMC tables and references	11.1.0	11.2.0
09-2012	RP-57	RP-121307 RP-121307	1278	Correction of MIMO channel model for polarized antennas	11.1.0	11.2.0
09-2012	RP-57	RP-121307 RP-121303	1278	Addition of 15 and 20MHz Bandwidths for Band 23 to TS 36.101	11.1.0	11.2.0
09-2012	RP-57	RP-121334	1283r1	(Rel-11) Add requirements for inter-band CA of B_1-18 and B_11-18 in	11.1.0	11.2.0
09-2012	RP-57	RP-121304	1285r1	TS36.101 CR for MPR mask for multi-clustered simultaneous transmission	11.1.0	11.2.0
09-2012	RP-57	RP-121447	1288r2	in single CC in Rel-11 Introduction of Japanese Regulatory Requirements to LTE Band	11.1.0	11.2.0
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09-2012	RP-57	RP-121315	1290	CR for Band 27 A-MPR	11.1.0	11.2.0
09-2012	RP-57	RP-121316	1291	CR to replace protected frequency range with new band number 27	11.1.0	11.2.0
09-2012	RP-57	RP-121215	1292r1	Introduction of CA band combination Band3 + Band5 to TS 36.101	11.1.0	11.2.0
09-2012	RP-57	RP-121306	1300r1	Requirements for eDL-MIMO RI test	11.1.0	11.2.0
09-2012	RP-57	RP-121306	1304	Corrections to TM9 demodulation tests	11.1.0	11.2.0
09-2012	RP-57	RP-121313	1306	Correction to PCFICH power parameter setting	11.1.0	11.2.0
09-2012	RP-57	RP-121306	1310r1	Correction on frequency non-selective CQI test	11.1.0	11.2.0
09-2012	RP-57	RP-121306	1313r1	eDL-MIMO CQI/PMI test	11.1.0	11.2.0
09-2012	RP-57	RP-121313	1316	Correction of the definition of unsynchronized operation	11.1.0	11.2.0
09-2012	RP-57	RP-121304	1320r1	Correction to Transmit Modulation Quality Tests for Intra-Band CA	11.1.0	11.2.0
09-2012	RP-57	RP-121338	1324r2	36.101 CR for LTE_CA_B7	11.1.0	11.2.0
09-2012	RP-57	RP-121331	1325	Introduction of CA_3_20 RF requirements into TS36.101	11.1.0	11.2.0
09-2012	RP-57	RP-121331	1326	A-MPR table correction for NS_18	11.1.0	11.2.0
09-2012	RP-57	RP-121304	1332r1	Bandwidth combination sets for intra-band and inter-band carrier aggregation	11.1.0	11.2.0
09-2012	RP-57	RP-121325	1339	Introduction of LTE Advanced Carrier Aggregation of Band 4 and Band 13	11.1.0	11.2.0
09-2012	RP-57	RP-121326	1340r1	Introduction of CA configurations CA-12A-4A and CA-17A-4A	11.1.0	11.2.0
09-2012	RP-57	RP-121324	1341	Introduction of CA_B3_B7 in 36.101	11.1.0	11.2.0
09-2012	RP-57	RP-121328	1343	Introduction of Band 2 + Band 17 inter-band CA configuration into	11.1.0	11.2.0
				36.101 FRC for TM9 FDD		
09-2012	RP-57	RP-121306	1351		11.1.0	11.2.0
09-2012	RP-57	RP-121295	1352	Random precoding granularity in PMI tests	11.1.0	11.2.0
09-2012	RP-57	RP-121302	1358	Introduction of RI test for eICIC	11.1.0	11.2.0
09-2012	RP-57	RP-121304	1360	Notes for deltaTib and deltaRib tables	11.1.0	11.2.0
09-2012	RP-57	RP-121304	1361	CR for A-MPR masks for NS_CA_1C	11.1.0	11.2.0
12-2012	RP-58	RP-121884	1362	Introduction of CA_3_8 RF requirements to TS 36.101	11.2.0	11.3.0
12-2012	RP-58	RP-121870	1363	Removal of square brackets for Band 27 in Table 5.6.1-1	11.2.0	11.3.0
12-2012	RP-58	RP-121861	1366	Some changes related to CA tests and overview table of DL measurement channels	11.2.0	11.3.0
12-2012	RP-58	RP-121860	1368	Correction of elCIC CQI tests	11.2.0	11.3.0
12-2012	RP-58	RP-121860	1370	Correction of elCIC demodulation tests	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1374	Correction on CSI-RS subframe offset parameter	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1376	Correction on FRC table in CSI test	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1382	Correction of reference channel table for TDD eDL-MIMIO RI test	11.2.0	11.3.0
12-2012	RP-58	RP-121850	1386	OCNG patterns for Sustained Data rate testing	11.2.0	11.3.0
12-2012	RP-58	RP-121867	1388r1	Introduction of one periodic CQI test for CA deployments	11.2.0	11.3.0
12-2012	RP-58	RP-121894	1396	Introduction of CA_B5_B12 in 36.101	11.2.0	11.3.0
12-2012	RP-58	RP-121850	1401	Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3	11.2.0	11.3.0
12-2012	RP-58	RP-121887	1406r1	Reference sensitivity for the small bandwidth of CA_4-12	11.2.0	11.3.0
12-2012	RP-58	RP-121860	1407	CR on elCIC RI test	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1409	Cleaning of 36.101 Performance sections Rel-11	11.2.0	11.3.0
12-2012	RP-58	RP-121861	1416	Out-of-band blocking requirements for inter-band carrier aggregation	11.2.0	11.3.0
12-2012	RP-58	RP-121861	1418	Adding missed SNR reference values for CA soft buffer tests	11.2.0	11.3.0
12-2012	RP-58	RP-121890	1422	Introduction of CA_4A-5A into 36.101	11.2.0	11.3.0
12-2012	RP-58	RP-121867	1431	Clean up of specification R11	11.2.0	11.3.0
12-2012	RP-58	RP-121867	1436	Band 1 to Band 33 and Band 39 UE coexistence requirements	11.2.0	11.3.0
12-2012	RP-58	RP-121871	1437r1	Editorial corrections for Band 26	11.2.0	11.3.0
12-2012	RP-58	RP-121896	1438	Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1442	Correction of eDL-MIMO RI test and RMC table for the CSI test	11.2.0	11.3.0
12-2012	RP-58	RP-121861	1444	Minor correction to ceiling function example - rel11	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1449	Correction of SNR definition	11.2.0	11.3.0
12-2012	RP-58	RP-121860	1450	Brackets clean up for eICIC CSI/demodulation	11.2.0	11.3.0
12-2012	RP-58	RP-121860	1455	CR on elCIC RI testing (Rel-11)	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1459	Correction on FRC table	11.2.0	11.3.0
12-2012	RP-58	RP-121879	1461r1	CR for LTE B14 HPUE (Power Class 1)	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1464	Adding references to the appropriate beamforming model (Rel-11)	11.2.0	11.3.0
12-2012	RP-58	RP-121898	1465r1	Introduction of CA_8_20 RF requirements into TS36.101	11.2.0	11.3.0
12-2012	RP-58	RP-121882	1468r1	Introduction of CA_6_20 Ki requirements into 1330.101 Introduction of inter-band CA_11-18 into TS36.101	11.2.0	11.3.0
12-2012	RP-58	RP-121903	1472r1	Introduction of inter-band CA_11-16 into 1336.101 Introduction of advanced receivers demodulation performance (FDD)	11.2.0	11.3.0
12-2012	RP-58	RP-121903	1473r1	Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD)	11.2.0	11.3.0
12-2012	RP-58	RP-121886	1474	CR to remove the square bracket of A-MPR in TS36.101	11.2.0	11.3.0
12-2012	RP-58	RP-121861	1476	Correction of some errors in reference sensitivity for CA in TS 36.101 (R11)	11.2.0	11.3.0
12-2012	RP-58	RP-121903	1480r1	Introduction of Advanced Receivers Test Cases for TDD	11.2.0	11.3.0
12-2012	RP-58	RP-121901	1490r1	Introduction of Band 29	11.2.0	11.3.0
12-2012	RP-58	RP-121849	149011	Low-channel Band 1 coexistence with PHS	11.2.0	11.3.0
12-2012	INF -30	111-12-1049	1734	FOM CHAINED DANG I COCKISTENCE MINI LING	11.2.0	11.3.0

12-2012	RP-58	RP-121861	1498r1	Completion of the tables of bandwidth combinations specified for CA	11.2.0	11.3.0
12-2012	RP-58	RP-121861	1499r1	Exceptions to REFSENS requrirements for class A2 CA combinations	11.2.0	11.3.0
12-2012	RP-58	RP-121892	1500	Introduction of carrier aggregation configuration CA_4-7	11.2.0	11.3.0
12-2012	RP-58	RP-121870	1504	Editorial corrections to Band 27 specifications	11.2.0	11.3.0
12-2012	RP-58	RP-121878	1505	Band 28 AMPR for DTV protection	11.2.0	11.3.0
12-2012	RP-58	RP-121852	1509r1	UE-UE coexistence between bands with small frequency separation	11.2.0	11.3.0
12-2012	RP-58	RP-121911	1510	Adding UE-UE Coexistence Requirement for Band 3 and Band 26	11.2.0	11.3.0
12-2012	RP-58	RP-121866	1513	Maintenance of Band 23 UE Coexistence	11.2.0	11.3.0
12-2012	RP-58	RP-121851	1515	Corrections to TM4 rank indicator Test 3	11.2.0	11.3.0
12-2012	RP-58	RP-121861	1517	Correction of test configurations and FRC for CA demodulation with power imbalance	11.2.0	11.3.0
12-2012	RP-58	RP-121860	1518	Applicable OFDM symbols of Noc_2 for PDCCH/PCFICH ABS-MBSFN test cases	11.2.0	11.3.0
03-2013	RP-59	RP-130279	1519	OCNG patterns for Enhanced Performance Requirements Type A	11.3.0	11.4.0
03-2013	RP-59	RP-130277	1520	Corrections on in-band blocking for Band 29 for carrier aggregation	11.3.0	11.4.0
03-2013	RP-59	RP-130268	1523	Brackets removal in Rel-11 TM4 rank indicator Test 3	11.3.0	11.4.0
03-2013	RP-59	RP-130279	1524r1	Cleanup of Advanced Receivers requirement scenarios for demodulation and CSI (FDD/TDD)	11.3.0	11.4.0
03-2013	RP-59	RP-130258	1528	Corrections to CQI reporting	11.3.0	11.4.0
03-2013	RP-59	RP-130262	1536	Corrections for eICIC performance requirements (rel-11)	11.3.0	11.4.0
03-2013	RP-59	RP-130264	1539	Correction of CA power imbalance performance requirements	11.3.0	11.4.0
03-2013	RP-59	RP-130287	1543	Correction of a symbol for MPR in single carrier for TS 36.101(R11)	11.3.0	11.4.0
03-2013	RP-59	RP-130287	1544r1	Correction of some inter-band CA requiements for TS 36.101 (R11)	11.3.0	11.4.0
03-2013	RP-59	RP-130276	1546	Correction of contigous allocation A-MPR for CA_NS_05	11.3.0	11.4.0
03-2013	RP-59	RP-130263	1547r1	Clarification of spurious emission domain for CA in TS 36.101 (R11)	11.3.0	11.4.0
03-2013	RP-59	RP-130264	1548	CR for CA performance requirements	11.3.0	11.4.0
03-2013	RP-59	RP-130284	1553r1	Introduction of downlink non-contiguous CA into REL -11 TS 36.101	11.3.0	11.4.0
03-2013	RP-59	RP-130263	1557	CA_1C: CA_NS_02 and CA_NS_03 A-MPR REL-11	11.3.0	11.4.0
03-2013	RP-59	RP-130287	1560	Editorial corrections to subclause 5	11.3.0	11.4.0
03-2013	RP-59	RP-130267	1562	Addition of UE Regional Requirements to Band 23 Based on New Regulatory Order in the US	11.3.0	11.4.0
03-2013	RP-59	RP-130272	1567	Band 26: modification of A-MPR for 'NS_15'	11.3.0	11.4.0
03-2013	RP-59	RP-130287	1571r1	Band 41 requirements for operation in China and Japan	11.3.0	11.4.0
03-2013	RP-59	RP-130260	1574	Remove [] from CSI test case parameters	11.3.0	11.4.0
03-2013	RP-59	RP-130287	1575	Corrections to UE co-existence	11.3.0	11.4.0
03-2013	RP-59	RP-130287	1579	UE-UE co-existence between Band 1 and Band 33/39	11.3.0	11.4.0
03-2013	RP-59	RP-130287	1580	Correction on reference to note for Band 7 and 38 co-existence	11.3.0	11.4.0
03-2013	RP-59	RP-130263	1584r1	Cleanup for CA UE RF requirements	11.3.0	11.4.0
03-2013	RP-59	RP-130263	1586	Corrections on UL configuration for CA UE receiver requirements	11.3.0	11.4.0
03-2013 03-2013	RP-59 RP-59	RP-130263 RP-130268	1588 1590	Correction of Transmit modulation quality requirements for CA Revision of Common Test Parameters for User-specific Demodulation Tests	11.3.0	11.4.0 11.4.0
03-2013	RP-59	RP-130278	1595	Correction for a Band 27 A-MPR table	11.3.0	11.4.0
03-2013	RP-59	RP-130276	1597	Correction of CA CQI test setup	11.3.0	11.4.0
03-2013	RP-59	RP-130287	1600r1	Correction of B12 DL Specification in Table 5.5A-2	11.3.0	11.4.0
03-2013	RP-59	RP-130263	1602	Correction of table reference	11.3.0	11.4.0
06-2013	RP-60	RP-130765	1604r1	Complementary description for definition of MIMO Correlation Matrices using cross polarized antennas	11.4.0	11.5.0
06-2013	RP-60	RP-130763	1607	Correction of transport format parameters for CQI index 10 (15 RBs) - Rel 11	11.4.0	11.5.0
06-2013	RP-60	RP-130765	1610	Maintenance of Band 23 A-MPR (NS_11) in TS 36.101 (Rel-11)	11.4.0	11.5.0
06-2013	RP-60	RP-130770	1613	CR for 36.101 : Adding the definition of CA_NS_05 and CA_NS_06 for additional spurious emissions for CA	11.4.0	11.5.0
06-2013	RP-60	RP-130770	1619	CR for introducing UE TM3 demodulation performance requirements under high speed	11.4.0	11.5.0
06-2013	RP-60	RP-130765	1623	Correction of test parameters for elCIC performance requirements	11.4.0	11.5.0
06-2013	RP-60	RP-130765	1625	Correction of test parameters for elCIC CSI requirements	11.4.0	11.5.0
06-2013	RP-60	RP-130765	1627	Correction of resource allocation for the multiple PMI Cat 1 UE test	11.4.0	11.5.0
06-2013	RP-60	RP-130766	1629	Removal of note 2 from band 28	11.4.0	11.5.0
06-2013	RP-60	RP-130770	1641	Correction of the CSI-RS parameter configuration	11.4.0	11.5.0
		DD 400770	1650r1	Addition of Band 41 for intra-band non-contiguous CA for 36.101	11.4.0	11.5.0
06-2013	RP-60	RP-130770				
06-2013	RP-60	RP-130770	1654r1	MPR for intra-band non-contiguous CA	11.4.0	11.5.0

06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 <th>-60 RF -60 RF</th> <th>P-130770 P-130763 P-130766 P-130766 P-130766 P-130767 P-130765 P-130770 P-130767 P-130766 P-130770 P-130770 P-130785 P-130781 P-130785 P-130787 P-130787 P-130787 P-130790 P-130790 P-130791 P-130791 P-130784 P-131285 P-131285 P-131285 P-131281 P-131293</th> <th>1681r1 1684 1685 1689 1691 1695r1 1697 1698r1 1703 1705 1716 1717 1532r1 1545r1 1608r1 1642r1 1687 1712 17713r1 1724r1 1770r1 1730r1 1732 1733r1 1736</th> <th>Correction for TS 36.101 RF: Corrections to RMC-s for sustained data rate test Non-contiguous intraband CA channel spacing Carrier aggregation in multi RAT and multiple band combination terminals Completion of out-of-band blocking requirements for inter-band CA with one UL CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) Correction on UE maximum output power for intra-band CA (R11) CR for introduction of FelClC demodulation performance requirements Removing bracket from CA_11A-18A requirments CR on the bandwidth coverage issue of CA CQI performance (Rel-11) Corrections to ACLR for Rel-11 CA Corrections to NS_11 A-MPR Table Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the LTE 450 band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth CR on applicability of CA sustained data rate tests (Rel-12)</th> <th>11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.5.0</th> <th>11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0</th>	-60 RF -60 RF	P-130770 P-130763 P-130766 P-130766 P-130766 P-130767 P-130765 P-130770 P-130767 P-130766 P-130770 P-130770 P-130785 P-130781 P-130785 P-130787 P-130787 P-130787 P-130790 P-130790 P-130791 P-130791 P-130784 P-131285 P-131285 P-131285 P-131281 P-131293	1681r1 1684 1685 1689 1691 1695r1 1697 1698r1 1703 1705 1716 1717 1532r1 1545r1 1608r1 1642r1 1687 1712 17713r1 1724r1 1770r1 1730r1 1732 1733r1 1736	Correction for TS 36.101 RF: Corrections to RMC-s for sustained data rate test Non-contiguous intraband CA channel spacing Carrier aggregation in multi RAT and multiple band combination terminals Completion of out-of-band blocking requirements for inter-band CA with one UL CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) Correction on UE maximum output power for intra-band CA (R11) CR for introduction of FelClC demodulation performance requirements Removing bracket from CA_11A-18A requirments CR on the bandwidth coverage issue of CA CQI performance (Rel-11) Corrections to ACLR for Rel-11 CA Corrections to NS_11 A-MPR Table Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the LTE 450 band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth CR on applicability of CA sustained data rate tests (Rel-12)	11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.5.0	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 09-2013 RP-6 <td>-60 RF -60 RF</td> <td>P-130770 P-130766 P-130766 P-130767 P-130765 P-130770 P-130767 P-130767 P-130766 P-130769 P-130771 P-130781 P-130787 P-130787 P-130787 P-130790 