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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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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*.

- [1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [2] ITU-R Recommendation SM.329-10, "Unwanted emissions in the spurious domain"
- [3] ITU-R Recommendation M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".
- [4] 3GPP TS 36.211: "Physical Channels and Modulation".
- [5] 3GPP TS 36.212: "Multiplexing and channel coding".
- [6] 3GPP TS 36.213: "Physical layer procedures".
- [7] 3GPP TS 36.331: " Requirements for support of radio resource management ".
- [8] 3GPP TS 36.307: " Requirements on User Equipments (UEs) supporting a release-independent frequency band".
- [9] 3GPP TS 36.423: "X2 application protocol (X2AP) ".

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.

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.

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).

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
BW _{Channel,block}	Sub-block bandwidth, expressed in MHz. BW _{Channel,block} = F _{edge,block,high} - F _{edge,block,low} .
$BW_{Channel_CA}$	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.
KS	excluding the cyclic prefix, (average power normalized to the subcarrier spacing) at the eNode B
^	transmit antenna connector
\hat{E}_{s}	The averaged received energy per RE of the wanted signal during the useful part of the symbol,
F	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 Frequency
F _{Interferer} (offset)	Frequency offset of the interferer
F _{Interferer}	Frequency of the interferer
F _C F _{C,block, high}	Frequency of the carrier centre frequency 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.
$F_{C_{low}}$	The centre frequency of the lowest carrier, expressed in MHz.
$F_{C_{high}}$	The centre frequency of the <i>highest carrier</i> , expressed in MHz.
$F_{ m DL_low}$ $F_{ m DL_high}$	The lowest frequency of the downlink operating band The highest frequency of the downlink operating band
$F_{\rm UL \ low}$	The lowest frequency of the uplink operating band
$\mathbf{F}_{\mathrm{UL_high}}^{-}$	The highest frequency of the uplink operating band
F _{edge,block,low}	The lower sub-block edge, where $F_{edge,block,low} = F_{C,block,low} - F_{offset}$.
F _{edge,block,high} F _{edge_low}	The upper sub-block edge, where $F_{edge,block,high} = F_{C,block,high} + F_{offset.}$ The <i>lower edge</i> of aggregated channel bandwidth, expressed in MHz.
F_{edge_high}	The <i>higher edge</i> of aggregated channel bandwidth, expressed in MHz.
F _{offset}	Frequency offset from $F_{C_{high}}$ to the <i>higher edge</i> or $F_{C_{low}}$ to the <i>lower edge</i> .
$F_{offset,block,low}$	Separation between lower edge of a sub-block and the center of the lowest component carrier within the sub-block
$F_{\rm offset, block, high}$	Separation between higher edge of a sub-block and the center of the highest component carrier within the sub-block
F _{OOB}	The boundary between the E-UTRA out of band emission and spurious emission domains.
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
T	antenna connector Transmission bandwidth which represents the length of a contiguous resource block allocation
L _{CRB}	expressed in units of resources blocks
N _{cp}	Cyclic prefix length
N _{DL}	Downlink EARFCN
N_{oc}	The power spectral density of a white noise source (average power per RE normalised to the
N _{oc1}	subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector The power spectral density of a white noise source (average power per RE normalized to the
· · oc1	subcarrier spacing), simulating interference in non-CRS symbols in ABS subframe from cells that
N _{oc2}	are not defined in a test procedure, as measured at the UE antenna connector. The power spectral density of a white noise source (average power per RE normalized to the
	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
N _{Offs-DL} N _{Offs-UL}	summation of the received power spectral densities of the strongest interfering cells explicitly defined in a test procedure plus, as measured at the UE antenna connector. The respective power spectral density of each interfering cell relative to is defined by its associated DIP value. Offset used for calculating downlink EARFCN Offset used for calculating uplink EARFCN
N_{otx}	The power spectral density of a white noise source (average power per RE normalised to the
1 V otx	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 _{RB_agg}	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
N_{RB_alloc}	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 _{UL}	Uplink EARFCN.
Rav	Minimum average throughput per RB.
P _{CMAX}	The configured maximum UE output power.
P_{CMAX}, c	The configured maximum UE output power for serving cell c.
P _{EMAX} P _{EMAX, c}	Maximum allowed UE 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 for serving cell <i>c</i> . Same as IE <i>P-Max</i> , defined in [7].
P _{Interferer}	Modulated mean power of the interferer
P _{PowerClass}	P _{PowerClass} is the nominal UE power (i.e., no tolerance).
P _{UMAX}	The measured configured maximum UE output power.
Puw	Power of an unwanted DL signal
Pw	Power of a wanted DL signal
RB _{start}	Indicates the lowest RB index of transmitted resource blocks.
RB _{end}	Indicates the highest RB index of transmitted resource blocks.
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
$\Delta T_{IB,c}$	cell <i>c</i> . Allowed maximum configured output power relaxation due to support for inter-band CA operation, for serving cell <i>c</i> .
ΔT_{C}	Allowed operating band edge transmission power relaxation.
$\Delta T_{C,c}$	Allowed operating band edge transmission power relaxation for serving cell c.
σ	Test specific auxiliary variable used for the purpose of downlink power allocation, defined in Annex C.3.2.
$\mathbf{W}_{\mathrm{gap}}$	Sub-block gap size

3.3 Abbreviations

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	CA for band X where X is the applicable E-UTRA operating band

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CA_X-X	Non-contiguous intra band CA for band X where X is the applicable E-UTRA operating band
CA_X-Y	CA for band X and Band Y where X and Y are the applicable E-UTRA operating band
CA_A-1 CC	Component Carriers
CPE	Customer Premise Equipment
CPE_X	Customer Premise Equipment for E-UTRA operating band X
CTL_X CW	Continuous Wave
DL	Downlink
DIP	Downink Dominant Interferer Proportion
eDL-MIMO	Down Link Multiple Antenna transmission
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
EPRE	Energy Per Resource Element
	Evolved UMTS Terrestrial Radio Access
E-UTRA EUTRAN	
	Evolved UMTS Terrestrial Radio Access Network
EVM	Error Vector Magnitude
FDD	Frequency Division Duplex
FRC	Fixed Reference Channel
HD-FDD	Half- Duplex FDD Medulation and Coding Scheme
MCS	Modulation and Coding Scheme
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
PSS	Primary Synchronization Signal
PSS_RA	PSS-to-RS EPRE ratio for the channel PSS
RE	Resource Element
REFSENS	Reference Sensitivity power level
r.m.s	Root Mean Square
SCC	Secondary Component Carrier
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 SSS
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

ETSI

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.

4.3 Void

4.3A Applicability of minimum requirements (CA, UL-MIMO, eDL-MIMO)

The requirements in clauses 5, 6 and 7 which are specific to CA, UL-MIMO, and eDL-MIMO are specified as suffix A, B, C, D 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 TBD
- d) Suffix D additional requirements need to support eDL-MIMO

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 and D) 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 and D) 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, and eDL-MIMO) 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 intraband 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.

4.4 RF requirements in later releases

The standardisation of new frequency bands 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 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 that is independent of release.

NOTE: For terminals conforming to the 3GPP release of the present document, some RF requirements in later releases may be mandatory independent of whether the UE supports the bands specified in later releases or not. The set of requirements from 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.

E-UTRA Operating Band	Uplink (UL) operating band BS receive UE transmit F _{UL_low} – F _{UL_high}	Downlink (DL) operating band BS transmit UE receive F _{DL_low} – F _{DL_high}	Duplex Mode
1			FDD
2			FDD
3	<u>1850 MHz – 1910 MHz</u> 1710 MHz – 1785 MHz	<u>1930 MHz</u> – <u>1990 MHz</u> 1805 MHz – <u>1880 MHz</u>	FDD
4	1710 MHz – 1785 MHz 1710 MHz – 1755 MHz	1805 MHz – 1880 MHz 2110 MHz – 2155 MHz	FDD
5	824 MHz – 849 MHz	869 MHz – 894MHz	FDD
6 ¹	830 MHz – 840 MHz	875 MHz – 885 MHz	FDD
7			FDD
8			FDD
9	1749.9 MHz – 1784.9 MHz		FDD
10	1710 MHz – 1770 MHz	2110 MHz - 2170 MHz	FDD
11	1427.9 MHz – 1447.9 MHz		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	Reserved	Reserved	FDD
16	Reserved	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		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		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
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
NOTE 1: E	and 6 is not applicable		
d	ownlink operating band is paired v	en carrier aggregation is configured. vith the uplink operating band (extern at is supporting the configured Pcell.	

Table 5.5-1 E-UTRA operating bands

5.5A Operating bands for CA

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

E-UTRA	E-UTRA	Uplink (UL) operating band			Downlink (DL) operating band			Duplex
CA Band	Band	BS receive	e/U	E transmit	BS transmit / UE receive			Mode
		F _{UL_low} – F _{UL_high}			F _{DL_lo}	w -	F_{DL_high}	
CA_1	1	1920 MHz	Ι	1980 MHz	2110 MHz	Ι	2170 MHz	FDD
CA_7	7	2500 MHz	Ι	2570 MHz	2620 MHz	Ι	2690 MHz	FDD
CA_38	38	2570 MHz	Ι	2620 MHz	2570 MHz	Ι	2620 MHz	TDD
CA_40	40	2300 MHz	Ι	2400 MHz	2300 MHz	Ι	2400 MHz	TDD
CA_41	41	2496 MHz		2690 MHz	2496 MHz		2690 MHz	TDD

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

E-UTRA	E-UTRA	Uplink (UL) operating band		Downlink (DL) operating band			Duplex	
CA Band	Band	BS receive / UE transmit		BS transmit / UE receive			Mode	
		F _{UL_low}	-	F _{UL_high}	F _{DL_low} – F _{DL_high}			
CA_1-5	1	1920 MHz	-	1980 MHz	2110 MHz	-	2170 MHz	FDD
CA_1-5	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	FDD
CA_1-18	1	1920 MHz	-	1980 MHz	2110 MHz	-	2170 MHz	FDD
CA_1-10	18	815 MHz	-	830 MHz	860 MHz	-	875 MHz	TDD
CA_1-19	1	1920 MHz	-	1980 MHz	2110 MHz	-	2170 MHz	FDD
CA_1-19	19	830 MHz	-	845 MHz	875 MHz	-	890 MHz	TDD
CA_1-21	1	1920 MHz	-	1980 MHz	2110 MHz	-	2170 MHz	FDD
07_1-21	21	1447.9 MHz	-	1462.9 MHz	1495.9 MHz	-	1510.9 MHz	TOD
CA_2-17	2	1850 MHz	-	1910 MHz	1930 MHz	-	1990 MHz	FDD
CA_2-17	17	704 MHz	-	716 MHz	734 MHz	-	746 MHz	FDD
CA_2-29	2	1850 MHz	-	1910 MHz	1930 MHz	-	1990 MHz	FDD
CA_2-29	29		N/A		717 MHz	-	728 MHz	FDD
CA_3-5	3	1710 MHz	-	1785 MHz	1805 MHz	-	1880 MHz	FDD
CA_3-5	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	FDD
CA_3-7	3	1710 MHz	-	1785 MHz	1805 MHz	-	1880 MHz	FDD
CA_3-7	7	2500 MHz	-	2570 MHz	2620 MHz	-	2690 MHz	
	3	1710 MHz		1785 MHz	1805 MHz		1880 MHz	
CA_3-8	8	880 MHz		915 MHz	925 MHz		960 MHz	FDD
04 2 20	3	1710 MHz	-	1785 MHz	1805 MHz	-	1880 MHz	
CA_3-20	20	832 MHz	-	862 MHz	791 MHz	-	821 MHz	FDD
CA_4-5	4	1710 MHz	-	1755 MHz	2110 MHz	-	2155 MHz	FDD
CA_4-5	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	FUU
	4	1710 MHz		1755 MHz	2110 MHz		2155 MHz	
CA_4-7	7	2500 MHz		2570 MHz	2620 MHz		2690 MHz	FDD
CA_4-12	4	1710 MHz	-	1755 MHz	2110 MHz	-	2155 MHz	FDD
CA_4-12	12	699 MHz	-	716 MHz	729 MHz	-	746 MHz	FUU
CA_4-13	4	1710 MHz	-	1755 MHz	2110 MHz	-	2155 MHz	FDD
CA_4-13	13	777 MHz	-	787 MHz	746 MHz	-	756 MHz	FUU
	4	1710 MHz	-	1755 MHz	2110 MHz	-	2155 MHz	
CA_4-17	17	704 MHz	-	716 MHz	734 MHz	-	746 MHz	FDD
CA 4.00	4	1710 MHz	-	1755 MHz	2110 MHz	-	2155 MHz	
CA_4-29	29		N/A		717 MHz	-	728 MHz	FDD
	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	
CA_5-12	12	699 MHz	-	716 MHz	729 MHz	-	746 MHz	FDD
	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	
CA_5-17	17	704 MHz	-	716 MHz	734 MHz	-	746 MHz	FDD
	7	2500 MHz	-	2570 MHz	2620 MHz	-	2690 MHz	
CA_7-20	20	832 MHz	-	862 MHz	791 MHz	-	821 MHz	FDD
	8	880 MHz	-	915 MHz	925 MHz	-	960 MHz	EDD
CA_8-20	20	832 MHz	-	862 MHz	791 MHz	-	821 MHz	FDD
CA 11 10	11	1427.9 MHz	-	1447.9 MHz	1475.9 MHz	-	1495.9 MHz	EDD
CA_11-18	18	815 MHz	-	830 MHz	860 MHz	-	875 MHz	FDD

Table 5.5A-2: Inter-band CA operating bands

E-UTRA	E-UTRA	Uplink (UL) operating band			Downlink (D	Duplex		
CA Band	Band	BS receive / UE transmit			BS transi	nit /	UE receive	Mode
		$F_{UL_{low}} - F_{UL_{high}}$			F _{DL_low} – F _{DL_high}			
CA_25-25	25	1850 MHz	-	1915 MHz	1930 MHz	Ι	1995 MHz	FDD
CA_41-41	41	2496 MHz	-	2690 MHz	2496 MHz	I	2690 MHz	TDD

Table 5.5A-3: Intra-band non-contiguous CA operating bands

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

5.6 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.

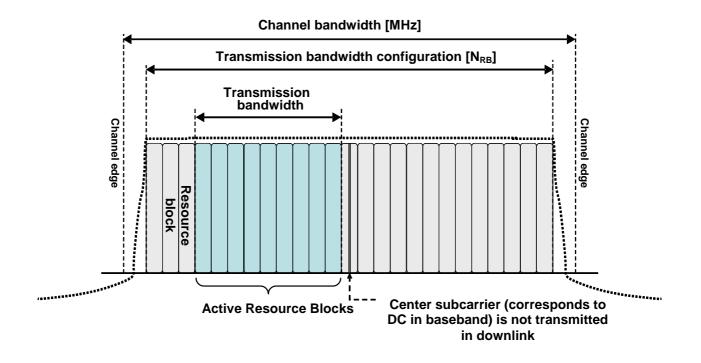


Figure 5.6-1: Definition of channel bandwidth and transmission bandwidth configuration for one E-UTRA carrier

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.

H	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	Yes ¹			
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	100	100	Yes	Yes	100	100			
25	Yes	Yes	Yes	Yes	Yes ¹	Yes ¹			
26	Yes	Yes	Yes	Yes ¹	Yes ¹				
27	Yes	Yes	Yes	Yes ¹					
28	100	Yes	Yes	Yes ¹	Yes ¹	Yes ^{1, 2}			
		100	100	100	100	100			
33			Yes	Yes	Yes	Yes			
34			Yes	Yes	Yes	100			
35	Yes	Yes	Yes	Yes	Yes	Yes			
36	Yes	Yes	Yes	Yes	Yes	Yes			
37	100	100	Yes	Yes	Yes	Yes			
38			Yes	Yes	Yes ³	Yes ³			
39			Yes	Yes	Yes	Yes			
40			Yes	Yes	Yes	Yes			
40			Yes	Yes	Yes	Yes			
41			Yes	Yes	Yes	Yes			
43			Yes	Yes	Yes	Yes			
43		Yes	Yes	Yes	Yes	Yes			
NOTE 1: 1	refers to the			elaxation of th					
					o specified (
	sensitivity requirement (subclause 7.3) is allowed. 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-								
	'38 MHz								
		bandwidth fo	or which the	uplink transm	ission band	width can			
b b	e restricted	by the netwo	rk for some	channel assig	inments in F	DD/TDD			
				et unwanted e					
	Clause 6.6.3				-	-			

Table 5.6.1-1: E-UTRA channel bandwidth

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.

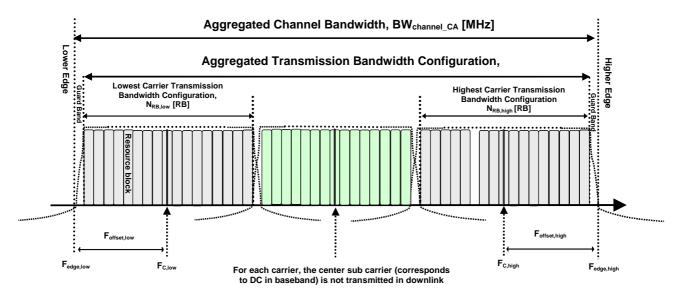


Figure 5.6A-1. Definition of Aggregated channel bandwidth and aggregated channel bandwidth edges

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

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

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

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

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

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

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.

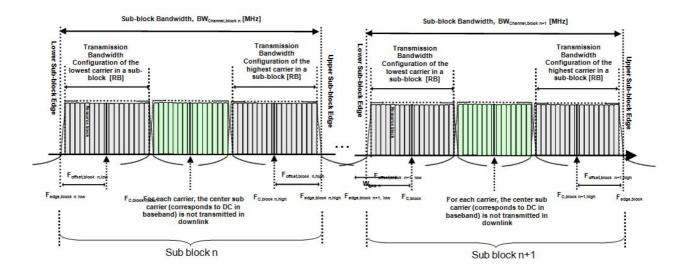


Figure 5.6A-2. Non-contiguous intraband CA terms and definitions

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

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

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

BWChannel,block = Fedge,block,high - Fedge,block,low [MHz]

The lower and upper frequency offsets F_{offset,block,low} and F_{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

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

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

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

CA Bandwidth Class	Aggregated Transmission Bandwidth Configuration	Maximum number of CC	Nominal Guard Band BW _{GB}					
A	N _{RB,agg} ≤ 100	1	a₁BW _{Channel(1)} - 0.5∆f₁ (NOTE 2)					
В	N _{RB,agg} ≤ 100	2	FFS					
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]	FFS	FFS					
E	[300] < N _{RB,agg} ≤ [400]	FFS	FFS					
F	[400] < N _{RB,agg} ≤ [500]	FFS	FFS					
NOTE 1: BW _{Cha}	NOTE 1: BW _{Channel(1)} and BW _{Channel(2)} are channel bandwidths of two E-UTRA component carriers							
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: a1 = 0.	.16/1.4 for BW _{Channel(1)} = 1.4	MHz whereas a1	= 0.05 for all other channel bandwidths.					

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

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.

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 or 5.6A.1-2.

E-UTRA CA configuration / Bandwidth combination set						
	Component carriers in o freq	Maximum				
E-UTRA CA configuration	Allowed channel bandwidths for carrier [MHz]	Allowed channel bandwidths for carrier [MHz]	aggregated bandwidth [MHz]	Bandwidth combination set		
CA_1C	15	15	40	0		
CA_IC	20	20	40			
CA 7C	15	15	40	0		
CA_7C	20	20	40			
CA 38C	15	15	- 40	0		
CA_36C	20	20	40			
	10	20		0		
CA_40C	15	15	40			
	20	10, 20				
	10	20		0		
CA_41C	15	15, 20	40			
	20	10, 15, 20				
5.6A supp	 1 (the indexing letter). Absend ort of all classes. he supported CC bandwidth co 	operating band and a CA band ce of a CA bandwidth class for ombinations, the CC downlink a	an operating ba	ind implies		

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

E-UTRA CA Configuration	E- UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combinatior set
CA_1A-5A	1				Yes			20	0
	5			X	Yes	Ň	N		
CA_1A-18A	1			Yes	Yes	Yes	Yes	35	0
	18			Yes Yes	Yes	Yes Yes	Yes		
CA_1A-19A	1 19			Yes	Yes Yes	Yes	res	35	0
	19			Yes	Yes	Yes	Yes		0
CA_1A-21A	21			Yes	Yes	Yes	105	35	
	2			Yes	Yes	100			
CA_2A-17A	17			Yes	Yes			20	0
<u></u>	2			Yes	Yes				
CA_2A-29A	29		Yes	Yes	Yes			20	0
	3				Yes	Yes	Yes	- 30	0
CA_3A-5A	5			Yes	Yes			30	0
UA_3A-3A	3				Yes			20	1
	5			Yes	Yes			20	
CA_3A-7A	3			Yes	Yes	Yes	Yes	40	0
0/(_0/(//(7				Yes	Yes	Yes	10	
	3				Yes	Yes	Yes	- 30 - 20	0
CA_3A-8A	8			Yes	Yes				
_	3			X	Yes				1
	8			Yes	Yes	Vaa	Vaa	- 30	0
CA_3A-20A	3 20			Yes Yes	Yes Yes	Yes	Yes		
	4			Yes	Yes				
CA_4A-5A	5			Yes	Yes			- 20	0
	4			Yes	Yes			- 30	0
CA_4A-7A	7			Yes	Yes	Yes	Yes		
	4	Yes	Yes	Yes	Yes				0
CA_4A-12A	12			Yes	Yes			20	
	4			Yes	Yes	Yes	Yes	20	0
	13				Yes			30	0
CA_4A-13A	4			Yes	Yes			20	1
	13				Yes			20	1
CA_4A-17A	4			Yes	Yes			20	0
<u> </u>	17			Yes	Yes			20	
CA_4A-29A	4			Yes	Yes			20	0
	29		Yes	Yes	Yes				
CA_5A -12A	5			Yes	Yes			20	0
	12			Yes	Yes				
CA_5A-17A	5 17			Yes Yes	Yes Yes			20	0
	7			162	Yes	Yes	Yes		
CA_7A-20A	20			Yes	Yes	100	100	- 30	0
	8			Yes	Yes			- 20	_
CA_8A-20A	20			Yes	Yes				0
0	11			Yes	Yes			- 25	0
CA_11A-18A	18			Yes	Yes	Yes			
NOTE 1: The CA Table 5.0 all classe NOTE 2: For each NOTE 3: For the s	6A-1 (the inc es. h band comb	lexing lette	er). Absen combinat	ce of a CA ions of ind	bandwid	th class fo	r an opera	ting band implie	

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

Table 5.6A.1-3: E-UTRA CA configurations and bandwidth combination sets defined for noncontiguous intra-band CA

E-UTRA CA configuration / Bandwidth combination set						
	Component carriers in o frequ					
E-UTRA CA configuration	Allowed channel bandwidths for carrier [MHz]	Allowed channel bandwidths for carrier [MHz]	Maximum aggregated bandwidth [MHz]	Bandwidth combination set		
CA_25A-25A	5, 10	5, 10	20	0		
CA_41A-41A	10, 15, 20	10, 15, 20	40	0		

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

5.7 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 bandwidth class C, the nominal channel spacing between two adjacent E-UTRA component carriers is defined as the following:

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

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 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 - 65535. 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.

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

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.

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

E-UTRA		Downlink		Uplink			
Operating Band	F _{DL_low} (MHz)	$N_{Offs-DL}$	Range of N _{DL}	F _{UL_low} (MHz)	Noffs-UL	Range of N _{∪L}	
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		
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	
с 7 с 1	arrier extends bey 5 and 100 channe	ond the opera I numbers at the t the upper op respectively.	ate carrier frequencie ting band edge shall he lower operating ba erating band edge sh	not be used. This in and edge and the las all not be used for c	plies that the fi st 6, 14, 24, 49	rst 7, 15, 25, 50, 74 and 99	

Table 5.7.3-1: E-UTRA channel numbers

TX-RX frequency separation 5.7.4

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

	TY DY
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

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

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).

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	$\pm 2^2$		
3					23	$\pm 2^2$		
4					23	±2		
5					23	±2		
6					23	±2		
7					23	± 2 $\pm 2^2$		
8					23	$\pm 2^2$		
9					23	±2		
10					23	<u>+2</u>		
11					23	<u>+2</u>		
12					23	$\pm 2^2$		
13					23	±2		
14	31	+2/-3			23	±2		
17	51	+2/-5			20	12		
17					23	<u>+2</u>		
18					23	$\pm 2^{5}$		
19					23	±2		
20					23	$\pm 2^{2}$		
20						±2 ±2		
21					23 23	± 2 +2/-3.5 ²		
22					23°	+2/-3.5 +2 ⁶		
24					23	± 2 $\pm 2^2$		
25					23	± 2 $\pm 2^2$		
26					23			
27					23	±2		
28					23	+2/-2.5		
33					23	<u>+2</u>		
34	-			-	23	<u>+2</u>		
35					23	<u>+2</u>		
36					23	±2		
37					23	<u>+2</u>		
38					23	<u>+2</u>		
39					23	<u>+2</u>		
40		ļ		ļ	23	± 2 $\pm 2^2$		
41					23			
42					23	+2/-3		
43					23	+2/-3		
44	<u> </u>				23	+2/[-3]		
NOTE 1: NOTE 2:						within F _{UL_low} ar ement is relaxe		
	tolerance lir For the UE	nit by 1.5 dB which support:	s both Band	11 and Band	21 operatin	g frequencies, t	he tolerance	-
	For a UE th	at supports bo	th Band 18	and Band 26,	the maximu	to account the t m output power ndwidths confin	requirement	t is relaxed by 5 MHz and
NOTE 6:		20 is signalled,	the total ou	tput power wit	hin 2000-20)05 MHz shall b	e limited to 7	′ dBm.

Table 6.2.2-1: UE Power Class

UE maximum output power for CA 6.2.2A

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

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_7C					23	+2/-2 ²		
CA_38C					23	+2/-2		
CA_40C					23	+2/-2		
CA_41C					23	$+2/-2^{2}$		
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).								

Table 6.2.2A-1: CA UE Power Class

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

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).

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/-3	-	-
2					23	$+2/-3^{2}$		
3					23	+2/-3 ²		
4					23	+2/-3		
5					23	+2/-3		
6					23	+2/-3		
7					23	$+2/-3^{2}$		
8					23	+2/-32		
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		
					20	12/0		
17					23	+2/-3		
18					23	+2/-3		
19					23	+2/-3		
20					23	$+2/-3^{2}$		
20					23	+2/-3		
21					25	$+2/-4.5^2$		
						+2/-4.0		
23					23	+2/-3		
						+2/-3		
24 25					23 23	+2/-3 +2/-3 ²		
25					23	$+2/-3^{2}$		
20					23	+2/-3		
28					23	+2/[-3]		
						.0/0		
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/-4		
43					23	+2/-4		
44					23	+2/[-3]		
NOTE 1: NOTE 2: NOTE 3:	$F_{UL_high} - 4$ tolerance lir	MHz and F _{∪L_} ⊦ mit by 1.5 dB	_{ligh} , the maxi	imum output p	ower require	within F _{UL_low} ar ement is relaxe g frequencies, t	d by reducing	g the lower
						to account the t		

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

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.

6.2.3 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 6.2.2-1due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3-1.

Modulation	Cha	Channel bandwidth / Transmission bandwidth (NRB)					MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 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

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

$M_A =$	[8.0]-[10.12]A	; $0 < A \le [0.33]$
	[5.67] - [3.07]A	; $[0.33] < A \leq [0.77]$
	[3.31]	; [0.77]< A ≤[1.0]

Where

 $A = N_{RB_alloc} \ / \ N_{RB}$

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 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.

Modulation		CA bandwidth Class C				
	50 RB + 100 RB	75 RB + 75 RB	75 RB+100 RB	100 RB + 100 RB	(dB)	
QPSK	> 12 and ≤ 50	> 16 and ≤ 75	> 16 and ≤ 75	> 18 and ≤ 100	≤ 1	
QPSK	> 50	> 75	> 75	> 100	≤2	
16 QAM	≤ 12	≤ 16	≤ 16	≤ 18	≤1	
16 QAM	> 12 and ≤ 50	> 16 and ≤ 75	> 16 and ≤ 75	> 18 and ≤ 100	≤2	
16 QAM	> 50	> 75	> 75	> 100	≤ 3	

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

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

Where MA is defined as follows

$M_A =$	8.2	; $0 \le A < 0.025$
	9.2 - 40A	; $0.025\!\le\!A\!<\!0.05$
	8 – 16A	; 0.05 $\leq A < 0.25$
	4.83 - 3.33A	; $0.25 \le A \le 0.4$,
	3.83 - 0.83A	; 0.4 \leq A \leq 1,

Where

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

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, 8.5]

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

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

6.2.4 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.