P-130790 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131285 P-131285 P-131281 P-131293</td> <td>1685 1689 1691 1695r1 1697 1698r1 1703 1705 1716 1717 1532r1 1545r1 1608r1 1642r1 1687 1712 1713r1 1723r1 1724r1 1730r1 1732 1733r1 1736</td> <td>RF: Corrections to RMC-s for sustained data rate test Non-contiguous intraband CA channel spacing Carrier aggregation in multi RAT and multiple band combination terminals Completion of out-of-band blocking requirements for inter-band CA with one UL CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) Correction on UE maximum output power for intra-band CA (R11) CR for introduction of FelCIC demodulation performance requirements Removing bracket from CA_11A-18A requirments CR on the bandwidth coverage issue of CA CQI performance (Rel-11) Corrections to ACLR for Rel-11 CA Corrections to NS_11 A-MPR Table Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA 4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of the LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of TS 36.101 Introduction of TS 36</td> <td>11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.5.0</td> <td>11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0</td>	-60 RF -60 RF	P-130770 P-130766 P-130766 P-130767 P-130765 P-130770 P-130767 P-130767 P-130766 P-130769 P-130771 P-130781 P-130787 P-130787 P-130787 P-130790 P-130790 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131285 P-131285 P-131281 P-131293	1685 1689 1691 1695r1 1697 1698r1 1703 1705 1716 1717 1532r1 1545r1 1608r1 1642r1 1687 1712 1713r1 1723r1 1724r1 1730r1 1732 1733r1 1736	RF: Corrections to RMC-s for sustained data rate test Non-contiguous intraband CA channel spacing Carrier aggregation in multi RAT and multiple band combination terminals Completion of out-of-band blocking requirements for inter-band CA with one UL CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) Correction on UE maximum output power for intra-band CA (R11) CR for introduction of FelCIC demodulation performance requirements Removing bracket from CA_11A-18A requirments CR on the bandwidth coverage issue of CA CQI performance (Rel-11) Corrections to ACLR for Rel-11 CA Corrections to NS_11 A-MPR Table Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA 4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of the LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of TS 36.101 Introduction of TS 36	11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.5.0	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0
06-2013 RP-6 09-2013 RP-6 <td>-60 RF -60 RF</td> <td>P-130770 P-130766 P-130766 P-130767 P-130765 P-130770 P-130767 P-130767 P-130766 P-130769 P-130771 P-130781 P-130787 P-130787 P-130787 P-130790 P-130790 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131285 P-131285 P-131281 P-131293</td> <td>1685 1689 1691 1695r1 1697 1698r1 1703 1705 1716 1717 1532r1 1545r1 1608r1 1642r1 1687 1712 1713r1 1723r1 1724r1 1730r1 1732 1733r1 1736</td> <td>Non-contiguous intraband CA channel spacing Carrier aggregation in multi RAT and multiple band combination terminals Completion of out-of-band blocking requirements for inter-band CA with one UL CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) Correction on UE maximum output power for intra-band CA (R11) CR for introduction of FelClC demodulation performance requirements Removing bracket from CA_11A-18A requirements CR on the bandwidth coverage issue of CA CQI performance (Rel-11) Corrections to ACLR for Rel-11 CA Corrections to NS_11 A-MPR Table Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA 4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of the Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the LTE 450 band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth</td> <td>11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.5.0</td> <td>11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0</td>	-60 RF -60 RF	P-130770 P-130766 P-130766 P-130767 P-130765 P-130770 P-130767 P-130767 P-130766 P-130769 P-130771 P-130781 P-130787 P-130787 P-130787 P-130790 P-130790 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131285 P-131285 P-131281 P-131293	1685 1689 1691 1695r1 1697 1698r1 1703 1705 1716 1717 1532r1 1545r1 1608r1 1642r1 1687 1712 1713r1 1723r1 1724r1 1730r1 1732 1733r1 1736	Non-contiguous intraband CA channel spacing Carrier aggregation in multi RAT and multiple band combination terminals Completion of out-of-band blocking requirements for inter-band CA with one UL CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) Correction on UE maximum output power for intra-band CA (R11) CR for introduction of FelClC demodulation performance requirements Removing bracket from CA_11A-18A requirements CR on the bandwidth coverage issue of CA CQI performance (Rel-11) Corrections to ACLR for Rel-11 CA Corrections to NS_11 A-MPR Table Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA 4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of the Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the LTE 450 band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.5.0	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0
06-2013 RP-6 09-2013 RP-6 <td>-60 RF -61 RF -61 RF -61 RF -61 RF</td> <td>P-130766 P-130766 P-130767 P-130765 P-130770 P-130767 P-130766 P-130765 P-130769 P-130771 P-130781 P-130787 P-130787 P-130790 P-130790 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131285 P-131281 P-131293</td> <td>1689 1691 1695r1 1698r1 1701 1703 1705 1716 1717 1532r1 1545r1 1608r1 1642r1 1687 1712 17713r1 1723r1 1724r1 1730r1 1732 1733r1 1736</td> <td>Carrier aggregation in multi RAT and multiple band combination terminals Completion of out-of-band blocking requirements for inter-band CA with one UL CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) Correction on UE maximum output power for intra-band CA (R11) CR for introduction of FelCIC demodulation performance requirements Removing bracket from CA_11A-18A requirments CR on the bandwidth coverage issue of CA CQI performance (Rel-11) Corrections to ACLR for Rel-11 CA Corrections to NS_11 A-MPR Table Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the LTE 450 band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth</td> <td>11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0</td> <td>11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.1.0 12.1.0 12.1.0</td>	-60 RF -61 RF -61 RF -61 RF -61 RF	P-130766 P-130766 P-130767 P-130765 P-130770 P-130767 P-130766 P-130765 P-130769 P-130771 P-130781 P-130787 P-130787 P-130790 P-130790 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131285 P-131281 P-131293	1689 1691 1695r1 1698r1 1701 1703 1705 1716 1717 1532r1 1545r1 1608r1 1642r1 1687 1712 17713r1 1723r1 1724r1 1730r1 1732 1733r1 1736	Carrier aggregation in multi RAT and multiple band combination terminals Completion of out-of-band blocking requirements for inter-band CA with one UL CR on the bandwidth coverage issue of CA demodulation performance (Rel-11) Correction on UE maximum output power for intra-band CA (R11) CR for introduction of FelCIC demodulation performance requirements Removing bracket from CA_11A-18A requirments CR on the bandwidth coverage issue of CA CQI performance (Rel-11) Corrections to ACLR for Rel-11 CA Corrections to NS_11 A-MPR Table Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the LTE 450 band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.4.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.1.0 12.1.0 12.1.0
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06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130769 P-130771 P-130781 P-130785 P-130777 P-130787 P-130795 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131285 P-131281 P-131293	1717 1532r1 1545r1 1608r1 1642r1 1687 1712 17713r1 1723r1 1724r1 1770r1 1730r1 1732 1733r1 1736	Corrections to NS_12 A-MPR Table Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.4.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.0.0	11.5.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130771 P-130781 P-130785 P-130777 P-130787 P-130795 P-130790 P-130791 P-130784 P-131300 P-131285 P-131303 P-131281 P-131293	1532r1 1545r1 1608r1 1608r1 1687 1712 1713r1 1723r1 1724r1 1707r1 1730r1 1732	Introduction of CA 1+8 into TS36.101(Rel-12) Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.0.0 12.0.0	12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130781 P-130785 P-130777 P-130787 P-130795 P-130790 P-130791 P-130784 P-131300 P-131285 P-131303 P-131281 P-131293	1545r1 1608r1 1642r1 1687 1712 1713r1 1723r1 1724r1 1707r1 1730r1 1732	Introduction of LTE Advanced inter-band Carrier Aggregation of Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.0.0 12.0.0	12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130785 P-130777 P-130787 P-130795 P-130790 P-130791 P-130784 P-131300 P-131285 P-131303 P-131281 P-131293	1608r1 1642r1 1687 1712 1713r1 1723r1 1724r1 1707r1 1730r1 1732 1733r1 1736	Band 3 and Band 28 to TS 36.101 Introduction of LTE Advanced inter-band Carrier Aggregation of Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.0.0 12.0.0	12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130777 P-130787 P-130795 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131281 P-131293	1642r1 1687 1712 1713r1 1723r1 1724r1 1707r1 1730r1 1732 1733r1 1736	Band 23 and Band 29 to TS 36.101 Introduction of CA B3+19 into TS36.101(Rel-12) Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.0.0	12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130787 P-130795 P-130775 P-130790 P-130791 P-130784 P-131300 P-131285 P-131285 P-131281 P-131293	1687 1712 1713r1 1723r1 1724r1 1707r1 1730r1 1732 1733r1 1736	Introduction of CA_4A-4A into 36.101 Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.0.0 12.0.0	12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.1.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130795 P-130775 P-130790 P-130791 P-130784 P-131300 P-131285 P-131303 P-131281 P-131293	1712 1713r1 1723r1 1724r1 1707r1 1730r1 1732 1733r1 1736	Adding 5MHz CBW for B3 of Inter band CA of B3+26 Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.0.0 12.0.0	12.0.0 12.0.0 12.0.0 12.0.0 12.0.0 12.1.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130775 P-130790 P-130791 P-130784 P-131300 P-131285 P-131303 P-131281 P-131293	1713r1 1723r1 1724r1 1707r1 1730r1 1732 1733r1 1736	Introduction of LTE Advanced Inter-Band Carrier Aggregation of Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 11.5.0 11.5.0 12.0.0 12.0.0 12.0.0	12.0.0 12.0.0 12.0.0 12.0.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130790 P-130791 P-130784 P-131300 P-131285 P-131303 P-131281 P-131293	1723r1 1724r1 1707r1 1730r1 1732 1733r1 1736	Band 2 and Band 13 Introduction of the LTE 450 band to TS 36.101 Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 11.5.0 12.0.0 12.0.0 12.0.0	12.0.0 12.0.0 12.0.0 12.1.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -60 RF -61 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130791 P-130784 P-131300 P-131285 P-131303 P-131281 P-131293	1724r1 1707r1 1730r1 1732 1733r1 1736	Introduction of the WCS band to TS 36.101 Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 11.5.0 12.0.0 12.0.0 12.0.0	12.0.0 12.0.0 12.1.0 12.1.0 12.1.0 12.1.0
06-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-60 RF -61 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-130784 P-131300 P-131285 P-131303 P-131281 P-131293	1707r1 1730r1 1732 1733r1 1736	Introduction of CA 19+21 into TS36.101(Rel-12) 36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	11.5.0 12.0.0 12.0.0 12.0.0 12.0.0	12.0.0 12.1.0 12.1.0 12.1.0 12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-61 RF -61 RF -61 RF -61 RF -61 RF -61 RF	P-131300 P-131285 P-131303 P-131281 P-131293	1730r1 1732 1733r1 1736	36.101 CR for LTE_CA_C_B3 CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	12.0.0 12.0.0 12.0.0 12.0.0	12.1.0 12.1.0 12.1.0 12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-61 RF -61 RF -61 RF -61 RF -61 RF	P-131285 P-131303 P-131281 P-131293	1732 1733r1 1736	CR on performance requirements of CA soft buffer managemen (Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	12.0.0 12.0.0 12.0.0	12.1.0 12.1.0 12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-61 RF -61 RF -61 RF -61 RF	P-131303 P-131281 P-131293	1733r1 1736	(Rel-12) CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	12.0.0 12.0.0	12.1.0 12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-61 RF -61 RF -61 RF	P-131281 P-131293	1736		12.0.0	12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-61 RF -61 RF -61 RF	P-131293		CR on applicability of CA sustained data rate tests (Rel-12)		
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-61 RF					
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	-61 RF		1739	Performance requirement for UE under EVA200	12.0.0	12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6		P-131290	1743	CR for introduction of FeICIC PBCH performance requirement	12.0.0	12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6		P-131290	1745	CR for introduction of FeICIC RI reporting requirements	12.0.0	12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6 09-2013 RP-6		P-131292	1747	Beamforming model for EPDCCH test	12.0.0	12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6		P-131303 P-131303	1748 1749	CR to introduce CSI tests for LTE450 CR to extend UE category of the existing 5MHz performance	12.0.0 12.0.0	12.1.0 12.1.0
09-2013 RP-6 09-2013 RP-6 09-2013 RP-6	04 55	D 404004	1707	requirements	40.00	40.4.0
09-2013 RP-6		P-131281	1767	UE REFSENS when supporting intra-band CA and inter-band CA	12.0.0	12.1.0
09-2013 RP-6		P-131279	1772	Correlation matrix for high speed train demodulation scenarios (Rel-12)	12.0.0	12.1.0
		P-131280	1776	Corrections to sustained data rate test (Rel-12)	12.0.0	12.1.0
1 U9-2U13 TRP-6		P-131303	1781	CR to introduce a new PHICH test based on 5MHz	12.0.0	12.1.0
		P-131303	1782	CR placeholder for applicability of new 5MHz tests	12.0.0	12.1.0
09-2013 RP-6		P-131303	1783r1 1784	CR: Proposal of applicability of new 5MHz tests	12.0.0	12.1.0
		P-131303		CR: PHICH tests for 5MHz	12.0.0	12.1.0
09-2013 RP-6		P-131290	1786 1794	CR for introduction of FeICIC CQI requirements Clarification of multi-cluster transmission	12.0.0 12.0.0	12.1.0
09-2013 RP-6	-01 KI	P-131281 P-131294	1794 1800r1	CA UE Coexistence Table update (Release 12)	12.0.0	12.1.0 12.1.0
09-2013 RP-6		P-131294 P-131302	18001	CA DE Coexistence Table update (Release 12) Coexistence between Band 27 and Band 38 (Release 12)	12.0.0	
09-2013 RP-6		P-131302 P-131285	1802	Addional requirement for CA_1A-18A into TS36.101	12.0.0	12.1.0 12.1.0
		P-131265 P-131296	1804		12.0.0	
09-2013 RP-6		P-131296 P-131281	1804	Add requirements for CA_1A-26A into TS36.101	12.0.0	12.1.0 12.1.0