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 40 22 25	5	>6	≤ 1
NS_03	6.6.2.2.1	2, 4,10, 23, 25, 35, 36	10	>6	≤ 1
		35, 50	15	>8	≤ 1
			20	>10	≤ 1
	66000	41	5	>6	≤ 1
NS_04	6.6.2.2.2	41	10, 15, 20	Table	6.2.4-4
NS_05	6.6.3.3.1	1	10,15,20	≥ 50	≤ 1
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
	66224	21	10.15	> 40	≤ 1
NS_09	6.6.3.3.4	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	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	Table	6.2.4-8
NS_15	6.6.3.3.8	26	1.4, 3, 5, 10, 15		6.2.4-9 6.2.4-10
NS_16	6.6.3.3.9	27	3, 5, 10		, 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
		_	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_22	6.6.3.3.15	42	5, 10, 15, 20	Table 5.6-1	[0]
NS_23	6.6.3.3.16	43	5, 10, 15, 20	Table 5.6-1	[0]
NS_32	-	-	-	-	-

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

Parameters	R	egion A	Regi	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	
A-IMPR [db] S 0 S 12 S 12 S 0 S 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			ng between two re both slots in the su		A-MPR value of	

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

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} inc	licates the lowest RB index	of transmitted resource blocks				
NOTE 2: LCRB is th	e length of a contiguous re	source block allocation				
NOTE 3: For intra-	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 rec	quirements for "NS	04" with bandwidth >5MHz

Channel bandwidth [MHz]	Parameters	Region A	Region B	Region C			
10	RB _{start}	0 – 12	13 – 36	37 – 49			
	RB _{start} + L _{CRB} [RBs]	N/A	>37	N/A ³			
	A-MPR [dB]	≤3dB	≤2dB	≤3dB			
15	RB _{start}	0 – 18	19 – 55	56 – 74			
	RB _{start} + L _{CRB} [RBs]	N/A	>56	N/A ³			
	A-MPR [dB]	≤3dB	≤2dB	≤3dB			
20	RB _{start}	0-24 25-74		75 – 99			
	RB _{start} + L _{CRB} [RBs]	N/A ³	>75	N/A ³			
	A-MPR [dB]	≤3dB	≤2dB	≤3dB			
 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: ³ refers to any RB allocation that starts in Region A or C is allowed the specified A-MPR NOTE 4: For intra-subframe frequency hopping which intersects regions, notes 1 and 2 apply on a per slot basis NOTE 5: For intra-subframe frequency hopping which intersects regions, the larger A-MPR value may be applied for both slots in the subframe 							

Channel Bandwidth [MHz]	Parameters									
	Fc [MHz]	<20	04			≥2004				
3	L _{CRB} [RBs]	1-1	5	>5						
	A-MPR [dB]	≤				≤ 1				
	Fc [MHz]	<20	04		200)4 ≤ Fc <	2007		≥2(007
5	L _{CRB} [RBs]	1-2				6 & -25	8-12		>	·6
	A-MPR [dB]	≤	7		≤	4	0		≤	1
	Fc [MHz]	200)5 ≤	Fc <2	015	;		201	5	
	RB _{start}		0.	-49				0-49	9	
10	L _{CRB} [RBs]	1-50			1-50					
	A-MPR [dB]	≤ 12					0			
	Fc [MHz]					<2012	2.5			
	RB _{start}	0-4			5-21		22	-56		57-74
	L _{CRB} [RBs]	≥1	7-	50	0-	6 & ≥50	≤25	>2	5	>0
	A-MPR [dB]	≤15	Ń	7		≤10	0	≤6	5	≤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	5	0	≤2			≤6.5
	Fc [MHz]					2010)			
	RB _{start}	0-12		1	3-29 30-68		68		69-99	
20	L _{CRB} [RBs]	≥1	10	-60		1-9 & >60	1-24	≥2	5	≥1
	A-MPR [dB]	≤15	<	≦7		≤10	0	≤7	,	≤15

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

Channel bandwidth [MHz]	Parameters	Regi	Region B	
	RB _{start}	()	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]	4-9	1-3 and 10-15	≥9
	A-MPR [dB]	≤4	≤3	≤3
	RB _{start}	0-6		7-9
5	L _{CRB} [RBs]	≤8 ≥9		≥15
	A-MPR [dB]	≤5	≤3	≤3

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

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 _{star} t	0		
10	L _{CRB} [RBs]	≤5	≥50	
	A-MPR [dB]	≤3	≤1	
	RB _{start}	3≥	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

Channel bandwidth [MHz]	Parameters	Region A	Region B	Region C
	RBend [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 6.2.4-10: A-MPR for "NS_15" for E-UTRA highest channel edge ≤ 845 MHz

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

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

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

Channel bandwidth [MHz]	Parameters	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 6.2.4-14: A-MPR for "NS_19"

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

Channel Bandwidth [MHz]	Parameters									
	Fc [MHz]	< 20	07.5		200	7.5 ≤ F	c < 201	2.5	2012.5 ≤ F	c ≤ 2017.5
5	RB _{start}	≤;	24		0	-3		4-6	≤24	
5	L _{CRB} [RBs]	>	·0	1:	5-19	≥20)	≥18	1-25	
	A-MPR [dB]	≤ [°]	17		≤1	≤4		≤2	≤	0
	Fc [MHz]					2	005			
	RB _{start}		0-25			2	26-34		35	-49
	L _{CRB} [RBs]		>0		8	3-15	;	>15	>	0
10	A-MPR [dB]		≤16			≤2		≤5	≤	6
10	Fc [MHz]									
	RB _{start}	0-5 6-10								
	L _{CRB} [RBs]		≥;	32			≥40			
	A-MPR [dB]		5	4			≤2			
	Fc [MHz]					20	12.5			
15	RB _{start}		0-14				15-24		25-39	61-74
15	L _{CRB} [RBs]	1-9 & 4	0-75	10-3	39	24-2	9	≥30	≥36	≤6
	A-MPR [dB]	≤11		≤6		≤1		≤7	≤5	≤6
	Fc [MHz]					2	010			
20	RB _{start}	0-21 22-31 32-38 39-49 50-68				69-99				
20	L _{CRB} [RBs]	>0 1-9 & 31-75 10-3		30	≥15	≥24	≥25	>0		
	A-MPR [dB]	≤17 ≤12 ≤6 ≤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.										

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 within an E-UTRA channel bandwidth, then subclauses 6.2.3 and 6.2.4 apply with the Network Signaling value indicated by the IE *additionalSpectrumEmission* of the PCC.

For intra-band contiguous aggregation with the UE configured for transmissions within the aggregated channel bandwidth, the maximum output power reductions specified in Table 6.2.4A-1 is allowed when the applicable CA network signalling value is indicated by the IE *additionalSpectrumEmissionSCell-r10*. Then clause 6.2.3A does not apply, i.e. carrier aggregation MPR = 0 dB.

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

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

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 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 and 16- 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	
	- 149	> 10	N/A	≤ 6.0	
75 RB / 75 RB	7 – 90	> 44	N/A	≤ 5.0	
	91 – 142	N/A	> 142	≤ 2.0	
 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 6.2.4A.1-1: Contiguous allocation A-MPR for CA_NS_01

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
$$\{M_{A}, 0.5\}$$

Where M_A is defined as follows

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

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.

CA_1C: CA_NS_02	RB _{end}	L _{CRB} [RBs]	A-MPR for QPSK and 16 –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

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

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

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

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.

CA_1C: CA_NS_03	RB _{end}	L _{CRB} [RBs]	A-MPR for QPSK and 16-QAM [dB]
	0 – 26	> 0	≤ 10 dB
	27 – 63	≥ RB _{end} - 27	≤ 6 dB
100 RB / 100 RB	27 – 63	< RB _{end} - 27	≤ 1 dB
	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
10 KD / 10 KD	76 – 95	> 45	≤ 5 dB
	96 – 149	> 43	≤ 8 dB
	120 – 149	1 - 43	≤ 6 dB

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

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
$$\{M_{A}, 0.5\}$$

Where M_A is defined as follows

$$\label{eq:main_state} \begin{split} [M_A = -23.33A + 17.5 & ; \ 0 \leq A < 0.15 \\ & -7.65A + 15.15 & ; \ 0.15 \leq A \leq 1] \end{split}$$

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 and it receives IE CA_NS_04 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.4-1.

CA Bandwidth Class C	RB _{Start}	L _{CRB} [RBs]	RB _{start} + L _{CRB} [RBs]	A-MPR for QPSK [dB]	A-MPR for 16QAM [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 and it receives IE CA_NS_04 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 M_A is defined as follows

$$\begin{split} \mathbf{M}_{A} &= 10.5, & 0 \leq A < 0.05 \\ &= -50.0A + 13.00, & 0.05 \leq A < 0.15 \\ &= -4.0A + 6.10, & 0.15 \leq A < 0.40 \\ &= -0.83A + 4.83, & 0.40 \leq A \leq 1 \end{split}$$

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.

CA_38C	RB _{end}	L _{CRB} [RBs]	A-MPR for QPSK and 16-QAM [dB]		
	0 – 12	>0	≤ 5 dB		
40000/40000	13 – 79	> RB _{end} – 13	≤ 2 dB		
100RB/100RB	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- 					

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

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

$$\begin{split} M_A &= -14.17 \; A + 16.50 \qquad ; \; 0 \leq A < 0.60 \\ &- 2.50 \; A + 9.50 \qquad ; \; 0.60 \leq A \leq 1 \end{split}$$

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

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.

CA Bandwidth Class C	RB_{end}	L _{CRB} [RBs]	A-MPR for QPSK and 16-QAM [dB]
	0 –22	>0	≤[4 dB
	23 – 105	> RB _{end} – 10	≤ 2 dB
100RB/100RB	106 – 142	> 75	≤ 3 dB
	143 – 177	>70	≤ 5 dB
	178 – 199	> 0	≤ 10 dB
	0 – 7	>0	≤ 5 dB
	20- 74	> RB _{end} – 10	≤ 2 dB
75RB/75RB	75 – 109	>64	≤ 2 dB
	110 – 144	>35	≤ 6 dB
	145 – 149	>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 M_A is defined as follows

 $\begin{array}{rl} M_A = & -23.33A + 17.5 & ; \ 0 \leq A < 0.15 \\ & -7.65A + 15.15 & ; \ 0.15 \leq A \leq 1 \end{array}$

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

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.

6.2.5 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

$$P_{CMAX_L,c} = MIN \{P_{EMAX,c} - \Delta T_{C,c}, P_{PowerClass} - MAX(MPR_c + A-MPR_c + \Delta T_{IB,c} + \Delta T_{C,c}, P-MPR_c)\}$$

 $P_{CMAX_H,c} = MIN \{P_{EMAX,c}, P_{PowerClass}\}$

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.

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 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:

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

where $T(P_{CMAX,c})$ is defined by the tolerance table below and applies to $P_{CMAX_L,c}$ and $P_{CMAX_L,c}$ separately, while T_L is the absolute value of the lower tolerance in Table 6.2.2-1 for the applicable operating band.

Р _{СМАХ,с} (dBm)	Tolerance T(P _{CMAX,c}) (dB)
$23 < P_{CMAX,c} \le 33$	2.0
$21 \le P_{CMAX,c} \le 23$	2.0
$20 \le P_{CMAX,c} < 21$	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
$-40 \le P_{CMAX,c} < 8$	7.0

Table 6.2.5-1: PCMAX.c tolerance

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

Inter-band CA Configuration	E-UTRA Band	ΔT _{IB,c} [dB]			
-	1	0.3			
CA_1A-5A	5	0.3			
CA_1A-18A	1	0.3			
	18	0.3			
CA_1A-19A	1	0.3			
	19	0.3			
CA_1A-21A	21	0.3			
<u> </u>	2	0.3			
CA_2A-17A	17	0.8			
CA_2A-29A	2	0.3			
CA_3A-5A	3	0.3			
	5	0.3			
CA_3A-7A	3 7	0.5			
	3	0.5			
CA_3A-8A	8	0.3			
	3	0.3			
CA_3A-20A	20	0.3			
00.40.50	4	0.3			
CA_4A-5A	5	0.3			
CA_4A-7A	4	0.5			
0///	7	0.5			
CA_4A-12A	4	0.3			
	12 0.8				
CA_4A-13A	4A-13A 4 0.3				
	<u>13</u> 4	0.3			
CA_4A-17A	17 0.8				
CA_4A-29A	4	0.3			
	5	0.8			
CA_5A-12A	12	0.4			
CA_5A-17A	5	0.8			
04_34-174	17	0.4			
CA_7A-20A	7	0.3			
	20	0.3			
CA_8A-20A	8	0.4			
	20	0.4 0.3			
CA_11A-18A	18	0.3			
bands	ove additional tolerances are only ap that belong to the supported inter-bar irations	plicable for the E-UTRA operating			
NOTE 2: The ab suppor	ove additional tolerances also apply i ted E-UTRA operating bands that bel aggregation configurations				
NOTE 3: In case aggreg	the UE supports more than one of the ation configurations and a E-UTRA of er-band carrier aggregation configurations and carrier aggregation configuration c	perating band belongs to more than			
	en the E-UTRA operating band freque				
	icable additional tolerance shall be th				
	cated to one decimal place for that op				
	configurations. In case there is a harm				
	and high band DL, then the maximun				
supp appl	oorted carrier aggregation configuration	ons involving such band shall be			
	en the E-UTRA operating band freque	ency range is >1GHz, the			
appl	icable additional tolerance shall be the ies for that operating band among the	ne maximum tolerance above that			

Table 6.2.5-2: ΔT_{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.

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 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.

Table 6.2.5A-1:Void

The total configured maximum output power PCMAX 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,

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

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

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 $\Delta t_{IB,c} = 1$.

For uplink intra-band contiguous carrier aggregation,

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

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

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;
- $\Delta T_{\text{IB},c}$ 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.

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.

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

 $P_{CMAX_L} - T(P_{CMAX_L}) \leq P_{UMAX} \leq P_{CMAX_H} + T(P_{CMAX_H})$

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

where $p_{UMAX,c}$ denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerance $T(P_{CMAX})$ is defined by the table below and applies to P_{CMAX_L} and P_{CMAX_H} separately.

Р _{смах} (dBm)	Tolerance T(P _{CMAX}) Intra-band with two active UL serving cells (dB)	Tolerance T(P _{CMAX}) Inter-band with two active UL serving cells (dB)
$21 \le P_{CMAX} \le 23$	2.0	2.0
$20 \le P_{CMAX} < 21$	[2.5]	TBD
19 ≤ P _{CMAX} < 20	[3.5]	TBD
18 ≤ P _{CMAX} < 19	[4.0]	TBD
13 ≤ P _{CMAX} < 18	[5.0]	TBD
$8 \le P_{CMAX} < 13$	[6.0]	TBD
$-40 \le P_{CMAX} < 8$	[7.0]	TBD

Table 6.2.5A-2: P_{CMAX} tolerance

Table 6.2.5A-3: Void

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 $P_{\text{UMAX},c}$ for serving cell c shall be within the following bounds:

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

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} (dBm)	Tolerance Tolerance TLOW(PCMAX_L,c) (dB) THIGH(PCMAX_H,c) (d			
$P_{CMAX,c} = 23$	3.0	2.0		
$[22] \le P_{CMAX,c} < [23]$	[5.0]	[2.0]		
$[21] \le P_{CMAX,c} < [22]$	[5.0] [3.0]			
$[20] \le P_{CMAX,c} < [21]$	[6.0] [4.0]			
$[16] \le P_{CMAX,c} < [20]$	[5.0]			
$[11] \le P_{CMAX,c} < [16]$	[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.

6.3 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.

	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

Table 6.3.2.1-1: Minimum output power

6.3.2A UE Minimum output power for CA

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

	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	lBm		
Measurement bandwidth				9.0 MHz	13.5 MHz	18 MHz

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

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	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

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

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 dBm					
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 intra-band contiguous carrier aggregation, transmit OFF power is defined as the mean power per component carrier when the transmitter is OFF on both 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 intra-band 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.

	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	lBm		
Measurement bandwidth				9.0 MHz	13.5 MHz	18 MHz

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

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.

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

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

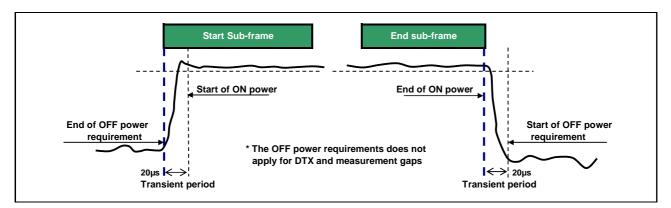


Figure 6.3.4.1-1: General ON/OFF time mask

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

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

Table 6.3.4.2-1: PRACH ON power measurement period

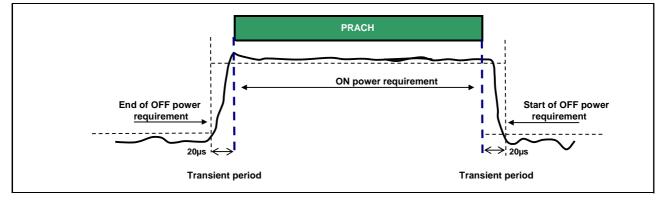


Figure 6.3.4.2-1: PRACH ON/OFF time mask

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

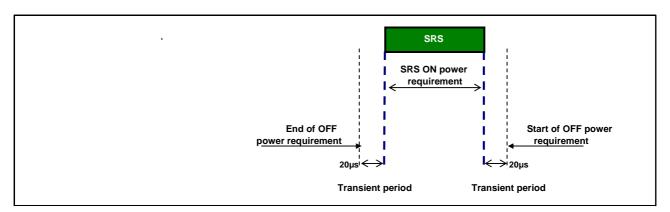


Figure 6.3.4.2.2-1: Single SRS time mask

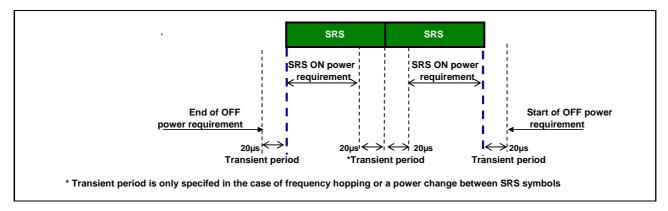
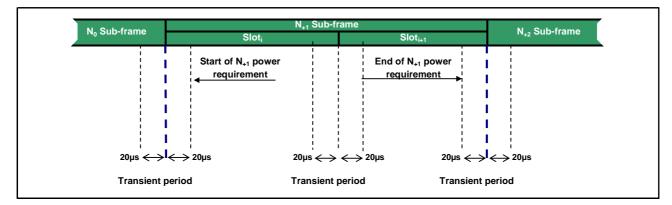


Figure 6.3.4.2.2-2: Dual SRS time mask for the case of UpPTS transmissions

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





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

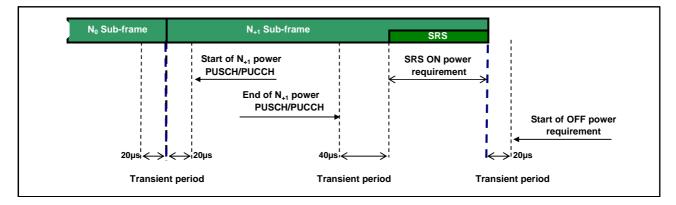


Figure 6.3.4.4-1: PUCCH/PUSCH/SRS time mask when there is a transmission before SRS but not after

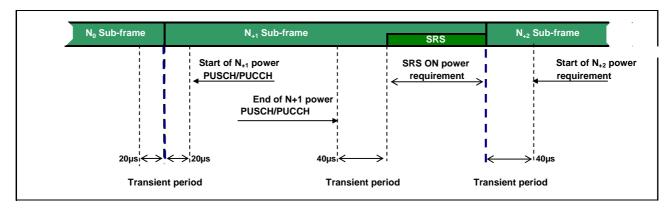


Figure 6.3.4.4-2: PUCCH/PUSCH/SRS time mask when there is transmission before and after SRS

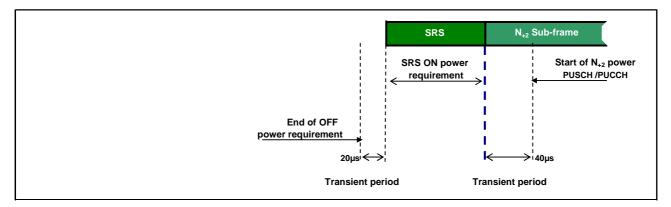


Figure 6.3.4.4-3: PUCCH/PUSCH/SRS time mask when there is a transmission after SRS but not before

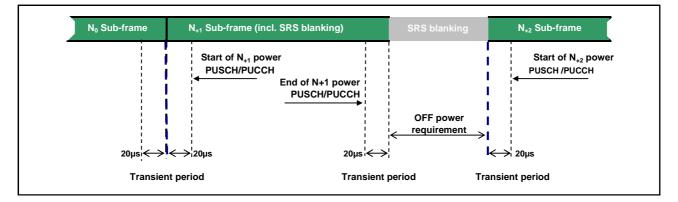


Figure 6.3.4.4-4: SRS time mask when there is FDD SRS blanking

6.3.4A ON/OFF time mask for CA

For intra-band 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.

6.3.5 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 $F_{UL_low} + 4$ MHz or $F_{UL_high} - 4$ MHz and F_{UL_high} .

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

Power step ∆P (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 ≤ ΔF	' < 3	±3.0	±4.0	±3.0
3 ≤ ΔF	° < 4	±3.5	±5.0	±3.5
4 ≤ ∆P	≤ 10	±4.0	±6.0	±4.0
10 ≤ ∆F	° < 15	±5.0	±8.0	±5.0
15 ≤	ΔP	±6.0	±9.0	±6.0
NOTE 2:	IOTE 1: For extreme conditions an additional ± 2.0 dB relaxation is allowed IOTE 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 F_{UL_low} and $F_{UL_low} + 4$ MHz or $F_{UL_high} - 4$ MHz and F_{UL_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 F_{UL_low} and $F_{UL_low} + 4$ MHz or $F_{UL_high} - 4$ MHz and F_{UL_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.			

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

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.

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

Table 6.3.5.3.1-1: Aggregate power control tolerance

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 intra-band contiguous carrier aggregation bandwidth classe C 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

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.

For intra-band contiguous carrier aggregation bandwidth classe C, 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 intra-band contiguous carrier aggregation bandwidth classe C, 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.

6.4 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 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.

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.

6.5.2 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 (caused by IQ offset)
- 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 IQ origin offset 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 requiremen	ts for Error Vector Magnitude
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Parameter	Unit	Average EVM Level	Reference Signal EVM Level
QPSK or BPSK	%	17.5	17.5
16QAM	%	12.5	12.5

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 (The IQ origin offset) is an additive sinusoid waveform that has the same frequency as the 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.

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	

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

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.

Parameter description	Unit	Limit (Note 1)		Applicable Frequencies
General	dB	$\max \left\{ \begin{array}{l} -25 - 10 \cdot \log_{10} \left(N_{RB} / L_{CRB} \right), \\ 20 \cdot \log_{10} EVM - 3 - 5 \cdot \left(\left \Delta_{RB} \right - 1 \right) / L_{CRB}, \\ -57 \ dBm \ / \ 180 \ kHz - P_{RB} \right\} \end{array}$		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
		-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	

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

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 non-
	allocated 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 $N_{_{RR}}$ is odd, or in the two RBs immediately adjacent to the DC frequency if $N_{_{RR}}$ is even, but
	ND ND
	excluding any allocated RB.
NOTE 6:	L_{CRB} is the Transmission Bandwidth (see Figure 5.6-1).
	$N_{\rm c}$ is the Transmission Bandwidth Configuration (and 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.
	$\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent ND outside of the allocated ballowidth.
NOTE 10	: $P_{\scriptscriptstyle RB}$ 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).

	Frequency range	Maximum ripple [dB]
F _{UL_Mea}	s – $F_{UL_Low} \ge 3 \text{ MHz}$ and $F_{UL_High} - F_{UL_Meas} \ge 3 \text{ MHz}$	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:	$F_{\text{UL}_\text{Meas}}$ refers to the sub-carrier frequency for which evaluated	the equalizer coefficient is
NOTE 2:	F_{UL_Low} and F_{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]	
$F_{UL_{Meas}} - F_{UL_{Low}} \ge 5 \text{ MHz} \text{ and } F_{UL_{High}} - F_{UL_{Meas}} \ge 5 \text{ MHz}$		4 (p-p)	
	(Range 1)		
F _{UL_Meas} – F _{UL_Low} < 5 MHz or F _{UL_High} – F _{UL_Meas} < 5 MHz		12 (p-p)	
	(Range 2)		
NOTE 1: F _{UL_Meas} refers to the sub-carrier frequency for which the equalizer coefficient is evaluated			
NOTE 2:	F_{UL_Low} and F_{UL_High} refer to each E-UTRA frequency 5.5-1	band specified in Table	

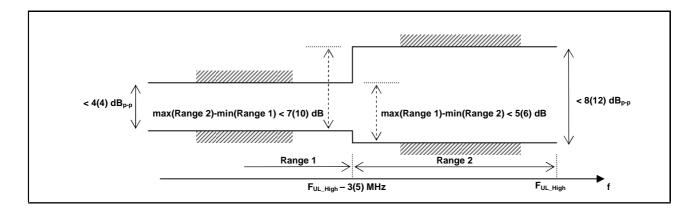


Figure 6.5.2.4.1-1: The limits for EVM equalizer spectral flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets).

6.5.2A Transmit modulation quality for CA

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 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.

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.

Table 6.5.2A.1-1: Minimum	requirements for Erro	r Vector Magnitude
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Parameter	Unit	Average EVM Level per CC	Reference Signal EVM Level
QPSK or BPSK	%	17.5	17.5
16QAM	%	12.5	12.5

6.5.2A.2 Carrier leakage for CA

Carrier leakage (The IQ origin offset) is an additive sinusoid waveform that has the same frequency as the modulated waveform carrier frequency. Carrier leakage is defined for each component carrier and is measured on the 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 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.

General		····· [/			
General		$\max\{-1\}$	$25 - 10 \cdot \log_{10} (N_{RB} / L_{CRB}),$		
	dB	$20 \cdot \log_{10}$	$EVM - 3 - 5 \cdot (\Delta_{RB} - 1) / L_{CRB}$,	Any non-allocated (Note 1)	
		– 57 dBm	$/180 kHz - P_{RB}$		
IQ Image	dB		-25	Exception for IQ image (Note 2)	
Carrier		-25	Output power > 0 dBm	Exception for Carrier frequency	
leakage	dBc	-20 -10	-30 dBm ≤ Output power ≤ 0 dBm -40 dBm ≤ Output power < -30 dBm	(Note 3)	
min (Ge non pow	imum requireme eneral, IQ Image h-allocated RB. 1	ent is calculate or Carrier leal The measurem Ilocated RB to	imit is evaluated in each non-allocated F ad as the higher of P_{RB} - 30 dB and the p kage) that apply. P_{RB} is defined in Note hent bandwidth is 1 RB and the limit is ex the measured average power per alloca	ower sum of all limit values 8. The limit is evaluated in each xpressed as a ratio of measured	
NOTE 2: Exc	eptions to the g	eneral limit are	e allowed for up to $L_{{\it CRBs}}$ RBs within a $$	contiguous width of $L_{\scriptscriptstyle CRBs}$ non-	
NOTE 3: Exc ban	eptions to the g	eneral limit are and the limit is	bandwidth is 1 RB. allowed for up to two contiguous non-a expressed as a ratio of measured powe ted RBs.		
NOTE 4: L_{CL}	_{RB} is the Transr	mission Bandw	vidth (see Figure 5.6-1) not exceeding	$N_{RB}/2-1$	
-	RB is the Transm cated.	nission Bandwi	idth Configuration (see Figure 5.6-1) of t	he component carrier with RBs	
NOTE 6: EV	M is the limits	specified in Ta	ble 6.5.2.1.1-1 for the modulation forma	t used in the allocated RBs.	
NOTE 7: Δ_{RI}	NOTE 7: Δ_{RB} is the starting frequency offset between the allocated RB and the measured no				
Δ_R	$_{\scriptscriptstyle RB}=1$ or $\Delta_{\scriptscriptstyle RB}=$	= -1 for the fi	rst adjacent RB outside of the allocated	bandwidth.	
NOTE 8: P_{RE}	_B is the transmit	ted power per	180 kHz in allocated RBs, measured in	dBm.	