09-2013 RP-6	61 D	P-131281 P-131297	1807 1808r1	Incorrect REFSENS UL allocation for CA_1C Introduction of CA_2A-4A into 36.101	12.0.0	12.1.0
09-2013 RP-6	61 0	P-131297 P-131281	1811	Contiguous intraband CA REFSENS with one UL	12.0.0	12.1.0
09-2013 RP-6		P-131281	1822	The Pcmax clauses restructured: This CR was NOT implemented as it was based on the wrong version of the spec	12.0.0	12.1.0
09-2013 RP-6	-61 RF	P-131298	1824	Introduction of inter-band CA Band 2+5	12.0.0	12.1.0
09-2013 RP-6		P-131285	1831	MPR for intra-band non-contiguous CA	12.0.0	12.1.0
09-2013 RP-6		P-131281	1832	Correction to Rel-10 A-MPR for CA_NS_04	12.0.0	12.1.0
09-2013 RP-6		P-131285	1834	CR for 36.101 : Add the definition of 5+20MHz for spectrum	12.0.0	12.1.0
00.0010			4000	emission mask for CA	40.00	40.4.5
09-2013 RP-6	-61 RF	D 404000	1839	CR to introduce CSI tests for LTE450 Remianed Transmitter requirements for intra-band non-contiguous	12.0.0 12.0.0	12.1.0 12.1.0
	-61 RF	P-131303 P-131293	1840			i
09-2013 RP-6	-61 RF -61 RF -61 RF		1840 1841	CA CR to introdue TM3 and TM4 test for 5MHz channel bandwidth	12.0.0	12.1.0

				requirements table (Rel-12)		
12-2013	RP-62	RP-131924	1852	Clean-up of uplink reference measurement channels (Rel-12)	12.1.0	12.2.0
12-2013	RP-62	RP-131946	1857	Introduction of CA band combination Band2 + Band12 to TS 36.101	12.1.0	12.2.0
12-2013	RP-62	RP-131954	1858	Introduction of CA band combination Band12 + Band25 to TS 36.101	12.1.0	12.2.0
12-2013	RP-62	RP-131931	1867	CA_NS_05 Emissions	12.1.0	12.2.0
12-2013	RP-62	RP-131939	1869	NS signaling for CA refsens	12.1.0	12.2.0
12-2013	RP-62	RP-131965	1870	Introduction of CA_23A-23A RF requirements into 36.101	12.1.0	12.2.0
12-2013 12-2013	RP-62 RP-62	RP-131928 RP-131940	1877r2 1878	Intraband CA channel bandwidth combination table restructuring	12.1.0 12.1.0	12.2.0 12.2.0
				Addition of CA_3C missing UE to UE co-existence requirement and corection to SEM		
12-2013	RP-62	RP-131959 RP-131939	1885	Introduction of LTE_CA_C_B27 to 36.101	12.1.0	12.2.0
12-2013	RP-62		1887	CR on correction of definition on Fraction of Maximum Throughput for CA	12.1.0	12.2.0
12-2013	RP-62	RP-131939	1889	CR on correction of test configurations of CA soft buffer tests	12.1.0	12.2.0
12-2013 12-2013	RP-62 RP-62	RP-131936 RP-131936	1893 1895r1	CR for FelCIC demodulation performance requirements CR on FelCIC PBCH performance requirement	12.1.0 12.1.0	12.2.0 12.2.0
12-2013	RP-62	RP-131936	1897r1	CR on RI reporting requirement	12.1.0	12.2.0
12-2013	RP-62	RP-131938	1899	Beamforming model for EPDCCH localized test	12.1.0	12.2.0
12-2013	RP-62	RP-131938	1901	Downlink physical setup for EPDCCH test	12.1.0	12.2.0
12-2013	RP-62	RP-131936	1904	Correction on the UE category for eICIC CQI test	12.1.0	12.2.0
12-2013	RP-62	RP-131920	1904	CR for receiver type verification test of CSI-RS based advanced	12.1.0	12.2.0
12-2013	RP-62	RP-131956	1910r1	receivers (Rel-12) Spurious emission band UE co-existence requirements for cross-	12.1.0	12.2.0
12-2013	RP-62	RP-131928	1916r2	region issue Allowed power reductions for multiple transmissions in a subframe	12.1.0	12.2.0
12-2013	RP-62	RP-131926	191012 1917r1	The coexistence requirements between Band 39 and Band 3	12.1.0	12.2.0
12-2013	RP-62	RP-131967	1918r1	The Pcmax clauses restructured and removal of addition of ΔTc to P-MPR	12.1.0	12.2.0
12-2013	RP-62	RP-131956	1919	Configured maximum output power for multiple TAG transmission	12.1.0	12.2.0
12-2013	RP-62	RP-131936	1927r1	Configured maximum output power for multiple TAG transmission	12.1.0	12.2.0
12-2013	RP-62	RP-131927	1934	CR on correction of FRC of power imbalance test	12.1.0	12.2.0
12-2013	RP-62	RP-131927	1937	UE-UE coexistence for Band 40	12.1.0	12.2.0
12-2013	RP-62	RP-131957	1955r1	Introduction of LTE Advanced intra-band contiguous Carrier Aggregation in Band 23 to TS 36.101	12.1.0	12.2.0
12-2013	RP-62	RP-131961	1956r1	Introduction of CA_3A-3A into TS 36.101	12.1.0	12.2.0
12-2013	RP-62	RP-131937	1957	CR Minimum requirement with Different Cell ID and Colliding CRS (with single NZP CSI-RS resource)	12.1.0	12.2.0
12-2013	RP-62	RP-131937	1958	CR Minimum requirement with Same Cell ID (with multiple NZP CSI-RS resources)	12.1.0	12.2.0
12-2013	RP-62	RP-131936	1962	Introduction of reference SNR-s for FeICIC demodulation performance requirements	12.1.0	12.2.0
12-2013	RP-62	RP-131938	1964	OCNG pattern for EPDCCH test	12.1.0	12.2.0
12-2013	RP-62	RP-131931	1965	CA performance requirements for TDD intra-band NC CA	12.1.0	12.2.0
12-2013	RP-62	RP-131958	1966r1	CA performance requirements for TDD intra-band NC CA	12.1.0	12.2.0
12-2013	RP-62	RP-131939	1968	Introduction of UE TM3 demodulation performance requirements under ETU300	12.1.0	12.2.0
12-2013	RP-62	RP-131937	1970	Introduction of test 1-A for CoMP	12.1.0	12.2.0
12-2013	RP-62	RP-131939	1972	Modification of TM9 test to verify correct SNR estimation	12.1.0	12.2.0
12-2013	RP-62	RP-131928	1984	Correction to blocking requirements and use of Delta_RIB	12.1.0	12.2.0
12-2013	RP-62	RP-131950	1985	Introduction of CA band combination Band5 + Band25 to TS 36.101	12.1.0	12.2.0
12-2013	RP-62	RP-131939	1988r1	CR on test point clarification for CA demodulation test	12.1.0	12.2.0
12-2013	RP-62	RP-131937	1994	CR to Introduce fading CQI test for CoMP (TDD)	12.1.0	12.2.0
12-2013	RP-62	RP-131937	1996	CR to Introduce channel model for CoMP fading CQI tests	12.1.0	12.2.0
12-2013	RP-62	RP-131937	1998	CR to Introduce RI test for CoMP (FDD)	12.1.0	12.2.0
12-2013	RP-62	RP-131938	2001r1	Distributed EPDCCH Demodulation Test	12.1.0	12.2.0
12-2013	RP-62	RP-131938	2003r1	Localized EPDCCH Demodulation Test	12.1.0	12.2.0
12-2013	RP-62	RP-131938	2005r1	Localized EPDCCH Demodulation Test	12.1.0	12.2.0
12-2013	RP-62	RP-131937	2007	Introduction of DL CoMP FDD static CQI test	12.1.0	12.2.0
12-2013	RP-62	RP-131937	2009	Introduction of DL CoMP TDD static CQI test	12.1.0	12.2.0
12-2013	RP-62	RP-131924	2014	P-max for Band 38 to Band 7 coexistence	12.1.0	12.2.0
12-2013 12-2013	RP-62 RP-62	RP-131948 RP-131952	2015 2017	Introduction of CA band combination B5 + B7 to TS 36.101	12.1.0 12.1.0	12.2.0 12.2.0
12-2013	RP-62 RP-62	RP-131937	2017	Introduction of CA band combination B7 + B28 to TS 36.101 Minimum requirement with Same Cell ID (with multiple NZP CSI-	12.1.0	12.2.0
12-2013	RP-62	RP-131937	2026	RS resources) TDD CR Minimum requirement with Different Cell ID and Colliding CRS (with single NZP CSI-RS resource) TDD	12.1.0	12.2.0
12-2013	RP-62	RP-131936	2028	Editoral change on FelCIC PBCH Noc setup	12.1.0	12.2.0
12-2013	RP-62	RP-131937	2032	Introduction of test 1-A for CoMP	12.1.0	12.2.0
12-2013	RP-62	RP-131931	2035r1	Correction of nominal guard bands for bandwidth classes A, B and C	12.1.0	12.2.0
12-2013	RP-62	RP-131937	2042	CR to Introduce RI test for CoMP (TDD)	12.1.0	12.2.0

10.0010	DD 00	DD 404007	00.40	OD	10.10	40.00
12-2013	RP-62	RP-131937	2043	CR to Introduce fading CQI test for CoMP (FDD)	12.1.0	12.2.0
12-2013	RP-62	RP-131931	2045	Correction of TDD PCFICH/PDCCH test parameter table	12.1.0	12.2.0
12-2013	RP-62	RP-131939	2047	Add EVA200 to table of channel model parameters	12.1.0	12.2.0
12-2013	RP-62	RP-131963	2050r1	Introduction of CA_7A-7A into TS 36.101	12.1.0	12.2.0
12-2013	RP-62	RP-131967	2057	Band 41 deployment in Japan	12.1.0	12.2.0
12-2013	RP-62	RP-131926	2059	CA_1C: Correction on CA_NS_02 A-MPR table	12.1.0	12.2.0
12-2013	RP-62	RP-131924	2060	Simplification of Band 12/17 in-band blocking test cases	12.1.0	12.2.0
12-2013	RP-62	RP-131967	2064	Correction of duplicated notes on table 7.3.1A-3	12.1.0	12.2.0
12-2013	RP-62	RP-131938	2066	Introduction of EPDCCH TM10 localized test R-12	12.1.0	12.2.0
12-2013	RP-62	RP-131938	2068	Introduction of SDR test for PDSCH with EPDCCH scheduling	12.1.0	12.2.0
03-2014	RP-63	RP-140377	2115	Editorial Correction for TS36.101 Rel-12	12.2.0	12.3.0
03-2014	RP-63	RP-140371	2108	UL-DL configuration and other parameters for FeICIC TDD CQI	12.2.0	12.3.0
03-2014	KF-03	KF-1403/1	2100	fading test (Rel-12)	12.2.0	12.3.0
00.004.4	DD 00	DD 440074	0007		40.00	40.0.0
03-2014	RP-63	RP-140374	2097	CR on TM9 localized ePDCCH test	12.2.0	12.3.0
03-2014	RP-63	RP-140374	2101	CR on reference measurement channel for ePDCCH test	12.2.0	12.3.0
03-2014	RP-63	RP-140371	2110	CR for TS36.101 COMP demodulation requirements	12.2.0	12.3.0
03-2014	RP-63	RP-140371	2113	CR for Combinations of channel model parameters	12.2.0	12.3.0
03-2014	RP-63	RP-140374	2114	CR for EPDCCH power allocation (Rel-12)	12.2.0	12.3.0
03-2014	RP-63	RP-140371	2106	Cleanup of the specification for FelCIC (Rel-12)	12.2.0	12.3.0
03-2014	RP-63	RP-140375	2089	CR for introduction of 15MHz based single carrier and CA SDR	12.2.0	12.3.0
				tests in Rel-12		121010
03-2014	RP-63	RP-140375	2080r1	CR on TM3 demodulation and soft buffer management test	12.2.0	12.3.0
03-2014	RP-63	RP-140373	2086	CR on reference measurement channel for TM10 PDSCH	12.2.0	12.3.0
00.2014	111 -00	131 - 1403/1	2000	demodulation test	12.2.0	12.0.0
02.0044	DD co	DD 440044	0474		40.00	40.00
03-2014	RP-63	RP-140241	2174	Introduction of 3MHz in Band 8 for CA_8_20 RF requirements into	12.2.0	12.3.0
				TS36.101		
03-2014	RP-63	RP-140417	2173r1	Addition of bandwidth combination set for CA_2A-29A and	12.2.0	12.3.0
				CA_4A-29A		
03-2014	RP-63	RP-140387	2071r1	Introduction of TDD inter-band CA_B39_B41 into 36.101	12.2.0	12.3.0
03-2014	RP-63	RP-140378	2069	CA_3C is adding 100RB+75RB uplink configuration for reference	12.2.0	12.3.0
				sensitivity		
03-2014	RP-63	RP-140388	2070	CR for TS36.101 on CA_C_B39	12.2.0	12.3.0
03-2014	RP-63	RP-140386	2072	Introduction of CA band B3+B27 to TS36.101	12.2.0	12.3.0
03-2014	RP-63	RP-140374	2074	CR of EPDCCH localzied test with TM10 QCL Type-B	12.2.0	12.3.0
03 2014	100	141-14037-4	2014	configuration (Rel-12)	12.2.0	12.5.0
03-2014	RP-63	RP-140371	2142	Clarification of contiguous and non-contiguous intra-band UE	12.2.0	12.3.0
03-2014	KP-03	RP-1403/1	2142		12.2.0	12.3.0
00.0044	DD 00	DD 440005	0404	capabilities in the same band	40.00	40.00
03-2014	RP-63	RP-140385	2161	Inrtroduction of additional bandwidth combination set for CA_2A-	12.2.0	12.3.0
				4A		
03-2014	RP-63	RP-140371	2131r1	CR to finalize RI test for CoMP	1220	12.3.0
					12.2.0	
03-2014	RP-63	RP-140368	2147	Correction of coding rate for 18RBs in UL RMC table	12.2.0	12.3.0
03-2014						
	RP-63 RP-63	RP-140368 RP-140371	2147 2144	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation	12.2.0	12.3.0 12.3.0
	RP-63	RP-140368	2147	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier	12.2.0	12.3.0
03-2014	RP-63 RP-63	RP-140368 RP-140371	2147 2144 2163	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test	12.2.0 12.2.0	12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368	2147 2144 2163 2137	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA	12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368	2147 2144 2163 2137 2122	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368	2147 2144 2163 2137	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions	12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370	2147 2144 2163 2137 2122 2160	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368 RP-140370 RP-140371	2147 2144 2163 2137 2122 2160 2129r1	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375	2147 2144 2163 2137 2122 2160 2129r1 2119	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374	2147 2144 2163 2137 2122 2160 2129r1 2119 2125	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140371	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12)	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374	2147 2144 2163 2137 2122 2160 2129r1 2119 2125	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140374 RP-140371 RP-140909	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12)	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140371	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter-	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140370 RP-140371 RP-140375 RP-140371 RP-140371 RP-140909	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140374 RP-140371 RP-140909	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter-	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140370 RP-140371 RP-140375 RP-140371 RP-140371 RP-140909	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter-	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140370 RP-140371 RP-140375 RP-140371 RP-140371 RP-140909	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140371 RP-140932 RP-140934 RP-140934	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140371 RP-140909 RP-140932 RP-140934 RP-140943 RP-140943 RP-140943	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140375 RP-140375 RP-140371 RP-140937 RP-140932 RP-140934 RP-140943 RP-140943 RP-140943 RP-140918	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced interband Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced interband Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140371 RP-140909 RP-140932 RP-140934 RP-140943 RP-140943 RP-140943	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced interband Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced interband Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140937 RP-140932 RP-140934 RP-140943 RP-140943 RP-140943 RP-140918 RP-140917	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced interband Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced interband Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction GA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64 RP-64 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140937 RP-140932 RP-140934 RP-140943 RP-140943 RP-140943 RP-140918 RP-140918	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations Clean up of TM9 SNR tests	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140371 RP-140937 RP-140932 RP-140934 RP-140943 RP-140943 RP-140943 RP-140918 RP-140918 RP-140933	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations Clean up of TM9 SNR tests Introduction of band B4+B27 CA to TS36.101	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140909 RP-140909 RP-140909 RP-140918 RP-140918 RP-140918 RP-140918 RP-140933 RP-140942	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207 2209 2210r1 2213	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations Clean up of TM9 SNR tests Introduction of CA band combination B1+B20 to TS 36.101	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140932 RP-140943 RP-140943 RP-140943 RP-140943 RP-140917 RP-140918 RP-140918 RP-140942 RP-140942 RP-140947	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207 2209 2210r1 2213 2216	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations Clean up of TM9 SNR tests Introduction of CA band combination B1+B20 to TS 36.101 Introduction of CA band combination B1+B20 to TS 36.101	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140371 RP-140909 RP-140909 RP-140909 RP-140918 RP-140917 RP-140918 RP-140917 RP-140917 RP-140917 RP-140914	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207 2209 2210r1 2213 2216 2218	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations Clean up of TM9 SNR tests Introduction of CA band combination B1+B20 to TS 36.101 Introduction of CA band combination B1+B20 to TS 36.101 CR for EPDCCH test (Rel-12) CR of modification on FeICIC rank testing (Rel-12)	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140932 RP-140943 RP-140943 RP-140943 RP-140943 RP-140917 RP-140918 RP-140918 RP-140942 RP-140942 RP-140947	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207 2209 2210r1 2213 2216	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations Clean up of TM9 SNR tests Introduction of band B4+B27 CA to TS36.101 Introduction of CA band combination B1+B20 to TS 36.101 CR for EPDCCH test (Rel-12) CR of modification on FelCIC rank testing (Rel-12) CR on FelCIC PBCH performance requirement (Rel-12)	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0