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

Para- meter	Unit	Meas BW Note 1		Limit	remark	Applicable Frequencies
General	dB	BW of 1 RB (180KHz rectangular)	$20 \cdot \log_{10}$	$25 - 10 \cdot \log_{10} (N_{RB} / L_{CRB}),$ $EVM - 3 - 5 \cdot (\Delta_{RB} - 1) / L_{CRB},$ $4 / 180 kHz - P_{RB} \}$	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_{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	the up to 2 non-allocated
Carrier leakage	dBc		-20 -30 dBm ≤ Output power ≤ 0 dBm		of the allocated RBs in the allocated component carrier	RBs are unknown. The frequency raster of the RBs is derived when this
			-10	-40 dBm ≤ Output power < -30 dBm		component carrier is allocated with RBs
	Resolutio bandwidth		han the me	asurement BW may be integrated t	to achieve the n	neasurement
			limit is are	allowed for up to $L_{\it CRB}$ RBs within	a contiguous v	vidth of $L_{\scriptscriptstyle CRB}^{}$
NOTE 3:	Two Exce			are allowed for up to two contiguous .1-1 apply for Table 6.5.2A.3.1-2 as		RBs

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

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.

6.6 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.

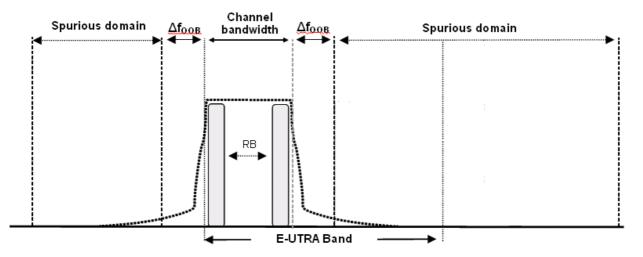


Figure 6.6-1: Transmitter RF spectrum

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 bandwidth1.43.05101520MHzMHzMHzMHzMHzMHz						
Channel bandwidth (MHz)	1.4	3	5	10	15	20	

Table 6.6.1-1: Occupied channel bandwidth

6.6.1A Occupied bandwidth for CA

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.

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.

Table 6.6.1B-1:	Occupied	channel	bandwidth
-----------------	----------	---------	-----------

	Occupied channel bandwidth / Channel bandwidth 1.4 3.0 5 10 15 20 MHz MHz MHz MHz MHz MHz					
Channel bandwidth (MHz)	1.4	3	5	10	15	20

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 ± 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									
Δf _{оов} (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	-10	-10	-10	-10	-10	-10	1 MHz			
± 2.5-2.8	-25	-10	-10	-10	-10	-10	1 MHz			
± 2.8-5		-10	-10	-10	-10	-10	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 6.6.2.1.1-1: 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 intra-band contiguous carrier aggregation the spectrum emission mask of the UE applies to frequencies (Δf_{OOB}) starting from the ± edge of the aggregated channel bandwidth (Table 5.6A-1) For intra-band contiguous carrier aggregation the bandwidth class C, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.1A-1 for the specified channel bandwidth.

	Spectrum emission limit [dBm]/BW _{Channel_CA}									
Δf _{00B} 25RB+100RB		50RB+100RB	75RB+75RB	75RB+100RB	100RB+100RB	Measurement				
(MHz)	(24.95 MHz)	(29.9 MHz)	(30 MHz)	(34.85 MHz)	(39.8 MHz)	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				
\pm 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				
\pm 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

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", and "NS_20")

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" or "NS_20" 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.

	Spectrum emission limit (dBm)/ Channel bandwidth								
Δf _{оов} (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)	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			
± 2.8-5.5		-13	-13	-13	-13	-13	1 MHz			
± 5.5-6		-25	-25	-25	-25	-25	1 MHz			
± 6-10			-25	-25	-25	-25	1 MHz			
± 10-15				-25	-25	-25	1 MHz			
± 15-20					-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.

	Spectru	Spectrum emission limit (dBm)/ Channel bandwidth								
Δf _{OOB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	Measurement bandwidth					
± 0-0.1	-13	-13	-15	-18	30 kHz					
± 0.1-1	-13	-13	-13	-13	100 kHz					
± 1-2.5	-13	-13	-13	-13	1 MHz					
± 2.5-2.8	-25	-13	-13	-13	1 MHz					
± 2.8-5		-13	-13	-13	1 MHz					
± 5-6		-25	-13	-13	1 MHz					
± 6-10			-25	-13	1 MHz					
± 10-15				-25	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.

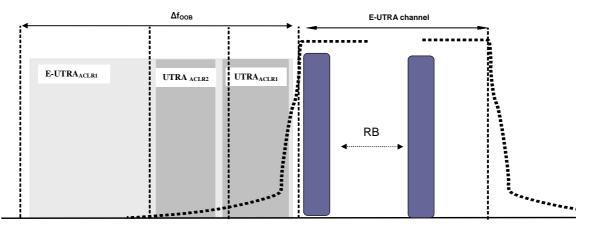
	Spectrum emission limit [dBm]/BW _{Channel_CA}									
	Δf _{oob} (MHz)	50+100RB (29.9 MHz)	75+75B (30 MHz)	75+100RB (34.85 MHz)	100+100RB (39.8 MHz)	Measurement bandwidth				
Γ	± 0-1	-22.5	-22.5	-23.5	-24	30 kHz				
	± 1-5.5	-13	-13	-13	-13	1 MHz				
	$\pm 5.5-34.9$	-25	-25	-25	-25	1 MHz				
	\pm 34.9-35		-25	-25	-25	1 MHz				
	$\pm 35 - 39.85$			-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.





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 -50dBm 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.

	Channel bandwidth / E-UTRA _{ACLR1} / Measurement bandwidth							
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 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 6.6.2.3.1-1: 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}			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 _{AC}	NOTE 1: E-UTRA _{ACLR1} shall be applicable for >23dBm								

6.6.2.3.1A 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 2nd 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.

		Channel	bandwidth / UTRA	ACLR1/2 / Measurem	ent 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	0.7+BW _{UTRA} /2	1.5+BW _{UTRA} /2 /	+2.5+BW _{UTRA} /2	+5+BW _{UTRA} /2	+7.5+BW _{UTRA} /2	+10+BW _{UTRA} /2
centre frequency offset [MHz]	-0.7- BW _{UTRA} /2	-1.5- BW _{UTRA} /2	/ -2.5-BW _{UTRA} /2	/ -5-BW _{UTRA} /2	/ -7.5-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
			nce with UTRA FDD nce with UTRA TDD			

Table 6.6.2.3.2-1: Requirements for	UTRA _{ACLR1/2}
-------------------------------------	-------------------------

6.6.2.3.2A Minimum requirement UTRA for CA

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.

UTRA Adjacent Channel Leakage power Ratio is specified for both the first UTRA adjacent channel (UTRA_{ACLR1}) and the 2nd UTRA adjacent channel (UTRA_{ACLR2}). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned aggregated channel bandwidth power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.2A-1. 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.

	CA bandwidth class / UTRA _{ACLR1/2} / measurement bandwidth				
	CA bandwidth class 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-1: Requirements for UTRA_{ACLR1/2}

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.

	CA bandwidth class / CA E-UTRA _{ACLR} / Measurement bandwidth				
	CA bandwidth class 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)	+ BW _{Channel_CA} / - BW _{Channel_CA}				

6.6.2.4 Void

6.6.2.4.1 Void

6.6.2A Void

<reserved for future use>

6.6.2B Out of band emission for UL-MIMO

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.

6.6.3 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.

Table 6.6.3.1-1: Boundary between E-UTRA out of band and spurious emission domain

Channel bandwidth	1.4	3.0	5	10	15	20
	MHz	MHz	MHz	MHz	MHz	MHz
ООВ boundary F _{ООВ} (MHz)	2.8	6	10	15	20	25

NOTE: In order that the measurement of spurious emissions falls within the frequency ranges that are more than F_{OOB} (MHz) from the edge of the channel bandwidth, the minimum offset of the measurement frequency from each edge of the channel should be $F_{OOB} + MBW/2$. MBW denotes the measurement bandwidth defined in Table 6.6.3.1-2.

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 Bar	nd 22, Band 42 and	Band 43	

Table 6.6.3.1-2: Spurious emissions limits

6.6.3.1A Minimum requirements for CA

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	ООВ boundary F _{оов} (MHz)
A	Table 6.6.3.1-1
В	FFS
C	BW _{Channel_CA} + 5

NOTE: In order that the measurement of spurious emissions falls within the frequency ranges that are more than F_{OOB} (MHz) from the edge of the channel bandwidth, the minimum offset of the measurement frequency from each edge of the aggregated channel should be $F_{OOB} + MBW/2$. MBW denotes the measurement bandwidth defined in Table 6.6.3.1-2.

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.

	Spurious emission									
E-UTRA Band	Protected band		ency MHz	range 2)	Maximum Level (dBm)	MBW (MHz)	Note			
1	E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 38, 40, 41, 42, 43, 44	F _{DL_low}	_	F _{DL high}	-50	1				
	E-UTRA Band 3, 34	F _{DL_low}	-	FDL high	-50	1	15			
	Frequency range	1880		1895	-40	1	15,27			
	Frequency range	1895		1915	-15.5		15, 26, 27			
	Frequency range	1915		1920	+1.6	5	15, 26, 27			
	Frequency range	1839.9	-	1879.9	-50	1	15			
2	E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 26, 27, 28, 29, 41, 42	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, 7, 8, 20, 26, 27, 28, 33, 34, 38, 41, 43, 44	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	(MHz) 1 1 5 1	13			
	E-UTRA Band 22, 42	F _{DL_low}	-	F _{DL_high}	-50		2			
	Frequency range	1884.5	-	1915.7	-41	0.3	13			
4	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 26, 27, 28, 29, 41, 43	$F_{DL_{low}}$	-	$F_{DL_{high}}$	-50					
	E-UTRA Band 42	F _{DL_low}	-	F_{DL_high}	-50	1	2			
5	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 28, 29,42, 43	F_{DL_low}	-	$F_{DL_{high}}$	-50					
	E-UTRA Band 41	F _{DL_low}	-	F_{DL_high}	-50	1	2			
	E-UTRA Band 26	859	-	869	-27					
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				
		1884.5	-	1919.6	-41	0.3	7			
	Frequency range	1884.5	-	1915.7			8			
7	E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 33, 34, 40, 42, 43	F_{DL_low}	-	$F_{DL_{high}}$	-50	1				
	Frequency range	2570	-	2575	+1.6	5	15, 21, 26			
	Frequency range	2575	-	2595	-15.5	(MHz) 1 1 5 1	15, 21, 26			
	Frequency range	2595	-	2620	-40	1	15, 21			
8	E-UTRA Band 1, 20, 28, 33, 34, 38, 39, 40	$F_{DL_{low}}$	-	$F_{DL_{high}}$	-50	1				
	E-UTRA band 3	F _{DL_low}	-	F_{DL_high}	-50		2			
	E-UTRA band 7	F _{DL_low}	-	F_{DL_high}	-50		2			
	E-UTRA Band 8	F _{DL_low}	-	F_{DL_high}	-50		15			
	E-UTRA Band 22, 41, 42, 43	F _{DL_low}	-	F_{DL_high}	-50		2			
	E-UTRA Band 11, 21	F _{DL_low}	-	F_{DL_high}	-50	1 5 1 <td< td=""><td>23</td></td<>	23			
	Frequency range	860	-	890	-40		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					
	Frequency range	1884.5	-	1915.7	-41		8			
	Frequency range	945	-	960	-50					
	Frequency range	1839.9	-	1879.9	-50					
10	Frequency range E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17,	2545	-	2575	-50					
	23, 24, 25, 26, 27, 28, 29, 41, 43 E-UTRA Band 22, 42	F _{DL_low}	-	F _{DL_high}	-50 -50		2			
11		F _{DL_low}		F _{DL_high}	-50		-			
	E-UTRA Band 1, 11, 18, 19, 21, 28, 34 Frequency range	F _{DL_low} 1884.5	-	F _{DL_high} 1915.7	-30		8			
	Frequency range	945	-	960	-41		0			
	Frequency range	1839.9	-	1879.9	-50	(MHz) 1 1 5 1				

Table 6.6.3.2-1: Requirements

	Frequency range	2545	-	2575	-50	1	
12	E-UTRA Band 2, 5, 13, 14, 17, 23, 24,	2040		2010			
	25, 26, 27, 41	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	
	E-UTRA Band 4, 10	$F_{DL_{low}}$	-	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,			L	-50	1	
	25, 26, 27, 29, 41	F _{DL_low} 769	-	F _{DL_high} 775	-35	0.00625	15
	Frequency range	709	-	805	-35	0.00625	11, 15
	Frequency range E-UTRA Band 14				-50	1	15
	E-UTRA Band 14 E-UTRA Band 24	F _{DL_low}	-	F _{DL_high}	-50	1	2
14	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17,	F _{DL_low}	-	F _{DL_high}			2
	23, 24, 25, 26, 27, 29, 41	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,	-		E	-50	1	
	25, 26, 27, 41		-	F _{DL_high}	-50	1	2
	E-UTRA Band 4, 10	F _{DL_low}	-	F _{DL_high}	-50	1	15
18	E-UTRA Band 12	F _{DL_low}	-	F _{DL_high}	-50	1	15
10	E-UTRA Band 1, 11, 21, 34	F _{DL_low}	-	F _{DL_high}	-50	1	
	Frequency range Frequency range	860	-	890	-40 -41	0.3	8
		1884.5	-	1915.7	-41		0
	Frequency range	758	-	799	-50 -40	1	15
	Frequency range	799	-	803	-40 -50	1	15
	Frequency range	945	-	960			
	Frequency range	1839.9	-	1879.9	-50	1	
19	Frequency range	2545	-	2575	-50	1	
19	E-UTRA Band 1, 11, 21, 28, 34 Frequency range	F _{DL_low} 1884.5	-	F _{DL_high} 1915.7	-50 -41	1 0.3	8
	Frequency range	945	-	960	-41	0.3	0
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	2545	-	2575	-50	1	
20	E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 40, 43	-		E	-50	1	
	E-UTRA Band 20	F _{DL_low}	-	F _{DL_high} F _{DL high}	-50	1	15
	E-UTRA Band 38, 42	FDL_low	-	FDL_high	-50	1	2
21	E-UTRA Band 1, 18, 19, 28, 34	F _{DL} low	_	FDL high	-50	1	-
	Frequency range	1884.5	-	1915.7	-41	0.3	8
	Frequency range	945	-	960	-50	1	
	Frequency range	1839.9	-	1879.9	-50	1	
	Frequency range	2545	-	2575	-50	1	
22	E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 33, 34, 38, 39, 40, 43			F _{DL high}	-50	1	
	Frequency range	F _{DL_low} 3510	-	3525	-40	1	15
	Frequency range	3525	-	3590	-40	1	10
23	E-UTRA Band 4, 5, 10, 12, 13, 14, 17,	3323	-	3390	-50		
-	23, 24, 26, 27, 29, 41	F _{DL_low}	-	F_{DL_high}	-50	1	
24	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17,	_		_	-50	1	
25	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 22,	F _{DL_low}	-	F _{DL_high}			
20	23, 24, 26, 27, 28, 29, 41, 42	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,			_ 2	=0		
	13, 14, 17, 18,19, 21, 22, 23, 24, 25, 26, 29, 34, 40, 42, 43	F _{DL low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 41	F _{DL low}	_	FDL_high	-50	1	2
	Frequency range	1884.5	-	1915.7	-41	0.3	8
		703	-	799	-50	1	-
	Frequency range	799	-	803	-40	1	15
	Frequency range	945	-	960	-50	1	1
	Frequency range	1839.9	-	1879.9	-50	1	
27	E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13,						
	14, 17, 22, 23, 25, 26, 27, 29, 38, 41, 42,	_		_	-50	1	
	43	F _{DL_low}	I -	F _{DL_high}	1	1	1

	Frequency range	799	-	805	-35	0.00625	
	E-UTRA Band 28	F _{DL_low}	-	790	-50	1	
28	E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 25, 26, 27, 34, 38, 41	F _{DL_low}	-	$F_{DL_{high}}$	-50	1	
	E-UTRA Band 1, 4, 10, 22, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	2
	E-UTRA Band 11, 21	F_{DL_low}	-	F_{DL_high}	-50	1	19, 24
	E-UTRA Band 1	F_{DL_low}	-	F_{DL_high}	-50	1	19, 25
	Frequency range	470	-	710	-26.2	6	31
	Frequency range	758	-	773	-32	1	15
	Frequency range	773	-	803	-50	1	
	Frequency range	662	-	694	-26.2	6	15
	Frequency range	1884.5	-	1915.7	-41	0.3	8, 19
	Frequency range	1839.9	-	1879.9	-50	1	
33	E-UTRA Band 1, 7, 8, 20, 22, 34, 38, 40, 42, 43	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	5
	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, 33, 38,39, 40, 41, 42, 43, 44	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							
36							
37			-				
38	E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 33, 34, 40, 42, 43	F_{DL_low}	-	$F_{DL_{high}}$	-50	1	
	Frequency range	2620	-	2645	-15.5	5	15, 22, 26
	Frequency range	2645	-	2690	-40	1	15, 22
39	E-UTRA Band 22, 34, 40, 41, 42, 44	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	
40	E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 33, 34, 38, 39, 41, 42, 43, 44	F _{DL_low}	-	F_{DL_high}	-50	1	
41	E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 34, 39, 40, 42, 44	F _{DL_low}	-	$F_{DL_{high}}$	-50	1	
	E-UTRA Band 9, 11, 18, 19, 21	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	30
	Frequency range	1839.9		1879.9	-50	1	30
	Frequency range	1884.5		1915.7	-41	0.3	8, 30
42	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 33, 34, 38, 40, 41, 44	F _{DL low}	-	$F_{DL_{high}}$	-50	1	
43	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 33, 34, 38, 40	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA Band 22	$F_{DL_{low}}$	-	F_{DL_high}	[-50]	[1]	3
		- DL_10W		DE liigh			
44	E-UTRA Band 3, 5, 8, 34, 39, 41 E-UTRA Band 1, 40, 42	F _{DL_low}	-	F _{DL_high}	-50	1	

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. 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, 3rd or 4th harmonic totally or partially overlaps the measurement bandwidth (MBW). 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 dBNOTE 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 FOOB (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 2545-2575 MHz and the channel bandwidth is 10 or 20 MHz.
NOTE 31:	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.

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.

E-								
UTRA CA Config uration	Protected band		ncy MHz	/ range z)	Maximum Level (dBm)	MBW (MHz)	Note	
CA_1C	E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 38, 40, 41, 42, 43, 44	$F_{DL_{low}}$	-	$F_{DL_{high}}$	-50	1		
	E-UTRA band 34	F _{DL_low}	-	F _{DL_high}	-50	1	4, 6, 7	
	Frequency range	1880	-	1895	-40	1	7, 10	
	Frequency range	1895	-	1915	-15.5	5	7, 10, 12	
	Frequency range	1900	-	1915	-15.5	5	6, 7, 10, 12	
	Frequency range	1915	-	1920	+1.6	5	6, 7, 10, 12	
	Frequency range	1884.5	-	1915.7	-41	0.3	4, 5	
<u></u>	Frequency range	1839.9	-	1879.9	-50	1		
CA_7C	E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 33, 34, 40, 42, 43	F _{DL_low}	-	F _{DL_high}	-50	1		
	Frequency range	2570	-	2575	+1.6	5	8, 12	
	Frequency range Frequency range	2575 2595	-	2595 2620	-15.5 -40	5	8, 12 8	
CA_38C	E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29, 33, 34, 40, 42, 43	F _{DL_low}	-	F _{DL_high}	-40	1	0	
	Frequency range	2620	-	2645	-15.5	5	9, 10, 11, 12	
	Frequency range	2645	-	2690	-40	1	9, 10, 11	
CA_40C	E-UTRA Band 1, 3, 7, 8, 20, 22, 26, 27, 33, 34, 38, 39, 41, 42, 43, 44	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, 34, 39, 40, 42, 44	F _{DL low}	-	F _{DL high}	-50	1		

Table 6.6.3.2A-1: Requirements

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.

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 (MHz)	Channel bandwidth / Spectrum emission limit (dBm)			Measurement bandwidth	Note	
	5 MHz	10 MHz	15 MHz	20 MHz		
1884.5 ≤ f ≤1915.7	-41	-41	-41	-41	300 KHz	1
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. Additional restrictions apply for operations below this point.						

Table 6.6.3.3.1-1: Additional requirements (PHS)

The requirements in Table 6.6.3.3.1-1 apply with the additional restrictions specified in Table 6.6.3.3.1-2 when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is less than the upper edge of PHS band (1915.7 MHz) + 4 MHz + the channel BW assigned.

Table 6.6.3.3.1-2: RB restriction	s for additional requ	uirement (PHS).
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15 MHz channel bandwidth with $f_c = 1932.5$ MHz						
RB _{start} 0-7 8-66 67-74						
L _{CRB}	N/A	≤ MIN(30, 67 – RB _{start})	N/A			
	20 MHz channel bandwidth with f _c = 1930 MHz					
RB _{start}	0-23	24-75	76-99			
L _{CRB}	N/A	≤ MIN(24, 76 – RB _{start})	N/A			

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 (300 kHz).

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.

	Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth			
		10 MHz	bandwidth			
ŀ	769 ≤ f ≤ 775	-57	6.25 kHz			
F	NOTE: The emissions measurement shall be sufficiently power averaged to ensure					
	standard standard deviation < 0.5 dB.					

Table 6.6.3.3.2-1:	Additional	requirements
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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 (6.25 kHz).

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.

Frequency band	Channel ban	Measurement bandwidth		
(MHz)	5MHz	10MHz	15MHz	
860 ≤ f ≤ 890	-40	-40	-40	1 MHz

 Table 6.6.3.3.3-1: Additional requirement

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 (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
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Frequency band (MHz)	Channel ba	Measurement bandwidth		
	5MHz	10MHz	15MHz	
1475.9 ≤ f ≤ 1510.9	-35	-35	-35	1 MHz

- NOTE 1: 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 (1 MHz).
- 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 both the above NOTE 1 and 100 kHz RBW.

6.6.3.3.5 Minimum requirement (network signalled value "NS_12")

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.

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
	1.4 MHz, 3 MHz, 5 MHz	
806 ≤ f ≤ 813.5	-42	6.25 kHz
NOTE 1: The requireme	ent applies for E-UTRA carriers with lower char	nel edge at or
above 814.2 M	1Hz.	-
NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a		aged to ensure a
standard deviation < 0.5 dB.		

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.

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 5 MHz	Measurement bandwidth
806 ≤ f ≤ 816	-42	6.25 kHz
NOTE 1: The requireme above 819 MH	nt applies for E-UTRA carriers with lower char z.	nnel edge at or
NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.		

Table 6.6.3.3.6-1: Additional requirements

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.

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 above 824 MH	nt applies for E-UTRA carriers with lower char z.	nnel edge at or
NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.		

Table 6.6.3.3.7-1: Additional requirements

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.

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz	Measurement bandwidth
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.

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 1.4, 3, 5, 10 MHz	Measurement bandwidth	Note
790 ≤ f ≤ 803	-32	1 MHz	

Table 6.6.3.3.9-1: Additional requirements

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.

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 and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.			

Table 6.6.3.3.10-1: Additional requirements

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

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 5, 10, 15, 20 MHz	Measurement bandwidth	Note
692-698	-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.

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.

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm) 1.4, 3, 5, 10, 15, 20 MHz	Measurement bandwidth
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

Table 6.6.3.3.13-1: Additional requirements

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.

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.					

Table 6.6.3.3.14-1: Additional requirements

6.6.3.3.15 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 6.6.3.3.15-1. 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.

Protect	ted 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 Table 6.6.3.3.13-1 is for unsynchronized operation. To				To meet these		
	requiremer	ements some restriction will be needed for either the operating band or protected				d or protected
	band.					

Table 6.6.3.3.15-1: Additional requirement

NOTE 1: 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 (1 MHz).

6.6.3.3.16 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 6.6.3.3.16-1. 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.

Protected	band	Frequency range (MHz)		nge (MHz)	Maximum Level (dBm)	MBW (MHz)
42		$F_{DL_{low}}$	-	F _{DL_high}	[-50]	1
re					or unsynchronized operation for either the operating band	

 Table 6.6.3.3.16-1: Additional requirement

NOTE 1: 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 (1 MHz).

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.

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.

Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)	Note
E-UTRA band 34	FDL_low	-	FDL_high	-50	1	
Frequency range	1884.5	1	1915.7	-41	0.3	1
NOTE 1: Applicable when the aggregated channel bandwidth is confined within frequency range 1940 - 1980 MHz						

Table 6.6.3.3A.1-1: Additional requirements (PHS)

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 (300 kHz).

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.

Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)
E-UTRA band 34	$F_{DL_{low}}$	-	F _{DL_high}	-50	1
Frequency range	1900	1	1915	-15.5	5
Frequency range	1915	I	1920	+1.6	5

Table 6.6.3.3A.2-1: Additional requirements

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.

Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)
E-UTRA band 34	$F_{DL_{low}}$	-	F_{DL_high}	-50	1
Frequency range	1880	-	1895	-40	1
Frequency range	1895	-	1915	-15.5	5
Frequency range	1915	-	1920	+1.6	5

Table 6.6.3.3A.3-1: Additional requirements

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.

Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)
Frequency range	2620	-	2645	-15.5	5
Frequency range	2645	-	2690	-40	1

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.

Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)
Frequency range	2570	1	2575	+1.6	5
Frequency range	2575	-	2595	-15.5	5
Frequency range	2595	-	2620	-40	1

Table 6.6.3.3A.5-1: Additional requirements

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.

6.6A 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 Frequency Offset	5MHz	10MHz	10MHz	20MHz	15MHz	30MHz	20MHz	40MHz
Interference CW Signal Level	-40dBc							
Intermodulation Product	-29dBc	-35dBc	-29dBc	-35dBc	-29dBc	-35dBc	-29dBc	-35dBc
Measurement bandwidth	4.5MHz	4.5MHz	9.0MHz	9.0MHz	13.5MHz	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 intra-band contiguous carrier aggregation the requirement of transmitting intermodulation is specified in Table 6.7.1A-1.

CA bandwidth class(UL)	С		
Interference Signal Frequency Offset	BW _{Channel_CA} 2*BW _{Channel_C}		
Interference CW Signal Level	-40dBc		
Intermodulation Product	-29dBc	-35dBc	
Measurement bandwidth	BW _{Channel}	_{_CA} - 2* BW _{GB}	

Table 6.7.1A-1: Transmit Intermodulation

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	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, in-gap test refers to the case when the interfering signal(s) is (are) located at a negative offset with respect to the the assigned channel frequency of the highest carrier frequency; or 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, 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 with channel bandwidth larger than or equal to 5 MHz, existing adjacent channel selectivity requirements, in-band blocking requirements and narrow band blocking requirements shall be supported for in-gap tests only if the sub-block gap size satisfies the following condition so that the interferer position does not change the nature of the core requirement tested:

 $Wgap \ge (Interferer frequency offset 1) + (Interferer frequency offset 2) -0.5*((Channel bandwidth 1) + (Channel bandwidth 2))$

where the interferer frequency offset represents the interferer frequency offset per carrier specified in subclause 7.5.1, subclause 7.6.1 and subclause 7.6.3.

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. Requirements for 4 ports are FFS. With the exception of subclause 7.9 all requirements shall be verified by using both (all) antenna ports simultaneously.

7.3 Reference sensitivity power level

The reference sensitivity power level REFSENS is the minimum mean power applied to both the UE antenna ports 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

Channel bandwidth									
E-UTRA	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Duplex		
Band	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	(dBm)	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		
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		
	The transmitter								
NOTE 2:	Reference meas	surement ch	nannel is A	4.3.2 with o	ne sided d	ynamic OC	NG		
	Pattern OP.1 FE				.5.1.1/A.5.	2.1			
	The signal powe For the UE whic				nd 9 the ref	erence sen	sitivity		
	level is FFS.					010100 301	Shivity		
NOTE 5:	For the UE whic	h supports	both Band	11 and Ba	and 21 the i	reference s	ensitivity		
	level is FFS.	ha raquira-	ont in ma	dified by O	E dD when	the comi-			
NOTE 6:	⁶ indicates that the frequency of the	assigned F		uilled by -0 hannel han	.ə aB wher dwidth is w	i me carrie ithin 865-8	94 MH7		
	For a UE that su								
	for Band 26 app						-		

Table 7.3.1-1: Reference sensitivity QPSK PREFSEN

The reference receive sensitivity (REFSENS) requirement specified in Table 7.3.1-1 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 X (informative).