03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140374 RP-140371 RP-140909 RP-140909 RP-140909 RP-140918 RP-140917 RP-140918 RP-140917 RP-140917 RP-140917 RP-140914	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207 2209 2210r1 2213 2216 2218	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations Clean up of TM9 SNR tests Introduction of CA band combination B1+B20 to TS 36.101 Introduction of CA band combination B1+B20 to TS 36.101 CR for EPDCCH test (Rel-12) CR of modification on FeICIC rank testing (Rel-12)	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0
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03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 03-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014 06-2014	RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-63 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64 RP-64	RP-140368 RP-140371 RP-140374 RP-140368 RP-140368 RP-140370 RP-140371 RP-140375 RP-140375 RP-140371 RP-140909 RP-140932 RP-140934 RP-140943 RP-140943 RP-140917 RP-140918 RP-140917 RP-140914 RP-140914 RP-140918	2147 2144 2163 2137 2122 2160 2129r1 2119 2125 2127 2177r3 2187r1 2188 2195r1 2196r3 2198 2207 2209 2210r1 2213 2216 2218 2220 2222	Correction of coding rate for 18RBs in UL RMC table Channel spacing for non-contiguous intra-band carrier aggregation Distributed EPDCCH Demodulation Test Configured transmitted power for CA CR for 36.101. Editorial correction on OCNG pattern Correction of table notes for NS_12-NS_15 spurious emissions requirements CR to finalize fading CQI test for CoMP Introduction of requirements for SNR test for TM9 CR on correction of downlink SDR tests with EPDCCH scheduling Correction on DL CoMP static CQI tests (Rel 12) RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-12) Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 3 and Band 20 Additional bandwidth combination set for LTE Advanced inter- band Carrier Aggregation of Band 7 and Band 20 CR for TS 36.101 on introduction CA_41D CR to TS 36.101 on introduction of CA BW class D requirements CR on correction on TDD IRC CQI test CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-12): correction of CSI-RS configurations Clean up of TM9 SNR tests Introduction of band B4+B27 CA to TS36.101 Introduction of CA band combination B1+B20 to TS 36.101 CR for EPDCCH test (Rel-12) CR of modification on FelCIC rank testing (Rel-12) CR of FolCIC PBCH performance requirement (Rel-12) Correction on out-of-band blocking for CA Update demodualtion performance requirements with new UE	12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.2.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0	12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.3.0 12.4.0

				performance		
06-2014	RP-64	RP-140911	2233	Clarification of Intra-band contiguous CA class C Narrow band blocking requirements	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2239	Correction for CA soft buffer test (Rel-12)	12.3.0	12.4.0
06-2014	RP-64	RP-140918	2241	CR on OCNG and propagation conditions for dual layer TM9 test (Rel-12)	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2247	Remove [] from elCIC TDD RI requirement	12.3.0	12.4.0
06-2014	RP-64	RP-140914	2256	Verification of exceptions of REFSENS requirements for carrier aggregation	12.3.0	12.4.0
06-2014	RP-64	RP-140914	2258	Applicability of exceptions to reference sensitivity requirements for CA	12.3.0	12.4.0
06-2014	RP-64	RP-140909	2269	In-band blocking case numbering re-establisment	12.3.0	12.4.0
06-2014	RP-64	RP-140918	2273	CR for TS36.101 FRC tables for COMP demodulation requirements	12.3.0	12.4.0
06-2014	RP-64	RP-140945	2277	Editorial correction of note in clause 4.4	12.3.0	12.4.0
06-2014	RP-64	RP-140926	2282r1	Editorial correction of note in clause 4.4	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2283	Introduction of new bandwidth combination set for CA_1A-5A UE	12.3.0	12.4.0
06-2014	RP-64	RP-140914	2286	CR for finalizing DL COMP CSI reporting requirements	12.3.0	12.4.0
06-2014	RP-64	RP-140914	2288	CR for adding DL CoMP CSI RMC tables (Rel-12)	12.3.0	12.4.0
06-2014 06-2014	RP-64 RP-64	RP-140921 RP-140914	2291 2293	Simplification of 36.101 Table 5.6A.1-1 for LTE_CA_C_B27 Finalization of CoMP demodulation test cases	12.3.0 12.3.0	12.4.0 12.4.0
06-2014	RP-64	RP-140914 RP-140918	2293	Editorial corrections for UE performance requirements for R12	12.3.0	12.4.0
06-2014	RP-64	RP-140916 RP-140937	2294	Introduction of CA performance requirements for Band 27 CA	12.3.0	12.4.0
06-2014	RP-64	RP-140937	2296	Introduction of CA performance requirements for Band 27 CA	12.3.0	12.4.0
06-2014	RP-64	RP-140994	2309	Inclusion of the out of band emission limit concluded in CEPT into band 28	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2314	UE to UE co-existence between B42/B43	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2318	Perf: Corrections to CA (Class C) performance with power imbalance (Rel-12)	12.3.0	12.4.0
06-2014	RP-64	RP-140920	2319	Introduction of CA performance requirements for Band 23 CA	12.3.0	12.4.0
06-2014	RP-64	RP-140914	2321	CR of modification on FelCIC rank testing (Rel-12)	12.3.0	12.4.0
06-2014	RP-64	RP-140914	2323	CR of introducing FelCIC TM9 testing (Rel-12)	12.3.0	12.4.0
06-2014	RP-64	RP-140917	2325	CR for EPDCCH SDR test (Rel-12)	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2328	Clean-up CR for demodulation requirements (Rel-12)	12.3.0	12.4.0
06-2014	RP-64	RP-140945	2330r1	Additional updates of UE categories for demodualtion performance requirements (Rel-12)	12.3.0	12.4.0
06-2014 06-2014	RP-64 RP-64	RP-140911 RP-140914	2333 2335r1	Throughput calculation for elCIC demodulation requirements Introduction of Band 28 requirements for flexible operation in Japan	12.3.0 12.3.0	12.4.0 12.4.0
06-2014	RP-64	RP-140911	2337r1	Add missing Uplink downlink configuration to elCIC TDD RI requirement	12.3.0	12.4.0
06-2014	RP-64	RP-140945	2338	Add static propagation condition matrix for 1 x 2	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2341	Cleanup of terminology for Rx requirements	12.3.0	12.4.0
06-2014	RP-64	RP-140945	2344	CR on separating CA UE demodulation tests from single carrier tests in Rel-12	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2351	Test configuration for intra-band contiguous carrier aggregation power control	12.3.0	12.4.0
06-2014	RP-64	RP-140935	2358	Addition of bandwidth combination sets for CA_2A-29A, CA_3A-5A, CA_4A-5A, CA_4A-12A, and CA_4A-29A into 36.101	12.3.0	12.4.0
06-2014	RP-64	RP-140914	2362	Correction of test configurations for intra-band non-contiguous aggregation	12.3.0	12.4.0
06-2014	RP-64	RP-140911	2365	Clarification on CA bandwidth classes	12.3.0	12.4.0
06-2014	RP-64 RP-64	RP-140917	2374	CR on correction of downlink SDR tests with EPDCCH scheduling	12.3.0	12.4.0
06-2014 06-2014	RP-64	RP-140922 RP-140911	2377 2378	Correction on LTE_CA_C_B39 Corrections on CA CQI tests	12.3.0 12.3.0	12.4.0 12.4.0
06-2014	RP-64	RP-140930	2381r1	Introduction of LTE-Advanced CA of Band 8 and Band 40 to TS36.101	12.3.0	12.4.0
06-2014	RP-64	RP-140927	2382r1	FRC for DL MIMO enahncement PMI requirements	12.3.0	12.4.0
06-2014	RP-64	RP-140603	2384r2	CR for TS 36.101 on introduction CA_40D	12.3.0	12.4.0
06-2014	RP-64	RP-140944	2385r1	CR to TS 36.101 on introduction of 3DL intra-band non- contiguous CA requirements	12.3.0	12.4.0
06-2014	RP-64	RP-140938	2387	Introduction of CA_2A-2A into TS 36.101	12.3.0	12.4.0
06-2014	RP-64	RP-140927	2392	Introduction of 4Tx beam steering model	12.3.0	12.4.0
06-2014 06-2014	RP-64 RP-64	RP-140914 RP-140936	2394 2395r2	CA_7C A-MPR Corrections Introduction of a new CA_7C bandwidth combination set into 36.101	12.3.0 12.3.0	12.4.0 12.4.0
06-2014	RP-64	RP-140918	2398	CR for TS36.101 CSI RMC table	12.3.0	12.4.0
06-2014	RP-64	RP-140940	2413	Introduction of LTE_CA_NC_B42 into 36.101	12.3.0	12.4.0
06-2014	RP-64	RP-140942	2420	Introduction of CA band combination B1+B20 to TS 36.101	12.3.0	12.4.0
06-2014	RP-64	RP-140919	2422	CA_3C is deleting 75RB+75RB uplink configuration for reference sensitivity	12.3.0	12.4.0
06-2014	RP-64	RP-140914	2425	CR on correction for TM10 CSI reporting requirements	12.3.0	12.4.0
09-2014	RP-65	RP-141197	2458r1	Introduction of CA_B1_B3_B19 into TS 36.101	12.4.0	12.5.0
09-2014	RP-65	RP-141428	2568	Updated REFSENS requirements for band combinations with	12.4.0	12.5.0

				Band 4 and Band 12		
09-2014	RP-65	RP-141468	2508r1	Introduction of 3 DL CA for Band 1+3+20	12.4.0	12.5.0
09-2014	RP-65	RP-141469	2571	Correction to CA in Band 1+20	12.4.0	12.5.0
09-2014	RP-65	RP-141525	2504r1	Perf: Cleanup and better description of DL-RMC-s with dynamic coding rate for CSI requirements (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141525	2565	Corrections to UE coex table	12.4.0	12.5.0
09-2014	RP-65	RP-141527	2434	Correction on support of a bandwidth combination set	12.4.0	12.5.0
09-2014	RP-65	RP-141527	2452r1	Remove the redundant table for FDD 4Tx multi-layer tests and correct the test case number (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141527	2466	Unequal DL CC RB allocations in Maximum input level	12.4.0	12.5.0
09-2014	RP-65	RP-141527	2469	Intra-band contiguous CA ACS case 2 test clarification	12.4.0	12.5.0
09-2014 09-2014	RP-65 RP-65	RP-141527 RP-141527	2484 2487	Corrections on delta Tc for UE MOP for intra-band contiguous CA Removal of Class B in UE TX requirement	12.4.0 12.4.0	12.5.0
09-2014	RP-65	RP-141527	2516r1	CR for CA applicability rule in 36.101 in Rel-12	12.4.0	12.5.0 12.5.0
09-2014	RP-65	RP-141527	2519r1	Editorial CR for CA performance tests in 36.101 in Rel-12	12.4.0	12.5.0
09-2014	RP-65	RP-141527	2548	Correction to NS_20 A-MPR for Band 23	12.4.0	12.5.0
09-2014	RP-65	RP-141530	2447	CR of introducing FeICIC TM9 testing (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141530	2454	Maintenance of CoMP demodulation performance requirements (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141530	2456	Clean-up CR for EPDCCH and FelCIC PBCH (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141530	2471	Throughput calculation for felCIC demodulation requirements	12.4.0	12.5.0
09-2014	RP-65	RP-141532	2439	CR on correction on CQI reporting TDD CSI meas in case two CSI subframe sets with CRS test (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141532	2441	CR on correction on RI reporting CSI meas in case two CSI subframe sets with CRS tests (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141532	2444	Clarification of high speed train scenario in 36.101 (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141532	2478	CQI reporting under fading: CQI indices in set	12.4.0	12.5.0
09-2014 09-2014	RP-65 RP-65	RP-141532 RP-141532	2490 2499	Correction on A-MPR table RF: Corrections to spurious emission band co-existence	12.4.0 12.4.0	12.5.0 12.5.0
				requirement for Band 44		
09-2014	RP-65	RP-141535	2559	Addition of E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA for Band 4 and 27	12.4.0	12.5.0
09-2014 09-2014	RP-65 RP-65	RP-141537 RP-141546	2541 2463r1	Band 42 contiguous CA channel bandwidth correction	12.4.0 12.4.0	12.5.0 12.5.0
				Introduction of PMI reporting requirements for DL MIMO enhancement		
09-2014	RP-65	RP-141548	2457r2	Introduction of CA_B1_B3 into TS 36.101	12.4.0	12.5.0
09-2014 09-2014	RP-65 RP-65	RP-141549 RP-141550	2556 2566	Addition of bandwidth combination set for CA_2A-4A Addition of 3MHz bandwidth for Band 12 , in the B2+B12 CA	12.4.0 12.4.0	12.5.0 12.5.0
09-2014	RP-65	RP-141551	2445	combination Introduction of CA 8+11 to 36.101 (Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141553	2491r1	Introduction of a new bandwidth combination set for CA_25A-25A into 36.101	12.4.0	12.5.0
09-2014	RP-65	RP-141554	2533r1	Introduction of requirements for 3DL inter-band carrier aggregation (FDD)	12.4.0	12.5.0
09-2014	RP-65	RP-141554	2534	Introduction of requirements for 3DL combinations with Band 30 (FDD)	12.4.0	12.5.0
09-2014	RP-65	RP-141557	2461r1	Introduction of CA_B19_B42_B42 into TS 36.101	12.4.0	12.5.0
09-2014	RP-65	RP-141559	2460r1	Introduction of CA_B1_B42_B42 into TS 36.101	12.4.0	12.5.0
09-2014	RP-65	RP-141560	2427	Adding 15MHz channel BW to B40 3DL and new bandwidth combination set for the 2DL	12.4.0	12.5.0
09-2014	RP-65	RP-141561	2488r1	Corrections on Maximum input level for intra-band non-contiguous 3DL	12.4.0	12.5.0
09-2014	RP-65	RP-141562	2436	Corrections on Maximum input level and ACS for intra-band CA	12.4.0	12.5.0
09-2014	RP-65	RP-141562	2481r1	Introduction of CA band combination B41+ B42 to TS 36.101	12.4.0	12.5.0
09-2014 09-2014	RP-65 RP-65	RP-141562 RP-141562	2522 2560	CR on CA power imbalance tests in Rel-12 CR Reducing MPR for Contiguous CA with Non-Contiguous	12.4.0 12.4.0	12.5.0 12.5.0
00.001:	DD 5-	DD / //5	05== :	Resource Allocations	46.1-	40 = "
09-2014	RP-65	RP-141563	2555r1	UL configuration for CA_4A-12A reference sensitivity	12.4.0	12.5.0
09-2014 09-2014	RP-65 RP-65	RP-141563 RP-141612	2557 2494r2	Addition of bandwidth combination set for CA_4A-12A Introduction of inter-band CA_18-28 into TS36.101	12.4.0 12.4.0	12.5.0 12.5.0
09-2014	RP-65	RP-141635	2552r2	Introduction of Inter-band CA_16-28 into 1536.101 Introduction of CA_1A-7A into 36.101(Rel-12)	12.4.0	12.5.0
09-2014	RP-65	RP-141636	2480r2	Introduction of 3DLs CA band combination of Band1 +5 + 7 to TS 36.101 Rel-12	12.4.0	12.5.0
09-2014	RP-65	RP-141653	2435r3	Introduction of 3 Band Carrier Aggregation (3DL/1UL) of Band 1, Band 3 and Band 8 to TS 36.101	12.4.0	12.5.0
09-2014	RP-65	RP-141682	2570r1	Introduction of CA band combination B1+B7+B20 to TS 36.101	12.4.0	12.5.0
09-2014	RP-65	RP-141708	2492r3	Introduction of 3 Band Carrier Aggregation of Band 1,Band 3 and Band 5 to TS 36.101	12.4.0	12.5.0
12-2014	RP-66	RP-142147	2671	Correction of CoMP TDD CSI tests (Rel-12)	12.5.0	12.6.0
12-2014	RP-66	RP-142144	2574	CR for REFSENSE in lower SNR and change history	12.5.0	12.6.0