For the UE which supports inter-band carrier aggregation configuration in Table 7.3.1-1A with uplink in one E-UTRA band, the minimum requirement for reference sensitivity in Table 7.3.1-1 shall be increased by the amount given in $\Delta R_{IB,c}$ in Table7.3.1-1A for the applicable E-UTRA bands.

Inter-band C Configuratio									
	1	0							
CA_1A-5A	5	0							
00.40.400	1	0							
CA_1A-18A	18	0							
CA_1A-19A	1	0							
CA_1A-19A	19	0							
CA_1A-21A	1	0							
0.12.0.1	21	0							
CA_2A-17A	2	0							
	17	0.5							
CA_3A-5A	3 5	0							
	3	0							
CA_3A-7A	7	0							
	3	0							
CA_3A-8A	8	<u> </u>							
	3	0							
CA_3A-20A	20	0							
CA_4A-5A	4	0							
CA_4A-5A	5	0							
CA_4A-7A	4	0.5							
<u> </u>	7	0.5							
CA_4A-12A	4	0							
	12	0.5							
CA_4A-13A	4	0							
	13	0							
CA_4A-17A	4	0 0.5							
	5	0.5							
CA_5A-12A	12	0.3							
	5	0.5							
CA_5A-17A	17	0.3							
CA_7A-20A	7	0							
	20	0							
CA_8A-20A	8	0							
	20	0							
CA_11A-184	11	0							
	18	0							
bar con	above additional tolerances are only ap ds that belong to the supported inter-ba- figurations	nd carrier aggregation							
agg the	above additional tolerances also apply regated operation for the supported E-U supported inter-band carrier aggregation	JTRA operating bands that belong to n configurations							
agg	ase the UE supports more than one of the regation configurations and a E-UTRA c inter-band carrier aggregation configuration c	operating band belongs to more than ations then:							
-	When the E-UTRA operating band free applicable additional tolerance shall be Table 7.3.1-1A, truncated to one decim operating band among the supported C	the average of the tolerances in al place that would apply for that							
	harmonic relation between low band U maximum tolerance among the different	L and high band DL, then the nt supported 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 tolerance in Table 7.3.1-1A that would apply for that operating band among the supported 								

Table 7.3.1-1A: ΔR_{IB,c}

CA configurations

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.

	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	20	FDD				
22			25	50	50 ¹	50 ¹	FDD				
23	6	15	25	50	75	100	FDD				
20		10	25	50	10	100	FDD				
25	6	15	25	50	50 ¹	50 ¹	FDD				
26	6	15	25	25 ¹	25 ¹	00	FDD				
27	6	15	25	25 ¹	20		FDD				
28	0	15	25	25 ¹	25 ¹	25 ¹	FDD				
		10	20	20	20	20	100				
33			25	50	75	100	TDD				
34			25	50	75	100	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				
40			25	50	75	100	TDD				
41			25	50	75	100	TDD				
42			25	50	75	100	TDD				
43		15	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: 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 bar										

 Table 7.3.1-2: Uplink configuration for reference sensitivity

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.

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

Table 7.3.1-3: Network signalling value for reference sensitivity

7.3.1A Minimum requirements (QPSK) for CA

For inter-band carrier aggregation with 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 both downlink component carriers active and either of the uplink carriers active. 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 active in the lower-frequency operating band is within a specified frequency range 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.

	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_3A-8A ⁴	4 3 N/A N/A N/A							FDD		
CA_SA-6A	8			N/A	N/A			гии		
CA_4A-12A ^{5,6}	4	[-89.2]	[-89.2]	[-90]	[-89.5]			FDD		
CA_4A-12A	12			-96.5	-93.5			гии		
CA_4A-17A ^{5,6}	4			[-90]	[-89.5]			FDD		
07_47-117	17			-96.5	-93.5			100		
NOTE 3: The s NOTE 4: No re bandw transmot th NOTE 5: These transm down NOTE 6: The re f_{UL}^{LB}	TDD as desc ignal power i quirements a width of the k mission band e case (the r e requiremen mission band link transmiss equirements = $\left[f_{DL}^{HB} / 0.3 \right] 0$ r frequency of	ribed in Annex s specified pe	A.5.1.1/A. r port re is at lease nich the 2nd gh band. Th pecified in 0 there is at w band for n of the high fied for UL $F_{UL_low}^{LB} + B^{2}$	5.2.1 st one indi d transmitt he referen clause 7.3 least one which the h band. EARFCN $W_{Channel}^{LB}/2 <$	vidual RE vidua	within the u c is within t ty is only v RE within th itter harmo pand (supe $L_{high} - BW_{Ch}^{LI}$	plink transn he downlinl erified when ne uplink nic is withir rscript LB) s annet/2 with	hission this is the such that f_{DL}^{HB} the		

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	Duplex mode		
CA_4A-12A	12	2	5	8	16			FDD		
CA_4A-17A	17			8	16			FDD		
CA_4A-17A 17 8 16 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.										

Table 7.3.1A-0b: Uplink configuration for the low band (exceptions)

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.

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 2A-29A	2			-98	-95			500			
CA_ZA-Z9A	29		-98.7	-97	-94			FDD			
	4			-100	-97			FDD			
CA_4A-29A	29		-98.7	-97	-94			FDD			
NOTE 2: Refer FDD/	29 -98.7 -97 -94 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-0d: Reference sensitivity QPSK PREFSENS

Table 7.3.1A-0e:	Uplink configuration for	reference sensitivity
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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		
	2			25	50					
CA_2A-29A	29		N/A	N/A	N/A			FDD		
0.4.4.4.00.4	4			25	50					
CA_4A-29A	29		N/A	N/A	N/A			FDD		

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 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 and Table 7.3.1A-1. 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 follow Table 7.3.1A-1 and form a contiguous allocation where TX–RX frequency separations are as defined in Table 5.7.4-1. 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 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.

	CA configuration / CC combination / $N_{RB_{agg}}$ / Duplex mode										
	100RB	+50RB	75RB-	+75RB	100RB	+75RB	100RB-	+100RB	Duplox		
CA configuration	PCC	SCC	PCC	SCC	PCC	SCC	PCC	SCC	Duplex Mode		
CA_1C	N/A	N/A	75	54	N/A	N/A	100	30	FDD		
CA_7C	N/A	N/A	75	0	N/A	N/A	75	0	FDD		
CA_38C			75	75			100	100	TDD		
CA_40C	100	50	75	75	N/A	N/A	100	100	TDD		
CA_41C	100	50	75	75	100	75	100	100	TDD		
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											

Table 7.3.1A-1: Intra-band CA uplink configuration for reference sensitivity

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.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, 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) with both downlink carriers active 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 Δ_{IBNC} given in Table 7.3.1A-3 for the SCC. 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.

CA configuration	Aggregated channel bandwidth (PCC+SCC)	W _{gap} /[MHz]	UL PCC allocation	ΔR _{IBNC} (dB)	Duplex mode		
	25RB+25RB	$30.0 < W_{gap} \le 55.0$	10 ¹	5.0			
	201012010	$0.0 < W_{gap} \le 30.0$	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	FDD		
CA_25A-25A	50RB+25RB	15.0 < W _{gap} ≤ 50.0	10 ⁴	5.5	FUU		
	50KB+25KB	$0.0 < W_{gap} \le 15.0$	32 ¹	0.0			
	50RB+50RB	10.0 < W _{gap} ≤ 45.0	10 ⁴	5.0			
	JUNDTJUND	$0.0 < W_{gap} \le 10.0$	32 ¹	0.0			
CA_41A-41A	NOTE 6	NOTE 7	NOTE 8	0.0	TDD		
CA_41A-41ANOTE 6NOTE 7NOTE 80.0TDDNOTE 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.NOTE 2:Wgap 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 4:4 refers to the UL resource blocks shall be located at RBstart=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 NRB as defined in							

Table 7.3.1A-3: Intra-band nor	n-contiguous CA uplink	configuration for reference sensitivity	ity

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 transmit antenna connectors.

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

Rx Parameter	Units	Channel bandwidth						
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
Power in Transmission Bandwidth Configuration	dBm -25							
 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 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. 								

 Table 7.4.1-1: Maximum input level

7.4.1A Minimum requirements for CA

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the maximum input level is defined with the uplink active on the band other than the band whose downlink is being tested. The UE shall meet the requirements specified in subclause 7.4.1 for each component carrier while both 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 shall be configured at nominal channel spacing to the PCC with the PCC configured closest to the uplink band. Downlink PCC and SCC are both activated. 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 intra-band non-contiguous carrier aggregation with two downlink carriers each carrier shall meet the requirements specified in Table 7.4.1-1 while all downlink carriers are active.

The throughput 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) over each carrier. For UE(s) supporting one uplink carrier, the uplink configuration of the PCC shall be in accordance with Table 7.3.1A-3.

Rx Parameter	Units CA Bandwidth Class						
		Α	В	С	D	E	F
Power in largest Transmission Bandwidth Configuration CC	dBm			-25			
Power in each other CC	dBm			-25 + 10log(N ^{RB,c} /N _{RB,larg est BW})			
 NOTE 1: The transmitter shall be set to 4dB below PCMAX_L or PCMAX_L_CA 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. 							

Table 7.4.1A-1: Maximum input level for intra-band contiguous CA

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_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

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).

		Channel bandwidth						
Rx Parameter	Units	1.4	3	5	10	15	20	
		MHz	MHz	MHz	MHz	MHz	MHz	
ACS	dB	33.0	33.0	33.0	33.0	30	27	

Rx Parameter	Units			Channel ba	andwidth				
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz		
Power in	dBm								
Transmission				DEESENS					
Bandwidth				REFSENS) + 14 UD				
Configuration									
	dBm	REFSENS	REFSENS	REFSENS	REFSENS	REFSENS	REFSENS		
PInterferer		+45.5dB	+45.5dB	+45.5dB	+45.5dB	+42.5dB	+39.5dB		
BWInterferer	MHz	1.4	3	5	5	5	5		
FInterferer (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 tra	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 I	2 with PCMAX L as defined in subclause 6.2.5.								
NOTE 2: The int	NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided								
				ribed in Annex A					
C.3.1							-		

Rx Parameter	Units			Channel b	andwidth					
		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			
PInterferer	dBm		-25							
BWInterferer	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 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.									

Table 7.5.1-3: Test parameters for Adjacent channel selectivity, Case 2

7.5.1A Minimum requirements for CA

For inter-band carrier aggregation with uplink assigned to one E-UTRA band, the adjacent channel requirements are defined with the uplink active on the band 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 both downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band (as noted in Table 5.5-1), the requirements for both downlinks shall be met with the uplink active in the 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 adjacent channel requirements of subclause 7.5.1A do not apply.

For intra-band contiguous carrier aggregation the downlink SCC shall be configured at nominal channel spacing to the PCC with the PCC configured closest to the uplink band. Downlink PCC and SCC are both activated. 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 intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, 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 specified in subclause 7.5.1 for each component carrier subject to in-gap and out-of-gap interferers while both downlink carriers are active. The interferer powerP_{interferer} for Case 1 in Table 7.5.1-2 shall be set to the maximum of the levels given by the two downlink carriers. For both Case 1 and Case 2 (Table 7.5.1-3), the wanted signal power level of each carrier shall be set in accordance with the ACS requirement (Clause 7.5.1) relative to the interferer power P_{interferer}.

		CA Bandwidth Class						
Rx Parameter	Units	В	С	D	E	F		
ACS	dB		24					

Rx Parameter	· Units		CA	A Bandwidth	Class	
		В	С	D	E	F
Pw in Transmission Ban	dwidth		REFSENS +			
Configuration, per CC			14 dB			
	dBm		Aggregated			
			power + 22.5			
PInterferer			dB			
BWInterferer	MHz		5			
F _{Interferer} (offset)	MHz		2.5 + F _{offset}			
			/			
			-2.5 - F _{offset}			
NOTE 1: The transmitte	er shall be set to 4dB	below P _{CM}	AX_L OF PCMAX_L_CA	as defined in	subclause 6.2	2.5A.
NOTE 2: The interferer	consists of the Refer	ence meas	urement channe	I specified in A	Annex A.3.2 wi	th one sided
dynamic OCN	G Pattern OP.1 FDD	/TDD as de	scribed in Annex	x A.5.1.1/A.5.2	2.1 and set-up	according to
Annex C.3.1						
NOTE 3: The Finterferer (d	offset) is relative to th	e center fre	equency of the ad	djacent CC be	ing tested and	shall be
further adjuste	ed to $\left[\mathrm{F}_{\mathrm{interferer}} \left/ 0.015 \right. ight.$	+ 0.5 0.015	+ 0.0075 MHz to	be offset from	n the sub-carri	er raster.

Table 7.5.1A-2: Test parameters for Adjacent channel selectivity, Case 1

Rx Parame	eter Units		CA	Bandwidth C	lass			
		В	С	D	E	F		
Pw in Transmission I Configuration, per Co	dBm		-47.5+10 log ₁₀ (N _{RB,c} / N _{RB agg})					
PInterferer	dBm			-25				
BWInterferer	MHz		5					
FInterferer (offset)	MHz		2.5+ F _{offset}					
			/					
			-2.5- F _{offset}					
	mitter shall be set to 24							
	erer consists of the Ref							
dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up accord						ccording to		
Annex C.3	Annex C.3.1							
	DTE 3: The F _{interferer} (offset) is relative to the center frequency of the adjacent CC being tested and shall be further							
adjusted t	$\circ \left[F_{\text{interferer}} / 0.015 + 0.5 \right]$	0.015 + 0.0075	MHz to be offse	et 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.

7.6 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.

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.