12-2014	RP-66	RP-142173	2581	CR on 4Tx codebook PMI testing	12.5.0	12.6.0
12-2014	RP-66	RP-142142	2587	CR for 1 PRB allocation performance in presence of MBSFN (rel-12)	12.5.0	12.6.0
12-2014	RP-66	RP-142144	2590	Maintenance of CA demodulation performance requirements (Rel-	12.5.0	12.6.0

12.2014 RP-66 RP-142167 Z592 Clean up for FelCiX demodulation performance requirements 12.50 12.50					12)		
12-2014 RP-66 RP-142162 2601 Coll test for TDD CL C 20MHz+15MHz R16-12 12-50 1	12-2014	RP-66	RP-142147	2592	Clean up for FelCIC demodulation performance requirements	12.5.0	12.6.0
12-2014 RP-66 RP-142162 2602 Sustained downlink data rate test for TDD CL_C 20MHz+15MHz 12-50 12-50 12-2014 RP-66 RP-142167 2602 COl reporting in AWGN. COl indices in set 12-50 1	12-2014	RP-66	RP-142166	2600	Correction of placement of CA_40D in Table	12.5.0	12.6.0
12-2014 RP-66 RP-142162 2692 Sustained downlink data rate test for TDD CLC 20MHz+15MHz 12-50 12-50 12-2014 RP-66 RP-142167 2691 Removal of square brackets for CA_B1_B3_and_CA_B1_B3_B19 12-50 12-50 12-2014 RP-66 RP-142167 2692 CR to favor of CA_capability for CA_parlorimance tests in 36.101 12-50 12-	12-2014	RP-66	RP-142162	2601	CQI test for TDD CL_C 20MHz+15MHz in Rel-12	12.5.0	12.6.0
12-2014 RP-66 RP-142147 2620 Col reporting in AWGN-COI Indices in set 12-50 12-5	12-2014	RP-66	RP-142162	2602	in Rel-12	12.5.0	12.6.0
12-2014 RP-66 RP-142147 2693 CR to fix error of CA capability for CA performance tests in 58.101 12.5.0 12.6.0							
In Rel-12							
behavior					in Rel-12		
NC CA					behavior		12.6.0
SA				2641	NC CA		
12-2014 RP-66 RP-142173 2582r1 Introduction of PUSCH 3-2 requirements into TS36.101 12-5.0 12-6.0					5A	12.5.0	
and ZP-CSIRS (Rel-12 test 8.3.1.3.2, 8.3.2.4.2)		RP-66					12.6.0
12-2014 RP-66 RP-142164 2576rt Corrections on Out-of-band blocking requirements for CA Class B 12-50 12-60	12-2014	RP-66	RP-142147	2661		12.5.0	12.6.0
12-2014 RP-66 RP-142149 2678 CR to specify applicability of CoMP RI test (Rel-12) 12.50 12.60	12-2014					12.5.0	12.6.0
and D	12-2014	RP-66	RP-142162	2603r1	12	12.5.0	12.6.0
12-2014 RP-66 RP-142144 2688 Correction of B29 REFSENS for CA_2A-29A-30A and CA_4A- 12.5.0 12.6.0 12.6.0 12.2014 RP-66 RP-142160 259473 Correction of B29 REFSENS for CA_2A-29A-30A and CA_4A- 12.5.0 12.6.0 12.2014 RP-66 RP-142160 259473 Correction of B29 REFSENS for CA_2A-29A-30A and CA_4A- 12.5.0 12.6.0 12.2014 RP-66 RP-142173 2705 Crediting requirements for inter-band CA_18-28 in TS36.101 12.5.0 12.6.0 12.2014 RP-66 RP-142174 2720 Shard 22 correction in UE to UE co-existance table. 12.5.0 12.6.0 12.2014 RP-66 RP-142144 2720 Shard 22 correction in UE to UE co-existance table. 12.5.0 12.6.0 12.2014 RP-66 RP-142147 2722 Correction to non-configuous downlink intraband CA receiver requirements for inter-band CA_18-28 in TS36.101 12.5.0 12.6.0 12.2014 RP-66 RP-142147 2722 Correction to mon-configuous downlink intraband CA receiver requirements 12.2014 RP-66 RP-142164 264311 Corrections for 3DL inter-band CA band combinations 12.5.0 12.6.0 12.2014 RP-66 RP-142164 264311 Corrections for 3DL inter-band CA band combinations 12.5.0 12.6.0 12.2014 RP-66 RP-142164 2731 Modifications for NS_12 and NS_13 12.5.0 12.6.0 12.2014 RP-66 RP-142163 2739 Introduction of CA_5-13 into 36.101 12.5.0 12.6.0 12.2014 RP-66 RP-142163 2739 Introduction of CA_5-13 into 36.101 12.5.0 12.6.0 12.2014 RP-66 RP-142163 2739 Introduction of CA_5-13 into 36.101 12.5.0 12.6.0 12.2014 RP-66 RP-142163 285172 CR for CA applicability rule in 36.101 Rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142163 285172 CR for CA applicability rule in 36.101 Rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142163 285172 CR for CA applicability rule in 36.101 Rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142163 285172 CR for formal demodiation test for 3DL CA 12.5.0 12.6.0 12.2014 RP-66 RP-142164 27311 CR for CA applicability rule in		RP-66	RP-142164	2576r1		12.5.0	12.6.0
12-2014 RP-66 RP-142164 2689 Correction of B29 REFSENS for CA_2A-29A-30A 12-2014 RP-66 RP-142144 2700 Delete the incorrect notes for FDD DMRS demodulation tests 12.5.0 12.6.0 (Rel-12) RP-66 RP-142160 2594/3 Correcting requirements for inter-band CA_18-28 in TS36.101 12.5.0 12.6.0 (Rel-12) RP-66 RP-142173 2705 CR of modification on PMI reporting requirements for DL MilMO 12.5.0 12.6.0 12.2014 RP-66 RP-142144 2720 Band 22 correction in UE to UE co-existance table. 12.5.0 12.6.0 12.2014 RP-66 RP-142147 2722 Correction to non-contiguous downlink intraband CA receiver requirements 12.2014 RP-66 RP-142147 2723 Correction to tono-contiguous downlink intraband CA receiver requirements 12.2014 RP-66 RP-142164 2733 Correction to table format of allowed channel bandwidths of non-contiguous intraband CA 12.2014 RP-66 RP-142164 243/11 Corrections for 3DL inter-band CA band combinations 12.5.0 12.6.0 12.2014 RP-66 RP-142164 273/11 Modifications for NS 12 and NS 13 12.5.0 12.6.0 12.2014 RP-66 RP-142169 2731 Modifications for NS 12 and NS 13 12.5.0 12.6.0 12.2014 RP-66 RP-142163 2731 Modifications for NS 12 and NS 13 12.5.0 12.6.0 12.2014 RP-66 RP-142163 2731 Modifications for NS 12 and NS 13 12.5.0 12.6.0 12.2014 RP-66 RP-142163 2766/11 CR for federance measurement channel for PUSCH3-2 test 12.5.0 12.6.0 12.2014 RP-66 RP-142163 2766/11 CR for CA applicability rule in 36.101 in Rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142163 2760/11 Carrection to Transmit Modulation Quality for CA 12.5.0 12.6.0 12.2014 RP-66 RP-142164 2760/11 Carrection to Transmit Modulation Quality for CA 12.5.0 12.6.0 12.2014 RP-66 RP-142164 2760/11 Carrection to Transmit Modulation Quality for CA 12.5.0 12.6.0 12.2014 RP-66 RP-142164 2760/11 Carrection to Transmit Modulation Quality for CA 12.5.0 12.6.0 12.2014							12.6.0
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12-2014 RP-66 RP-142173 Z705 CR of modification on PMI reporting requirements for DL MIMO 12.5.0 12.6.0					(Rel-12)		
enhancement							
12-2014 RP-66 RP-142147 2722 Correction to non-contiguous downlink intraband CA receiver requirements requirements 12-50 12-6.0					enhancement		
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12-2014 RP-66 RP-142147 Z723 Correction to table format of allowed channel bandwidths of noncontiguous intraband CA					requirements		
12-2014 RP-66 RP-142164 2643r1 Corrections for 3DL inter-band CA band combinations 12.5.0 12.6.0							
12-2014 RP-66 RP-142189 2739 Introduction of CA _5-13 into 36.101 12.5.0 12.6.0 12.2014 RP-66 RP-142173 270611 CR for reference measurement channel for PUSCH3-2 test 12.5.0 12.6.0 12.2014 RP-66 RP-142173 270611 CR for reference measurement channel for PUSCH3-2 test 12.5.0 12.6.0 12.2014 RP-66 RP-142188 267611 CR for CA applicability rule in 36.101 in Rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142187 267611 CR for CA applicability rule in 36.101 in Rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142187 13 Introduction of PUSCH3-2 requirements into TS36.101 12.5.0 12.6.0 12.2014 RP-66 RP-142187 269011 CR on sustained data rate test for 3DL CA 12.5.0 12.6.0 12.2014 RP-66 RP-142187 269011 CR on sustained data rate test for 3DL CA 12.5.0 12.6.0 12.2014 RP-66 RP-142147 274711 TS36.101 removal of brackets (RF) 12.5.0 12.6.0 12.2014 RP-66 RP-142144 27755 Correction to Transmit Modulation Quality for CA 12.5.0 12.6.0 12.2014 RP-66 RP-142144 277101 Clarification on UL and DL CA 12.5.0 12.6.0 12.2014 RP-66 RP-142144 277101 Clarification on on UL and DL CA 12.5.0 12.6.0 12.2014 RP-66 RP-142147 2735r1 Band 28 and NS_24 12.5.0 12.6.0 12.2014 RP-66 RP-142180 2729r1 Introduction of Dual Connectivity to TS 36.101 Rel-12, RF part 12.5.0 12.6.0 12.2014 RP-66 RP-142182 27011 Introduction of idual uplink inter-band CA in TS 36.101 rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142182 27011 Introduction of Inter-band CA in TS 36.101 rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142182 27011 Introduction of inter-band CA in TS 36.101 rel-12 12.5.0 12.6.0 12.2014 RP-66 RP-142184 2751/2 Removal of brackets and TBD from CA feature 12.5.0 12.6.0 12.2014 RP-66 RP-142184 2751/2 Removal of brackets and TBD from CA feature 12.5.0 12.6.0 12.2014 RP-66 RP-142185 272111 Addition of 2UL non-contiguous intr					contiguous intraband CA		
12-2014 RP-66 RP-142173 2706r1 CR of reference measurement channel for PUSCH3-2 test 12.5.0 12.6.0							
12-2014 RP-66 RP-142144 272771 CR for reference measurement channel for PUSCH3-2 test 12.5.0 12.6.0 12-2014 RP-66 RP-142188 2676r1 CR for CA applicability rule in 36.101 in Rel-12 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2690r1 CR for emove CA capability column in CA performance test tables (Rel-12) 12-2014 RP-66 RP-142187 2690r1 CR on sustained data rate test for 3DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2690r1 CR on sustained data rate test for 3DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2681r2 CR on normal demodulation test for 3DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142147 2747r1 736.101 removal of brackets (RF) 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2755 Correction to Transmit Modulation Quality for CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2710r1 Clarification on UL and DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2710r1 Clarification on UL and DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2735r1 Band 28 and NS _24 12.5.0 12.6.0 12-2014 RP-66 RP-142180 2729r1 Introduction of bual Connectivity to TS 36.101 Rel-12, RF part 12.5.0 12.6.0 12-2014 RP-66 RP-142180 2729r1 Introduction of dual uplink inter-band CA in TS 36.101 rel-12 12.5.0 12.6.0 12-2014 RP-66 RP-142182 2701r1 Introduction of dual uplink inter-band CA in TS 36.101 rel-12 12.5.0 12.6.0 12-2014 RP-66 RP-142182 2701r1 Introduction of Hammonic Signal Exceptions in Spurious Emissions 12-2014 RP-66 RP-142187 27572 Removal of brackets and TBD from CA feature 12.5.0 12.6.0 12-2014 RP-66 RP-142187 27572 Removal of brackets and TBD from CA feature 12.5.0 12.6.0 12-2014 RP-66 RP-142187 27571 Removal of brackets and TBD from CA feature 12.5.0 12.6.0 12-2014 RP-66 RP-142187 27571 Removal of brackets and TBD from CA feature 12.5.0 12.6.0 12-2014 RP-66 RP-142187 27571 Removal of brackets and TBD from							
12-2014 RP-66 RP-142144 2727r1 CR for CA applicability rule in 36.101 in Rel-12 12.5.0 12.6.0							
12-2014 RP-66 RP-142188 2676r1 CR to remove CA capability column in CA performance test tables (Rel-12) 12-2014 RP-66 RP-142173 r3 Introduction of PUSCH 3-2 requirements into TS36.101 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2680r1 CR on sustained data rate test for 3DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2681r2 CR on normal demodulation test for 3DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142147 2747r1 TS36.101 removal of brackets (RF) 12.5.0 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2755 Correction to Transmit Modulation Quality for CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2710r1 Clarification on UL and DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2710r1 Clarification of notes relating to interferer offsets in intraband CA 12.5.0 12.6.0 12-2014 RP-66 RP-142147 2735r1 Band 28 and NS_24 12.5.0 12.6.0 12-2014 RP-66 RP-142179 2684r1 CR for UE requirements for 256QAM 12.5.0 12.6.0 12-2014 RP-66 RP-142180 2729r1 Introduction of Dual Connectivity to TS 36.101 Rel-12, RF part 12.5.0 12.6.0 12-2014 RP-66 RP-142184 2680r1 Introduction of dual uplink inter-band CA in TS 36.101 rel-12 12.5.0 12.6.0 12-2014 RP-66 RP-142184 2758 Correction to Note 2 of Harmonic Signal Exceptions in Spurious 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2758 Correction to Note 2 of Harmonic Signal Exceptions in Spurious 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2751r2 Removal of brackets and TBD from CA feature 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2689r1 Maintenance of CA performance requirements (Rel-12) 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2679r2 CR to introduce CQI test for 3 DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2679r2 CR to introduce CQI test for 3 DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2689r2 Introduction of LC MTC into TS 36.101 12.5.0 12.6.0 12-2014 RP-66 RP-142187 2689r2							
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12-2014 RP-66 RP-142187 2681r2 CR on normal demodulation test for 3DL CA 12.5.0 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2747r1 TS36.101 removal of brackets (RF) 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2755 Correction to Transmit Modulation Quality for CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2710r1 Clarification on UL and DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2717r1 Clarification of notes relating to interferer offsets in intraband CA receiver requirement tables. 12.5.0 12.6.0 12-2014 RP-66 RP-142147 2735r1 Band 28 and NS_24 12.5.0 12.6.0 12-2014 RP-66 RP-142180 2729r1 Introduction of Dual Connectivity to TS 36.101 Rel-12, RF part 12.5.0 12.6.0 12-2014 RP-66 RP-142184 2680r1 Introduction of dual uplink inter-band CA in TS 36.101 rel-12 12.5.0 12.5.0 12.6.0 12-2014 RP-66 RP-142184 275tr Recover an accept					Introduction of PUSCH 3-2 requirements into TS36.101	12.5.0	
12-2014 RP-66 RP-142147 2747r1 TS36.101 removal of brackets (RF) 12.5.0 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2755 Correction to Transmit Modulation Quality for CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2710r1 Clarification on UL and DL CA 12.5.0 12.6.0 12-2014 RP-66 RP-142144 2717r1 Clarification of notes relating to interferer offsets in intraband CA receiver requirement tables. 12.5.0 12.6.0 12-2014 RP-66 RP-142147 2735r1 Band 28 and NS_24 12.5.0 12.6.0 12-2014 RP-66 RP-142180 2729r1 Introduction of Dual Connectivity to TS 36.101 Rel-12, RF part 12.5.0 12.6.0 12-2014 RP-66 RP-142184 2680r1 Introduction of dual uplink inter-band CA in TS 36.101 rel-12 12.5.0 12.6.0 12-2014 RP-66 RP-142184 2680r1 Introduction of inter-band CA_1-28 into TS36.101 12.5.0 12.6.0 12-2014 RP-66 RP-142182 2701r1 Introduction of inter-band CA_1-28							
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CSI-RS config Rel-12							12.7.0
03-2015 RP-67 RP-150392 2765r1 CR for applicability and test rules for TDD-FDD CA performance 12.6.0 12.7.0	03-2015	RP-67	RP-150387	2761	CSI-RS config Rel-12	12.6.0	12.7.0
	03-2015	RP-67	RP-150392	2765r1	CR for applicability and test rules for TDD-FDD CA performance	12.6.0	12.7.0

				requirements		
03-2015	RP-67	RP-150392	2766	Introduction of CQI tests for TDD-FDD CA	12.6.0	12.7.0
03-2015	RP-67	RP-150395	2767r1	CR to introduce the SU-MIMO whitening verification test	12.6.0	12.7.0
03-2015	RP-67	RP-150392	2768r1	CR on power imbalance test for 3DL CA	12.6.0	12.7.0
03-2015	RP-67	RP-150392	2769	CR on sustained data rate test for TDD FDD CA	12.6.0	12.7.0
03-2015	RP-67	RP-150394	2770r1	CR for introduction of 256QAM demodulation performance	12.6.0	12.7.0
				requirements		
03-2015	RP-67	RP-150393	2772r1	CR: DC UE performance requirements	12.6.0	12.7.0
03-2015	RP-67	RP-150390	2773r1	CR: MTC demodulation performance requirements	12.6.0	12.7.0
03-2015	RP-67	RP-150390	2774r1	CR: MTC CSI requirements	12.6.0	12.7.0
03-2015	RP-67	RP-150396	2775r1	Introduction of the eIMTA functional PDSCH demodulation test	12.6.0	12.7.0
03-2015	RP-67	RP-150387	2776r3	CR on RF core requirements for D2D	12.6.0	12.7.0
03-2015	RP-67	RP-150387	2777	Modification of CSI reference measurement channel Rel-12	12.6.0	12.7.0
03-2015	RP-67	RP-150388	2779	Editorial correction for CA_18A-28A	12.6.0	12.7.0
03-2015 03-2015	RP-67	RP-150388 RP-150384	2781 2783	Removing brackets for CA_1A-28A MSD requirements Editorial correction on symbols for enhanced performance	12.6.0 12.6.0	12.7.0 12.7.0
03-2013	KF-07	KF-130364	2/03	requirements type A	12.0.0	12.7.0
03-2015	RP-67	RP-150387	2784	Corrections on reference measurement channel	12.6.0	12.7.0
03-2015	RP-67	RP-150388	2792	Correction of TS 36.101 for the Pcell support of 25+41	12.6.0	12.7.0
03-2015	RP-67	RP-150395	2793r1	CR for single cell demodulation test for SU-MIMO	12.6.0	12.7.0
03-2015	RP-67	RP-150391	2794	Introduction of CA_3A-42A and CA_3A-42C into 36.101	12.6.0	12.7.0
03-2015	RP-67	RP-150384	2797	UL HARQ in PDSCH and PDCCH/PCFICH demod test cases for	12.6.0	12.7.0
				elCIC/felCIC with MBSFN ABS		
03-2015	RP-67	RP-150382	2800	Correction to elCIC aggressor cell configurations	12.6.0	12.7.0
03-2015	RP-67	RP-150387	2801	R4-73AH-0040: Correction for uplik CA configuration in TS 36.101	12.6.0	12.7.0
				Rel-12		
03-2015	RP-67	RP-150387	2802r1	Correction of MSD levels for CA_1A-8A in TS 36.101 rel-12	12.6.0	12.7.0
03-2015	RP-67	RP-150387	2805	Removal of eDL-MIMO term from specification	12.6.0	12.7.0
03-2015	RP-67	RP-150388	2809	Clarification of 2UL/3DL contiguous intraband CA REFSENS test	12.6.0	12.7.0
03-2015	RP-67	RP-150392	2811r1	CR on TM4 normal demodulation test for 3DL CA	12.6.0	12.7.0
03-2015	RP-67	RP-150392	2812	CR on introducing new DL referece measurement channels	12.6.0	12.7.0
03-2015	RP-67	RP-150392	2813r1	CR on normal demodulation test for TDD-FDD CA	12.6.0	12.7.0
03-2015	RP-67	RP-150388	2815	Additions of bandwidth combination set reference	12.6.0	12.7.0
03-2015	RP-67	RP-150388	2816	Correction of band number in Table 5.6A.1-2a for	12.6.0	12.7.0
		DD /=0000		LTE_CA_B4_B12_B30	10.00	
03-2015	RP-67	RP-150382	2819	UE to UE co-existence between B42/B43	12.6.0	12.7.0
03-2015	RP-67	RP-150382	2822	Corrections to CA in-band emissions requirement	12.6.0	12.7.0
03-2015	RP-67	RP-150381	2830	Uplink RMCs for sustained data rate test	12.6.0	12.7.0
03-2015 03-2015	RP-67 RP-67	RP-150382 RP-150392	2833 2839r1	Corrections to the CA power imbalance test	12.6.0 12.6.0	12.7.0 12.7.0
03-2015	RP-67	RP-150392 RP-150392	2842	CR for soft buffer tests for TDD-FDD CA in 36.101 in Rel-12 Editorial CR for CA UE performance tests in 36.101 in Rel-12	12.6.0	12.7.0
03-2015	RP-67	RP-150392	2847	UE spurious emissions structure correction for CA	12.6.0	12.7.0
03-2015	RP-67	RP-150387	2850	Correction of PCMAX for uplink inter-band and intra-band carrier	12.6.0	12.7.0
03-2013	101-01	101-150507	2030	aggregation	12.0.0	12.7.0
03-2015	RP-67	RP-150387	2851	Exceptions for spurious response for UL CA	12.6.0	12.7.0
03-2015	RP-67	RP-150388	2852r1	Correction of REFSENS, OOBB and uplink configuration for	12.6.0	12.7.0
00 20 .0		1 100000	2002.	3DL/1UL CA	12.0.0	
03-2015	RP-67	RP-150390	2853	SNR definition for category 0 UE	12.6.0	12.7.0
03-2015	RP-67	RP-150390	2854r1	FRC for category 0 UE PDSCH performance requirements	12.6.0	12.7.0
03-2015	RP-67	RP-150390	2855r1	Introduction of new PHICH and PBCH performance requirements	12.6.0	12.7.0
				for category 0 UE		
03-2015	RP-67	RP-150387	2861	Correction to FOOB reference in definition of MPR for contiguous	12.6.0	12.7.0
				CA with non-contiguous resource allocation		
03-2015	RP-67	RP-150387	2862	Band 31 update	12.6.0	12.7.0
03-2015	RP-67	RP-150384	2867	Implementation of CA configurations specified in later releases	12.6.0	12.7.0
06-2015	RP-68	RP-150958	2870r2	Intra-band contiguous CA reference sensitivity definition for Class	12.7.0	12.8.0
00.0015	DD 00	DD 450004	0004.0	D OD as MTO COllege	40.7.0	40.00
06-2015	RP-68	RP-150961	2881r2	CR on MTC CQI tests	12.7.0	12.8.0
06-2015	RP-68	RP-150962	2882r2	CR on 256QAM demodulation performance requirements	12.7.0	12.8.0
06-2015	RP-68	RP-150962	2883r3	CR on 256QAM sustained data rate tests for single carrier and	12.7.0	12.8.0
06-2015	RP-68	RP-150962	2885r4	TDD or FDD CA CR on 256QAM CQI test	12.7.0	12.8.0
06-2015	RP-68	RP-150962 RP-150963	2886r3	CR on DC SDR tests	12.7.0	12.8.0
06-2015	RP-68	RP-150963 RP-150963	2887r2	Maintenance CR for DC demodualtion performance requirements	12.7.0	12.8.0
06-2015	RP-68	RP-150963 RP-150958	2888	CR to restore R.10-2 FDD	12.7.0	12.8.0
		RP-150956	2889r3	Introduction of UE category 0 PDSCH/PHICH/PBCH performance	12.7.0	12.8.0
06-2015	I KD-KX	111 100001	200313	requirements	12.1.0	12.0.0
06-2015	RP-68				•	
			2901		1270	1280
06-2015	RP-68	RP-150954	2901 2902	UE to UE co-existence between B42/B43	12.7.0 12.7.0	12.8.0 12.8.0
06-2015 06-2015	RP-68 RP-68	RP-150954 RP-150958	2902	UE to UE co-existence between B42/B43 Correction of maximum aggregated bandwidth for CA_26A-41A	12.7.0	12.8.0
06-2015 06-2015 06-2015	RP-68 RP-68	RP-150954 RP-150958 RP-150957	2902 2903r2	UE to UE co-existence between B42/B43 Correction of maximum aggregated bandwidth for CA_26A-41A Introduction of TDD SU-MIMO whitening verification test	12.7.0 12.7.0	12.8.0 12.8.0
06-2015 06-2015	RP-68 RP-68	RP-150954 RP-150958	2902	UE to UE co-existence between B42/B43 Correction of maximum aggregated bandwidth for CA_26A-41A	12.7.0	12.8.0
06-2015 06-2015 06-2015	RP-68 RP-68	RP-150954 RP-150958 RP-150957	2902 2903r2	UE to UE co-existence between B42/B43 Correction of maximum aggregated bandwidth for CA_26A-41A Introduction of TDD SU-MIMO whitening verification test Correction of FRC table for CA demodualtion with power	12.7.0 12.7.0	12.8.0 12.8.0

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06-2015	RP-68	RP-150958	2909	Corrections to the CA power imbalance test	12.7.0	12.8.0
06-2015	RP-68	RP-150957	2910r1	Clarification on RMC for D2D UE	12.7.0	12.8.0
06-2015	RP-68	RP-150960	2911	Correction on TDD eIMTA PDSCH functionality test	12.7.0	12.8.0
06-2015	RP-68	RP-150954	2931	3.5 GHz out-of-band blocking	12.7.0	12.8.0
06-2015	RP-68	RP-150965	2933	Correction of FRC names	12.7.0	12.8.0
06-2015	RP-68	RP-150954	2936	Correction of the 3DL CA REFSENS	12.7.0	12.8.0
06-2015	RP-68	RP-150962	2939r1	CR on 256QAM sustained data rate tests for TDD FDD CA	12.7.0	12.8.0
06-2015	RP-68	RP-150958	2940r1	Maintenance CR for 3DL CA performance requirements	12.7.0	12.8.0
06-2015	RP-68	RP-150958	2941r1	Maintenance CR for TDD FDD CA demodulation performance requirements	12.7.0	12.8.0
06-2015	RP-68	RP-150965	2944	Corrections on 2UL intra-band non-contiguous CA requirements	12.7.0	12.8.0
06-2015	RP-68	RP-150958	2947	Updates to the definitions of CA capability (Rel-12)	12.7.0	12.8.0
06-2015	RP-68	RP-150955	2950	Clarification of PDSCH allocation in CSI PUSCH 3-0 felCIC tests	12.7.0	12.8.0
06-2015	RP-68	RP-150954	2956	(Rel-12) NS value for intra-band contiguous CA configurations not allowed	12.7.0	12.8.0
06-2015	RP-68	RP-150957	2958	A-MPR Receiver spurious emissions requirements for downlink-only	12.7.0	12.8.0
				bands		
06-2015	RP-68	RP-150958	2959	Amendments to MPR for uplink inter-band and intra-band non- contiguous CA	12.7.0	12.8.0
06-2015	RP-68	RP-150958	2960r1	NS values for secondary cells of non-contigous CA configurations	12.7.0	12.8.0
06-2015	RP-68	RP-150955	2961r1	Corrections to test configurations for intra-band non-contiguous	12.7.0	12.8.0
06-2015	RP-68	RP-150954	2962	Corrections to test configurations for 3DL inter-band CA	12.7.0	12.8.0
06-2015	RP-68	RP-150954	2967	Adding REFSENS exception requirements for 1+3+26	12.7.0	12.8.0
06-2015	RP-68	RP-150956	2971	Corrections to NS_22 and NS_23	12.7.0	12.8.0
06-2015	RP-68	RP-150954	2972	Corrections to 41D fallback	12.7.0	12.8.0
06-2015	RP-68	RP-150957	2972	Corrections to 41D failback Corrections to EVM requirements for ProSe and Annex F of	12.7.0	12.8.0
06-2015	RP-68	RP-150958	2976	36.101 Removal of B27 from 2UL CA_7A_20A co-existence protected	12.7.0	12.8.0
				band list		
06-2015	RP-68	RP-150957	2977r1	CR on corrections to D2D RF core requirements	12.7.0	12.8.0
06-2015	RP-68	RP-150963	2978r1	CR on corrections to D2D RF core requirements	12.7.0	12.8.0
06-2015	RP-68	RP-150957	2979	CR clarification of RMC for DL category 0 UE HD-FDD	12.7.0	12.8.0
06-2015	RP-68	RP-150960	2980r1	Introducation of TDD elMTA CQI requirement	12.7.0	12.8.0
06-2015	RP-68	RP-150958	2985	Change of 1.4MHz single carrier SNR values for multiple CA configurations	12.7.0	12.8.0
06-2015	RP-68	RP-150954	2992	Clarification to spurious emission requirement for the edge of spurious domain	12.7.0	12.8.0
06-2015	RP-68	RP-150955	2996	Correction to CA_7C A-MPR in CA-NS_06	12.7.0	12.8.0
06-2015	RP-68	RP-150965	2998r1	CR to update UE performance tests for UE DL category in 36.101 in Rel-12	12.7.0	12.8.0
06-2015	RP-68	RP-150965	2999	CR to update Annex for new DL category in 36.101 in Rel-12	12.7.0	12.8.0
06-2015	RP-68	RP-150958	3002	CR for updating CA applicability rule in 36.101 in Rel-12	12.7.0	12.8.0
06-2015	RP-68	RP-150957	3005r1	CR for Rel-12 NAICS - Definitions	12.7.0	12.8.0
06-2015	RP-68	RP-150965	3012r1	Clarification on uplink configuration for reference sensitivity of inter-band CA	12.7.0	12.8.0
06-2015	RP-68	RP-150954	3018	EVM for Intra-band contiguous UL CA for non-equal Channel BWs		
06-2015					12.7.0	12.8.0
	I KP-68	RP-150958	3019		12.7.0 12.7.0	12.8.0 12.8.0
06-2015	RP-68 RP-68	RP-150958 RP-150958	3019 2780r3	A-MPR correction for CA_39C CA_NS_07	12.7.0	12.8.0
06-2015 06-2015	RP-68 RP-68	RP-150958	2780r3	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101		
06-2015 06-2015 06-2015	RP-68			A-MPR correction for CA_39C CA_NS_07	12.7.0 12.8.0	12.8.0 13.0.0
06-2015	RP-68 RP-68	RP-150958 RP-150646	2780r3 2785r2	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101	12.7.0 12.8.0 12.8.0	12.8.0 13.0.0 13.0.0
06-2015 06-2015 06-2015	RP-68 RP-68 RP-68	RP-150958 RP-150646 RP-150968 RP-150972	2780r3 2785r2 2951r2 2952r1	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0
06-2015 06-2015	RP-68 RP-68 RP-68	RP-150958 RP-150646 RP-150968	2780r3 2785r2 2951r2	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA	12.7.0 12.8.0 12.8.0 12.8.0	12.8.0 13.0.0 13.0.0 13.0.0
06-2015 06-2015 06-2015 06-2015	RP-68 RP-68 RP-68 RP-68	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974	2780r3 2785r2 2951r2 2952r1 2953r2	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0
06-2015 06-2015 06-2015 06-2015 06-2015	RP-68 RP-68 RP-68 RP-68 RP-68	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150975	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0
06-2015 06-2015 06-2015 06-2015 06-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150975	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150975 RP-150967 RP-150668	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150975 RP-150967 RP-150668 RP-150673	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150975 RP-150967 RP-150668 RP-150673 RP-151479	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intra-	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 09-2015 09-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-69 RP-69	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150967 RP-150668 RP-150673 RP-151479 RP-151479 RP-151479 RP-151483	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028 3029	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intraband non-contiguous Carrier Aggregation in Band 4	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.1.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 09-2015 09-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-69 RP-69	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150967 RP-150668 RP-150673 RP-151479 RP-151505	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028 3029	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intraband non-contiguous Carrier Aggregation in Band 4 Correction to TDD FDD CA	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.1.0 13.1.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-69 RP-69 RP-69 RP-69 RP-69	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150967 RP-150668 RP-150673 RP-151479 RP-151479 RP-151479 RP-151483 RP-151476	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028 3029 3031 3033	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intraband non-contiguous Carrier Aggregation in Band 4 Correction to TDD FDD CA Alignment of CA Receiver requirements parameters	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.1.0 13.1.0 13.1.0 13.1.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 09-2015 09-2015 09-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-69 RP-69 RP-69	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150967 RP-150668 RP-150673 RP-151479 RP-151479 RP-151479 RP-151483	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028 3029 3031 3033 3036	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intraband non-contiguous Carrier Aggregation in Band 4 Correction to TDD FDD CA Alignment of CA Receiver requirements parameters Correction to RI test parameters in TS 36.101 (Rel-13) UE co-existence requirements between Band 42 and Japanese	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0 13.0.0 13.0.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.1.0 13.1.0 13.1.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-69 RP-69 RP-69 RP-69 RP-69	RP-150958 RP-150968 RP-150972 RP-150974 RP-150975 RP-150967 RP-150668 RP-150673 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151476 RP-151475	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028 3029 3031 3033 3036 3040	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intraband non-contiguous Carrier Aggregation in Band 4 Correction to TDD FDD CA Alignment of CA Receiver requirements parameters Correction to RI test parameters in TS 36.101 (Rel-13) UE co-existence requirements between Band 42 and Japanese bands Introduction of relaxation rule for multiple 3DL inter-band CA	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150967 RP-150668 RP-150668 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151475 RP-151475 RP-151475	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028 3029 3031 3033 3036 3040 3050	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intraband non-contiguous Carrier Aggregation in Band 4 Correction to TDD FDD CA Alignment of CA Receiver requirements parameters Correction to CoMP demodulation requirements Correction to RI test parameters in TS 36.101 (Rel-13) UE co-existence requirements between Band 42 and Japanese bands Introduction of relaxation rule for multiple 3DL inter-band CA configurations	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150967 RP-150967 RP-150668 RP-151479 RP-151479 RP-151479 RP-151475 RP-151475 RP-151475 RP-151475 RP-151475	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028 3029 3031 3033 3036 3040 3050 3052	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intraband non-contiguous Carrier Aggregation in Band 4 Correction to TDD FDD CA Alignment of CA Receiver requirements parameters Correction to CoMP demodulation requirements Correction to RI test parameters in TS 36.101 (Rel-13) UE co-existence requirements between Band 42 and Japanese bands Introduction of relaxation rule for multiple 3DL inter-band CA configurations Adding CA_42D to the out of band blocking requirement exception	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 06-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-68 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-150958 RP-150646 RP-150968 RP-150972 RP-150974 RP-150967 RP-150668 RP-150668 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151475 RP-151475 RP-151475	2780r3 2785r2 2951r2 2952r1 2953r2 2994r1 3011r1 3021 3022 3028 3029 3031 3033 3036 3040 3050	A-MPR correction for CA_39C CA_NS_07 Introduction of dual uplink CA into 36.101 Introduction of intra-band CA_42D to TS 36.101 Introduction of additional 2DL inter-band CA Introduction of additional 3DL inter-band CA Introduction of 4DL inter-band CA Introduction of non-contiguous Carrier Aggregation (CA) in Band 42 for 3DL CR to 36.101: New CA bandwidth classes for FeCA Introduction of CA_3A-40A to TS 36.101 Introduction of CA_3A-40C to TS 36.101 Table 7.3.1A-0f (2UL CA MSD) notes numbering correction Additional bandwidth combination set for LTE Advanced intraband non-contiguous Carrier Aggregation in Band 4 Correction to TDD FDD CA Alignment of CA Receiver requirements parameters Correction to CoMP demodulation requirements Correction to RI test parameters in TS 36.101 (Rel-13) UE co-existence requirements between Band 42 and Japanese bands Introduction of relaxation rule for multiple 3DL inter-band CA configurations	12.7.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	12.8.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0

09-2015 09-2015 09-2015		RP-151483	3065	Corrections to CSI PUCCH 1-0 static test 4 and PUSCH 3-2 tests	13.0.0	13.1.0
	RP-69 RP-69	RP-151488 RP-151479	3066 3068	Corrections in Table 5.6A.1-2, 7.3.1-1A and 7.3.1-1B. Corrections of Spurious emission band UE co-existence for	13.0.0	13.1.0 13.1.0
	RP-69	RP-151483	3070	interband 2UL CA in Table 6.6.3.2A-0	13.0.0	13.1.0
09-2015			3070	Revisions of Spurious emission band UE co-existence in Table 6.6.3.2-1		
00 2010	RP-69	RP-151475	3076	Correction to PDCCH/PCFICH test parameters in TS 36.101 (Rel-13)	13.0.0	13.1.0
09-2015	RP-69	RP-151475	3080	Correction to PMI delay in PMI test for TDD	13.0.0	13.1.0
09-2015	RP-69	RP-151503	3081r1	Introduction of dual uplink CA into 36.101	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3083	Maintanence CR for MTC CSI performance requirements	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3085	Maintanence CR for SCE demodulation and CSI requriements	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3087	Maintenance CR for DC demodulation performance requirements and SDR tests	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3089	Cleanup of TDD-FDD CA demodulation performance requirments	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3091	Cleanup of R12 SU-MIMO Enhanced Performance Type C requirments	13.0.0	13.1.0
09-2015	RP-69	RP-151475	3102	Correction on UE maximum output power class of Band 22 for UL MIMO	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3104	Removal of square brackets for Cat-0 UE demodulation requirements	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3106	Removal of square brackets for LTE-CA_B41_B42	13.0.0	13.1.0
09-2015	RP-69	RP-151490	3107	Removal of square brackets for LTE-CA_B41_B42_B42	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3112	Corrections on 3DL CA performance requirements	13.0.0	13.1.0
09-2015	RP-69	RP-151489	3113	CR 36.101 BW combination for CA_8A_41A	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3114	UL DL pairing for CA of B39+B41+B41 and B39+B39+B41	13.0.0	13.1.0
09-2015	RP-69	RP-151498	3116	Introduction of additional band combinations for 2DL inter-band CA	13.0.0	13.1.0
09-2015	RP-69	RP-151499	3117	Introduction of additional band combinations for 3DL inter-band CA	13.0.0	13.1.0
09-2015	RP-69	RP-151475	3118	Minor corrections in 36.101	13.0.0	13.1.0
09-2015	RP-69	RP-151479	3121	CR adding clarification for Band 28 restrictions in 36.101	13.0.0	13.1.0
09-2015	RP-69	RP-151494	3123r1	Introduction of propagation conditions to handle 4 receivers in the UE	13.0.0	13.1.0
09-2015	RP-69	RP-151504	3125r1	Addition on interband CA 2UL/3DL pairs without MSD	13.0.0	13.1.0
	RP-69	RP-151483	3127	CR for UE performance tests for intra-band contiguous CA with	13.0.0	13.1.0
09-2015				minimum channel spacing on Band 41		
09-2015 09-2015	RP-69	RP-151496	3130r2	minimum channel spacing on Band 41 TM9 performance with CRS assistance information	13.0.0	13.1.0
09-2015 09-2015 09-2015	RP-69	RP-151496 RP-151495	3130r2 3133r1	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101	13.0.0 13.0.0	13.1.0
09-2015 09-2015 09-2015 09-2015	RP-69 RP-69	RP-151496 RP-151495 RP-151483	3130r2 3133r1 3135r1	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13)	13.0.0 13.0.0 13.0.0	13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015	RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485	3130r2 3133r1 3135r1 3137	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101	13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501	3130r2 3133r1 3135r1 3137 3139r1	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA	13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479	3130r2 3133r1 3135r1 3137 3139r1 3141	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479 RP-151473 RP-151479	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13)	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483 RP-151483	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483 RP-151482 RP-151482 RP-151482	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3164 3165	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Fixed Reference Channels	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151482 RP-151482 RP-151482 RP-151482	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3164 3165 3166	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Interference Models	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151479 RP-151479 RP-151479 RP-151479 RP-151479 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3164 3165 3166 3167	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Interference Models CR for Rel-12 NAICS - CQI Tests	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3164 3165 3166 3167 3168	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Interference Models CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151593	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3164 3165 3166 3167 3168 3170	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Interference Models CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151593 RP-151593 RP-152158	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3164 3165 3166 3167 3168 3170 3172r1	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Fixed Reference Channels CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of UE RF requirements for CA_42E	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151593	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3164 3165 3166 3167 3168 3170	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-12) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Fixed Reference Channels CR for Rel-12 NAICS - Interference Models CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of UE RF requirements for CA_42E Correction on UL 64QAM measurment channels Release 13 CAT A CR to align NS_04 values to meet FCC OOBE	13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 12-2015 12-2015	RP-69 RP-70 RP-70	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483 RP-151482	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3164 3165 3166 3167 3168 3170 3172r1 3173 3175	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Fixed Reference Channels CR for Rel-12 NAICS - Interference Models CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of UE RF requirements for CA_42E Correction on UL 64QAM measurment channels Release 13 CAT A CR to align NS_04 values to meet FCC OOBE requirements	13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 12-2015 12-2015 12-2015	RP-69 RP-70 RP-70	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151483 RP-151482	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3166 3167 3168 3170 3172r1 3173 3175	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Fixed Reference Channels CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of UE RF requirements for CA_42E Correction on UL 64QAM measurment channels Release 13 CAT A CR to align NS_04 values to meet FCC OOBE requirements Maintenance of elMTA PDSCH demodulation test	13.0.0 13.0.0	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 12-2015 12-2015 12-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-70 RP-70 RP-70	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151593 RP-152136 RP-152136 RP-152136	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3166 3167 3168 3170 3172r1 3173 3175	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Fixed Reference Channels CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of UE RF requirements for CA_42E Correction on UL 64QAM measurment channels Release 13 CAT A CR to align NS_04 values to meet FCC OOBE requirements Maintenance of elMTA PDSCH demodulation test Correction for elMTA CQI tests	13.0.0 13.1.0 13.0 13	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 12-2015 12-2015 12-2015 12-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-70 RP-70 RP-70 RP-70	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151593 RP-151593 RP-152136 RP-152136 RP-152136 RP-152133	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3166 3167 3168 3170 3172r1 3173 3175 3178 3180r1 3186	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Interference Models CR for Rel-12 NAICS - Interference Models CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of UE RF requirements for CA_42E Correction on UL 64QAM measurment channels Release 13 CAT A CR to align NS_04 values to meet FCC OOBE requirements Maintenance of elMTA PDSCH demodulation test Correction for elMTA CQI tests Simplified CA fading Test method becomes optional	13.0.0 13.1.0 13.0 13	13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 12-2015 12-2015 12-2015 12-2015 12-2015 12-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-70 RP-70 RP-70 RP-70 RP-70 RP-70	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151593 RP-152136 RP-152136 RP-152136 RP-152133 RP-152133	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3166 3167 3168 3170 3172r1 3173 3173 3175 3178 3180r1 3186 3191	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-12) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Fixed Reference Channels CR for Rel-12 NAICS - Interference Models CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of UE RF requirements for CA_42E Correction on UL 64QAM measurment channels Release 13 CAT A CR to align NS_04 values to meet FCC OOBE requirements Maintenance of elMTA PDSCH demodulation test Correction for elMTA CQI tests Simplified CA fading Test method becomes optional Correction of the applicable UE categories for 256QAM UE demodulation performance requirements (Rel-13)	13.0.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0 13.1.0	13.1.0 13.2.0 13.0 13.2.0 13.0 13.0 13.0 13.0 13.0 13.0 13.0 13
09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 09-2015 12-2015 12-2015 12-2015 12-2015	RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-69 RP-70 RP-70 RP-70 RP-70	RP-151496 RP-151495 RP-151483 RP-151485 RP-151485 RP-151501 RP-151479 RP-151479 RP-151479 RP-151479 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151482 RP-151593 RP-151593 RP-152136 RP-152136 RP-152136 RP-152133	3130r2 3133r1 3135r1 3137 3139r1 3141 3143r1 3145 3146r1 3147 3153 3155 3166 3167 3168 3170 3172r1 3173 3175 3178 3180r1 3186	minimum channel spacing on Band 41 TM9 performance with CRS assistance information Introduction of UL 64QAM to TS 36.101 Modification of test parameters for TM9 demodulation with 256QAM (Rel-13) CR to add demodulation tests for new release 13 2CC combinations in 36.101 Introduction of 4CC demodulation requirements for FDD and FDD-TDD CA Correction to FDD-TDD closed loop spatial multiplexing 3CC requirement table Correction to DC supported testable bandwidth list Clarification of UL configuration for CA demodulation requirements Spreading of harmonic for 2UL interband and 2 ULnon-contiguous intraband CA Correction to dRib and REFSENS Corrections to CSI RMCs used for PUSCH 3-2 testing (Rel-13) Corrections to applicability of CSI requirements for low UE categories (Rel-13) CR for Rel-12 NAICS - Demodulation Test CR for Rel-12 NAICS - Fixed Reference Channels CR for Rel-12 NAICS - CQI Tests Introduction of CA_7A-40A and CA_7A-40C to TS 36.101 CR for Rel-13 NAICS - TM10 Demodulation and CSI Test Introduction of UE RF requirements for CA_42E Correction on UL 64QAM measurment channels Release 13 CAT A CR to align NS_04 values to meet FCC OOBE requirements Maintenance of elMTA PDSCH demodulation test Correction of the applicable UE categories for 256QAM UE	13.0.0 13.1.0 13.0 13	13.1.0 13.1.0

Performance requirements Performance require	12-2015	RP-70	RP-152163	3196	CR on introduction of 5CC FDD/TDD CA demodulation	13.1.0	13.2.0
Performance requirements					performance requirements		
12-2015 RP-70 RP-162134 3208 Correction of the 2UL CA co-existence table for CA 18A-28A 13.1.0 132.0 12-2015 RP-70 RP-162139 321011 Correction of JUDIUD C 13.1.0 132.0 12-2015 RP-70 RP-162139 321011 Correction of JuDiu Configuration for CA .42D 13.1.0 132.0 12-2015 RP-70 RP-162133 3212 Introduction of Judiu Configuration for CA .42D 13.1.0 132.0 12-2015 RP-70 RP-162133 3212 Corrections to the CSI minimum requirement for PUSCH 3-2 (Rel 1.1.1.0 13.2.0 1					performance requirements		
12-2015 RP-70 RP-152152 3209 Introduction of 3DL/ZUL DC 13.1.0 13.2.0 12.2015 RP-70 RP-152133 3212 Introduction of dual uplink CA Into 36.101 13.1.0 13.2.0 12.2015 RP-70 RP-152133 3214 Introduction of dual uplink CA Into 36.101 13.1.0 13.2.							
12-2015 RP-70 RP-152133 32101 Correction of Uplink Configuration for CA 42D 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3212 Introduction of dual uplink CA into \$8.101 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3214 Corrections to the CSI minimum requirement for PUSCH 3-2 (Ref. 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3216 Corrections to MIMO Correlation Matrices using cross polarized 13.1.0 13.2.0							
12-2015 RP-70 RP-152133 3212 Introduction of dual uplink CA Into 36.101 13.10 13.20 13.20 12-2015 RP-70 RP-152133 3216 Corrections to the CSI minimum requirement for PUSCH 3-2 (Rel· 13.1.0 13.20							
12-2015 RP-70 RP-152133 3214 Corrections to the CSI minimum requirement for PUSCH 3-2 (Rel- 13.1.0 13.2.0							
130 131 132 132 132 133 132							
antennas (Rel-12)					13)		
12-2015 RP-70 RP-152136 3225 CR for UE performance tests for intra-band contiguous CA with minimum channel spacing on Band 41 13.10 13.2.0 1					antennas (Rel-12)		
minimum channel spacing on Band 41		1					
12-2015 RP-70 RP-152130 3227 Correction in SNR definition for CSI test 13.1.0 13.2.0 12-2015 RP-70 RP-152130 3232 Correction to reference channel for CQI requirements 13.1.0 13.2.0 12-2015 RP-70 RP-152164 3241 Correction to reference channel for CQI requirements 13.1.0 13.2.0 12-2015 RP-70 RP-152143 3242 Introduction of 2 UL and 3 DL interband cases with MSD 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3249 Correction to Physical channel for CQI reporting in type A test 13.1.0 13.2.0	12-2013	KF-70	KF-132130	3223		13.1.0	13.2.0
12:2015 RP-70 RP-152130 3232 Correction to reference channel for CQI requirements 13.1.0 13.2.0	12-2015	RP-70	RP-152136	3227r1		13.1.0	13.2.0
12-2015 RP-70 RP-152164 3241 Correction to mandatory ZUL support for 3DL Interband CAD 13.10 13.20	12-2015	RP-70				13.1.0	
12-2015 RP-70 RP-152132 3246 Correction to f 2 UL and 3 DL Interband cases with MSD 13.1,0 13.2,0	12-2015	RP-70	RP-152168	3233r1		13.1.0	13.2.0
12-2015 RP-70 RP-152132 3246 CR on FRC for CDM-multiplexed DM RS 13.1.0 13.2.0	12-2015	RP-70	RP-152164		Correction to mandatory 2UL support for 3DL interband CA	13.1.0	13.2.0
12-2015 RP-70 RP-152132 3249 Correction to physical channel for CQI reporting in type A test 13.1.0 13.2.0	12-2015	RP-70	RP-152164	3242	Introduction of 2 UL and 3 DL interband cases with MSD	13.1.0	
Case							
12-2015 RP-70 RP-152134 32961 Correction on CA A4-A4-S4 table reference 13.1.0 13.2.0	12-2015	RP-70	RP-152132	3249	· · · · · · · · · · · · · · · · · · ·	13.1.0	13.2.0
12-2015 RP-70 RP-152134 32991 Clarification of Pcell support in 36.101 in CA scenarios 13.1.0 13.2.0							
12-2015 RP-70 RP-152132 3273 A-MPR correction for CA_NS_06 CA-7C non-contiguous RB 13.1.0 13.2.0							
allocation all					Clarification of Pcell support in 36.101 in CA scenarios		
12-2015 RP-70 RP-152133 3278 Correction of uplink configuration for CA_18-28 13.1.0 13.2.0	12-2015	RP-70	RP-152132	3273		13.1.0	13.2.0
12-2015 RP-70 RP-152135 3280 CR on corrections for ProSe Direct Discovery demodulation 13.1.0 13.2.0							
requirements requirements							
Communication	12-2015	RP-70	RP-152135	3280	requirements	13.1.0	13.2.0
PMI C\$ Reference Symbol tests	12-2015	RP-70	RP-152135	3281		13.1.0	13.2.0
12-2015 RP-70 RP-152167 328671 Introduction of CA_58 to TS_36.101 13.1.0 13.2.0	12-2015	RP-70	RP-152131	3285		13.1.0	13.2.0
12-2015 RP-70 RP-152133 3288 Introduction of dual uplink CA into 36.101 13.1.0 13.2.0 12.2015 RP-70 RP-152150 32911 CR on eD2D RF core requirements 13.1.0 13.2.0 13.2.0 RP-152151 RP-70 RP-152131 3294 Correction of supported sub-block frequency arrangement for CA_41-41 13.1.0 13.2.0 13.2.0 CA_41-41 13.1.0 13.2.0 CA_41-41 13.1.0 13.2.0 CA_41-41 13.1.0 13.2.0 CA_41-41 13.1.0 13.2.0 CA_41-41 13.1.0 13.2.0 CA_41-41 13.1.0 13.2.0 CA_41-41 13.1.0 13.2.0 CA_41-41 13.1.0 13.2.0 CA_41-41 13.1.0 CA_41-41 13.1.0 CA_41-41 13.1.0 CA_41-41 13.1.0 CA_41-41		RP-70		3286r1		13.1.0	13.2.0
12-2015 RP-70 RP-152151 RP-10 RP-152171 RP-10 RP-152171 RP-70 RP-152171 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152131 RP-70 RP-152147 RP-152147 RP-152148 RP-70 RP-152148 RP-70 RP-152172 RP-70 RP-152172 RP-70 RP-152173 RP-70 RP-152160 RP-70 RP-152151 RP-70 RP-152153 RP-70 RP		RP-70		3287		13.1.0	
RP-0 RP-152171 329273 Introduction of B65 in Region 1 13.1.0 13.2.0 12-2015 RP-70 RP-152131 3294 Correction of supported sub-block frequency arrangement for CA_41-41 13.2.0 13.2.0 13.2.0 13.2.0 13.2.0 13.2.0 13.2.0 RP-70 RP-152131 3296 Correction of test configuration for combinations of inter-band and intra-band CA 12-2015 RP-70 RP-152147 3299r2 RF receiver requirements for UE(s) supporting four antenna ports 13.1.0 13.2.0 12-2015 RP-70 RP-152148 3300r2 Introduction of RF requirements for LAA operation 13.1.0 13.2.0							
12-2015 70 RP-152171 329213 3294 Correction of supported sub-block frequency arrangement for CA_41-41 13.1.0 13.2.0	12-2015		RP-152150	3291r1			
12-2015 RP-70 RP-152131 3294 Correction of supported sub-block frequency arrangement for CA_41-41 13.1.0 13.2.0	12-2015		RP-152171	3202r3	Introduction of B65 in Region 1	13.1.0	13.2.0
12-2015 RP-70 RP-152131 3296 Correction of test configuration for combinations of inter-band and intra-band CA 13.1.0 13.2.0					Correction of supported sub-block frequency arrangement for	13.1.0	13.2.0
Intra-band CA Intra-band CA RP-10 RP-152147 329pr2 RF receiver requirements for UE(s) supporting four antenna ports 13.1.0 13.2.0					CA_41-41		
12-2015 RP-70 RP-152148 3300r2 Introduction of RF requirements for LAA operation 13.1.0 13.2.0 12-2015 RP-70 RP-152172 3309r2 Introduction of Band 66 13.1.0 13.2.0 12-2015 RP-70 RP-152166 3311 Correction on CQI test 1A for TDD eIMTA 13.1.0 13.2.0 12-2015 RP-70 RP-152166 3312r1 Introduction of 3DL/3UL Inter-band CA of CA_39A-41C and CA_39A-41C and CA_39C-41A 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3314 Correction of the resource allocation in FRC for CAT0 UE demodulation tests 13.1.0 13.2.0 12-2015 RP-70 RP-152151 3318 Introduce TM4 performance requirements when CRS assistance information is provided 13.1.0 13.2.0 12-2015 RP-70 RP-152151 3319r1 Introduce TM10 performance requirements when CRS assistance information is provided for multiple-CSI-process capable UE 13.1.0 13.2.0 12-2015 RP-70 RP-152163 3325 Introduction of SDL/1UL CA combinations into TS 36.101 13.1.0 13.2.0 12-2015 RP-70					intra-band CA		
12-2015 RP-70 RP-152136 RP-70 RP-152166 RP-70 RP-152166 RP-70 RP-152166 RP-70 RP-152166 RP-70 RP-152166 RP-70 RP-152133 RP-70 RP-152133 RP-70 RP-152151 RP-70 RP-152163 RP-70 RP-152163 RP-70 RP-152163 RP-70 RP-152163 RP-70 RP-152138 RP-70 RP-152138 RP-70 RP-152138 RP-70 RP-152138 RP-70 RP-152133 RP-70 RP-152133 RP-70 RP-152133 RP-70 RP-152133 RP-70 RP-152131 RP-70 RP-152							
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12-2015 RP-70 RP-152151 3318 Introduce TM4 performance requirements when CRS assistance information is provided 13.1.0 13.2.					Introduction of 3DL/3UL Inter-band CA of CA_39A-41C and		
12-2015 RP-70 RP-152151 3318 Introduce TM4 performance requirements when CRS assistance information is provided 13.1.0 13.2.0	12-2015	RP-70	RP-152133	3314	Correction of the resource allocation in FRC for CAT0 UE	13.1.0	13.2.0
12-2015 RP-70 RP-152151 3319r1 Introduce TM10 performance requirements when CRS assistance information is provided for multiple-CSI-process capable UE 13.1.0 13.2.0	12-2015	RP-70	RP-152151	3318	Introduce TM4 performance requirements when CRS assistance	13.1.0	13.2.0
12-2015 RP-70 RP-152151 3320r1 Introduce TM10 performance requirements when CRS assistance information is provided for one-CSI-process capable UE 13.1.0 13.2.0 12-2015 RP-70 RP-152163 3325 Introduction of 5DL/1UL CA combinations into TS 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152175 3326r1 Introduction of Region 3 requirement in Band 65 13.1.0 13.2.0 12-2015 RP-70 RP-152138 3327 Correction of CA_8A-41C bandwidth combination set 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3329 Removal of DC channel bandwidth combination set table 13.1.0 13.2.0 12-2015 RP-70 RP-152136 3331 CR on demodulation requirements of Dual Connectivity 13.1.0 13.2.0 12-2015 RP-70 RP-152131 3332r1 Modification and correction of CA_3A-3A BCS1 in Rel.13 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152162 3338 Introduction of finished 4DL inter-band CAs to TS 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152162	12-2015	RP-70	RP-152151	3319r1	Introduce TM10 performance requirements when CRS assistance	13.1.0	13.2.0
12-2015 RP-70 RP-152163 3325 Introduction of 5DL/1UL CA combinations into TS 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152175 3326r1 Introduction of Region 3 requirement in Band 65 13.1.0 13.2.0 12-2015 RP-70 RP-152138 3327 Correction of CA_8A-41C bandwidth combination set 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3329 Removal of DC channel bandwidth combination set table 13.1.0 13.2.0 12-2015 RP-70 RP-152136 3331 CR on demodulation requirements of Dual Connectivity 13.1.0 13.2.0 12-2015 RP-70 RP-152131 3332r1 Modification and correction of CA_3A-3A BCS1 in Rel.13 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3334 Correction of MSD levels for 2UL inter-band CA in TS 36.101 Rel-13.1.0 13.1.0 13.2.0 12-2015 RP-70 RP-152162 3338 Introduction of finished 4DL inter-band CAs to TS 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152164 3340r1 Introduction of A_7A-7	12-2015	RP-70	RP-152151	3320r1	Introduce TM10 performance requirements when CRS assistance	13.1.0	13.2.0
12-2015 RP-70 RP-152175 3326r1 Introduction of Region 3 requirement in Band 65 13.1.0 13.2.0 12-2015 RP-70 RP-152138 3327 Correction of CA_8A-41C bandwidth combination set 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3329 Removal of DC channel bandwidth combination set table 13.1.0 13.2.0 12-2015 RP-70 RP-152136 3331 CR on demodulation requirements of Dual Connectivity 13.1.0 13.2.0 12-2015 RP-70 RP-152131 3332r1 Modification and correction of CA_3A-3A BCS1 in Rel.13 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3334 Correction of MSD levels for 2UL inter-band CA in TS 36.101 Rel-13.1.0 13.1.0 13.2.0 12-2015 RP-70 RP-152162 3338 Introduction of finished 4DL inter-band CAs to TS 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152170 3339 Introduction of CA_7A-7A BCS1 to TS 36.101 13.1.0 13.1.0 13.2.0 12-2015 RP-70 RP-152164 3340r1 Introducti	10 0015	DD 70	DD 450400	2225		12.1.0	12.00
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12-2015 RP-70 RP-152136 3331 CR on demodulation requirements of Dual Connectivity 13.1.0 13.2.0 12-2015 RP-70 RP-152131 3332r1 Modification and correction of CA_3A-3A BCS1 in Rel.13 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152133 3334 Correction of MSD levels for 2UL inter-band CA in TS 36.101 Rel-13.1.0 13.1.0 13.2.0 12-2015 RP-70 RP-152162 3338 Introduction of finished 4DL inter-band CAs to TS 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152170 3339 Introduction of CA_7A-7A BCS1 to TS 36.101 13.1.0 13.2.0 12-2015 RP-70 RP-152164 3340r1 Introduction of additional 2 UL and 3 DL interband cases with MSD 13.1.0 13.2.0							
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12-2015 RP-70 RP-152170 3339 Introduction of CA_7A-7A BCS1 to TS 36.101 13.1.0 13.1.0 13.2.0 12-2015 RP-70 RP-152164 3340r1 Introduction of additional 2 UL and 3 DL interband cases with MSD 13.1.0 13.2.0	12-2015	RP-70	RP-152162	3338		13.1.0	13.2.0
12-2015 RP-70 RP-152164 3340r1 Introduction of additional 2 UL and 3 DL interband cases with MSD 13.1.0 13.2.0							
					Introduction of additional 2 UL and 3 DL interband cases with		
10.110 10.210	12-2015	RP-70	RP-152158	3341r1	MSD Addition of Class E into CA BW Class table.	13.1.0	13.2.0

12-2015	RP-70	RP-152131	3343	Table 6.2.4A-1 note 1 correction	13.1.0	13.2.0
12-2015	RP-70	RP-152164	3345	Removal of (NOTE 4) from Table 5.6A.1-2a	13.1.0	13.2.0
12-2015	RP-70	RP-152160	3347	Introduction of 4DL NC CA in band42 in 36.101	13.1.0	13.2.0
12-2015	RP-70	RP-152173	3348	Introduction of 1447-1467MHz Band into 36.101	13.1.0	13.2.0
12-2015	RP-70	RP-152136	3352	CR: PDSCH ETU600 performance requirements	13.1.0	13.2.0
				Introduction of additional band combinations for 2DL inter-band	13.1.0	13.2.0
12-2015	RP-70	RP-152156	3357	CA		
12-2015	RP-70	RP-151972	3358r2	Revision of the RAN4 approved R4-158446 (big CR 3DL 36.101)	13.1.0	13.2.0
12-2015	RP-70	RP-152147	3359r1	Introduction of the Medium Correlation A model	13.1.0	13.2.0
12-2015	RP-70	RP-152147	3360r1	Requirements for ePDCCH with 4Rx	13.1.0	13.2.0
12-2015	RP-70	RP-152147	3361r1	Requirements for PDCCH with 4Rx	13.1.0	13.2.0
12-2015	RP-70	RP-152147	3362r1	Requirements for PDSCH with 4Rx	13.1.0	13.2.0
12-2015	RP-70	RP-152147	3363r1	Requirements for PHICH with 4Rx	13.1.0	13.2.0
12-2015	RP-70	RP-152159	3367r1	Introduction of intra-band non-contiguous CA in Band 41 for 4DL	13.1.0	13.2.0
12-2015	RP-70	RP-152165	3368	Addition of 2 UL and 3 DL mixed intra/inter band carrier	13.1.0	13.2.0
				aggregation combinations without MSD.		
12-2015	RP-70	RP-152133	3372r1	Revision to CR 3256	13.1.0	13.2.0
12-2015	RP-70	RP-152133	3375	Correction to Pcmax for CA to include delta_T_ProSe	13.1.0	13.2.0
12-2015	RP-70	RP-152162	3376	Delta TIB,c and Delta RIB,c for 1UL/4DL	13.1.0	13.2.0
12-2015	RP-70	RP-152136	3378	NS_05 modification for PHS protection in Japan	13.1.0	13.2.0
01-2016	RP-70			Edotorial correction: Correction of reference to section 6.6.3.3.19	13.2.0	13.2.1
				for NS_04 in Table 6.2.4-1		

History

Document history				
V13.2.1	May 2016	Publication		