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	ubiii	6	6	6	6	7	9		
Configuration									
BWInterferer	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		
Floffset, 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 tra	nsmitter	shall be set to	4dB below Pcr	MAX_L at the minii	mum uplink co	nfiguration spe	cified in		
Table 7	'.3.1-2 wi	th PCMAX_L as o	defined in subo	lause 6.2.5.					
NOTE 2: The inte	erferer co	onsists of the R	Reference mea	surement chanr	el specified in	Annex A.3.2 w	vith one		
sided d	ynamic C	OCNG Pattern	OP.1 FDD/TD	D as described i	n Annex A.5.1	.1/A.5.2.1 and	set-up		
accordi	ing to Ani	nex C.3.1							

E-UTRA	Parameter	Unit	Case 1	Case 2	Case 3	Case 4	Case 5	
band	PInterferer	dBm	-56	-44			-38	
	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}			-BW/2 - 11	
$\begin{array}{c} 1,2,3,4,5,\\ 6,7,8,9,\\ 10,11,12,\\ 13,14,17,\\ 18,19,20,\\ 21,22,23,\\ 25,26,27,\\ 28,31,33,\\ 34,35,36,\\ 37,38,39,\\ 40,41,42,\\ 43,44 \end{array}$	FInterferer	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 b. the carrier frequency +BW/2 + Floffset, case 1 NOTE 3: Florterferer range values for unwanted modulated interfering signal are interferer center frequencies								

Table 7.6.1.1-2: In-band blocking

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 uplink assigned to one E-UTRA band the in-band blocking requirements are defined with the uplink active on the band 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 both downlink carriers are active. 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. For E-UTRA CA configurations including an operating

band without uplink band (as noted in Table 5.5-1), the requirements for both downlinks shall be met with the uplink in the band capable of UL operation.. The requirements for the component carrier configured in the operating band without uplink band are specified in Table 7.6.1.1-1 and Table 7.6.1.1A-0.

E-UTRA band	Parameter	Unit	Case 1	Case 2			
	PInterferer	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	FInterferer	F _{Interferer} MHz (Note 2)		F _{DL_low} – 15 to F _{DL_high} + 15			
NOTE 1: For cer	rtain bands, the ur	nwanted mo	dulated interfering signal r	nay not fall inside the			
NOTE 2: For ea a. t	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 _{loffset, case 1} and						
NOTE 3: FInterfere	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 shall be configured at nominal channel spacing to the PCC with the PCC configured closest to the uplink band. Downlink PCC and SCC are both activated. 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-2.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, 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 specified in subclause 7.6.1.1 for each component carrier subject to in-gap and out-of-gap interferers while both downlink carriers are active.

Rx Parameter	Units	CA Bandwidth Class							
		В	С	D	E	F			
Pw in Transmission		REFSENS + CA Bandwidth Class specific value below							
Bandwidth	dBm		12						
Configuration, per CC			12						
BWInterferer	MHz		5						
Floffset, case 1	MHz		7.5						
Floffset, case 2	MHz		12.5						
NOTE 1: The transmit	ter shall b	be set to 4dB bel	OW PCMAX_L OF PC	MAX_L_CA as defin	ed in subclause 6	6.2.5A			
NOTE 2: The interfere	NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided								
dynamic OC	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-1:	In band	blocking	parameters
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CA configuration	n Parameter Unit		Case 1	Case 2			
	PInterferer	dBm	-56	-44			
	FInterferer	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}			
CA_1C, CA_7C, CA_38C, CA_40C, CA_41C	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:							

Table 7.6.1.1A-2: In-band blocking

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.

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 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 $\max(8, \left[(N_{RB} + 2 \cdot L_{CRBs})/8 \right])$ 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.

Rx Parameter	Units	Channel bandwidth					
		1.4	3 MHz	5 MHz	10	15	20
		MHz			MHz	MHz	MHz
Power in		REFS	ENS + ch	annel ban	dwidth sp	ecific valu	e below
Transmission	dBm						
Bandwidth	UDIII	6	6	6	6	7	9
Configuration							
NOTE 1: The transmit	ter shall be	e set to 40	B below I	Рсмах_∟ at	the minim	num uplink	ζ.
configuration	specified i	in Table 7	7.3.1-2 wit	h Pcmax_L	as define	d in subcla	ause
6.2.5.							
	NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided						
dynamic OC	NG Pattern	OP.1 FE	D/TDD a	s describe	ed in Anne	x A.5.1.1/	A.5.2.

Table 7.6.2.1-1: Out-of-band blocking parameters

E-UTRA band	Parameter	Units	Frequency				
			Range 1	Range 2	Range 3	Range 4	
	PInterferer	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, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44	F _{Interferer} (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	FInterferer	MHz	-	-	-	FUL_low - FUL_high	
NOTE 1: For th	e UE which su	oports both	n Band 11 and Bai	nd 21 the out of blo	ocking is FFS.		

Table 7.6.2.1-2: Out of band blocking

7.6.2.1A Minimum requirements for CA

For inter-band carrier aggregation with the uplink assigned to one E-UTRA band, the out-of-band blocking requirements are defined with the uplink active on the band 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. The UE shall meet these requirements for each component carrier while both downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band (as noted in Table 5.5-1), the requirements for both downlinks shall be met with the uplink active in the 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.

Paramete	er Unit	Range 1	Range 2	Range 3
Pw	dBm	Table 7.6.	2.1-1 for both component of	carriers
Pinterferer	dBm	-44 + ΔR _{IB,c}	-30 + ΔR _{IB,c}	-15 + ΔR _{IB,c}
Finterferer	MHz	$-60 < f - F_{DL_{Low(1)}} < -15$	$-85 < f - F_{DL_{Low(1)}} \le -60$	$1 \le f \le F_{DL_Low(1)} - 85$
(CW)		or	or	or
		$-60 < f - F_{DL_{Low(2)}} < -15$	$-85 < f - F_{DL_{Low(2)}} \le -60$	$F_{DL_{High(1)}} + 85 \le f$
		or	or	$\leq F_{DL_Low(2)} - 85$
		$15 < f - F_{DL_{High(1)}} < 60$	$60 \leq f - F_{DL_{High(1)}} < 85$	or
		or	or	$F_{DL_{High(2)}} + 85 \le f$
		$15 < f - F_{DL_{High(2)}} < 60$	$60 \leq f - F_{DL_{High(2)}} < 85$	≤ 12750
NOTE 1:		nd F _{DL_High(1)} denote the respec		
	operating b	and, $F_{DL_Low(2)}$ and $F_{DL_High(2)}$ the second seco	ne respective lower and up	per frequency limits of the
	upper oper	5		
NOTE 2:		$_{(2)} - F_{DL_High(1)} < 145 \text{ MHz and}$		
	in both Rar	nge 1 and Range 2. Then the l	ower of the P _{Interferer} applies	i.
NOTE 3:	For F _{DL_Low}	$_{(1)} - 15 \text{ MHz} \le f \le F_{\text{DL}-High}(1) + 1$	5 MHz and F _{DL_Low(2)} – 15 I	$MHz \le f \le F_{DL_{High(2)}} + 15$
	MHz the ap	propriate adjacent channel se	electivity and in-band blocki	ng in the respective
	subclauses	7.5.1A and 7.6.1.1A shall be	applied.	
NOTE 4:	$\Delta R_{IB,c}$ acco	rding to Table 7.3.1-1A applies	s when serving cell <i>c</i> is me	asured.

Table 7.6.2.1A-0: out-of-band blocking for inter-band carrier aggregation with one active uplink

For Table 7.6.2.1A-0 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 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 shall be configured at nominal channel spacing to the PCC with the PCC configured closest to the uplink band. Downlink PCC and SCC are both activated. 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 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.

Table 7.6.2.1A-1: Out-of-band blocking parameters

Rx Parameter		CA Bandwidth Class					
		В	С	D	E	F	
Pw in Transmission Bandwidth Configuration, per CC	dBm	REFSENS + CA Bandwidth Class specific value below					
			9				
NOTE 1: The transmitter shall be set to 4dB below NOTE 2: Reference measurement channel is spec FDD/TDD as described in Annex A.5.1.1/	ified in Anr					ern OP.1	

Table	7.6.2.1A	-2: Out	of band	blocking
IUNIO	1.0.2.17	 . out	or surre	a biooning

CA configuration	Parameter	Units	Frequency		
			Range 1	Range 2	Range 3
	PInterferer	dBm	-44	-30	-15
	E		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
CA_1C, <u>CA_3C</u> , CA_7C , CA_38C, CA_40C, CA_41C	F _{Interferer} (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

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, 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 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 $\max(24,6 \cdot \lceil N_{RB} \cdot /6 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies 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 $\max(8, \left[(N_{RB} + 2 \cdot L_{CRBs})/8 \right])$ exceptions per assigned E-UTRA channel

per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 spurious response are applicable.

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

Parameter	Unit	Channel Bandwidth						
Farameter	Unit	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
р	dPm	P _{REFSENS} + channel-bandwidth specific value below						
Pw	dBm	22	18	16	13	14	16	
P _{uw} (CW)	dBm	-55	-55	-55	-55	-55	-55	
F_{uw} (offset for $\Delta f = 15 \text{ kHz}$)	MHz	0.9075	1.7025	2.7075	5.2125	7.7025	10.2075	
F_{uw} (offset for $\Delta f = 7.5 \text{ kHz}$)	MHz							
NOTE 1: The transmitter shall be set a 4 dB below P _{CMAX_L} at the minimum uplink configuration specified in Table 7.3.1-2 with P _{CMAX_L} as defined in subclause 6.2.5. NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic								
	Pattern OP.1 F						amic	

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

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the narrow-band blocking requirements are defined with the uplink active on the band 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 both downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band (as noted in Table 5.5-1), the requirements for both downlinks shall be met with the uplink active in the 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 intra-band contiguous carrier aggregation the downlink SCC shall be configured at nominal channel spacing to the PCC with the PCC configured closest to the uplink band. Downlink PCC and SCC are both activated. 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 \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 7.6.3.1A-1.

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, 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 specified in subclause 7.6.3.1 for each component carrier subject to in-gap and out-of-gap interferers while both downlink carriers are active.

Parameter	Unit	CA Bandwidth Class						
Falanielei	Unit	В	С	D	E	F		
Pw in Transmission Bandwidth	dBm	REF	SENS + CA Band	vidth Class	specific value	below		
Configuration, per CC	UDIII		16 ⁴					
P _{uw} (CW)	dBm		-55					
FIIM (offset for			- F _{offset} – 0.2					
$\Delta f = 15 \text{ kHz}$	MHz		/					
$\Delta I = 15 \text{ KHz})$			+ F _{offset} + 0.2					
F _{uw} (offset for	MHz							
⊿f = 7.5 kHz)								
NOTE 1: The transmitter shall be set to	4dB below F	CMAX_L OF PC	MAX_L_CA as define	d in subclau	se 6.2.5A.			
NOTE 2: Reference measurement char	nel is specifi	ied in Annex	A.3.2 with one sid	ed dynamic	OCNG Patter	rn OP.1		
FDD/TDD as described in Ann	ex A.5.1.1/A	.5.2.1.						
	NOTE 3: The Finterferer (offset) is relative to the center frequency of the adjacent CC being tested and shall be further							
adjusted to $\lfloor F_{\text{interferer}} / 0.015 + 0$	adjusted to $[F_{interferer}/0.015+0.5]0.015+0.0075$ MHz to be offset from the sub-carrier raster.							
NOTE 4: The requirement is applied for	the band co	mbinations v	vhose component	carriers' BW	/≥5 MHz.			

Table	7.6.3.1A-1	: Narrow-band	blocking
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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_{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.

Rx parameter	Rx parameter Units Channel bandwidth						
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in		REF	SENS + ch	annel band	width speci	fic value bel	ow
Transmission Bandwidth Configuration	dBm	6	6	6	6	7	9
Configuration Image: Configuration 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.							

Table 7.7.1-1	Spurious	response	parameters
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Table 7.7.1-2: Spurious response

Parameter	Unit	Level
P _{Interferer} (CW)	dBm	-44
FInterferer	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 uplink assigned to one E-UTRA band the spurious response requirements are defined with the uplink active on the band 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 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 both downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band (as noted in Table 5.5-1), the requirements for both downlinks shall be met with the uplink active in the 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 shall be configured at nominal channel spacing to the PCC with the PCC configured closest to the uplink band. Downlink PCC and SCC are both activated. 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 intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, 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 specified in clause 7.7.1 for each component carrier while both downlink carriers are active.

Rx Parameter	Units	CA Bandwidth Class				
		В	С	D	E	F
Pw in Transmission Bandwidth	dPm	REFSENS + CA Bandwidth Class specific value below				
Configuration, per CC	ration, per CC		9			
NOTE 1: The transmitter shall be set to 4dB below PCMAX_L or PCMAX_L_CA 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-1: Spurious response parameters

Table 7.7.1A-2: Spurious response

Parameter	Unit	Level		
P _{Interferer} (CW)	dBm	-44		
FInterferer	MHz	Spurious response frequencies		

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_{CMAX_L} is defined as the total transmitter power over the two transmit antenna connectors.

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

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

The throughput shall be $\ge 95\%$ 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

Rx Parame	eter	Units			С	hannel ban	dwidth				
			1.4 MHz	1.4 MHz 3 MHz		5 MHz	10 MHz	15 MHz	20 MHz		
Power in			RI	FSEN	S + chan	nel bandwi	dth specific	value below			
Transmissior Bandwidth Configuratior		dBm	12	8		6	6 7		9		
P _{Interferer 1} (CW)		dBm				-46					
P _{Interferer 2} (Modulated)		dBm									
BW Interferer 2			1.4		3			5			
FInterferer 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*FInterferer 1								
NOTE 1: Th	ne trans	mitter sha	all be set to 4dB	below I	PCMAX_L a	t the minim	um uplink c	onfiguration	specified in		
Ta	able 7.3	.1-2 with	PCMAX_L as defin	ed in su	ubclause	6.2.5.	-	-			
NOTE 2: Re	eference	e measur	ement channel is	s specif	fied in Ar	nex A.3.2 v	vith one side	ed dynamic	OCNG		
Pa	attern O	P.1 FDD/	/TDD as described in Annex A.5.1.1/A.5.2.1.								
NOTE 3: Th	ne modu	ulated inte	rferer consists of the Reference measurement channel specified in Annex								
A.	3.2 with	one side	d dynamic OCN	G Patte	ern OP.1	FDD/TDD a	as describe	d in Annex			
			n set-up accordii						is 5MHz E-		
U	TRA sig	nal as de	scribed in Annex	CD for	channel I	oandwidth ≥	≥5MHz	-			

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.

7.8.1A Minimum requirements for CA

For inter-band carrier aggregation with uplink assigned to one E-UTRA band the wide band intermodulation requirements are defined with the uplink active on the band 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 both downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band (as noted in Table 5.5-1), the requirements for both downlinks shall be met with the uplink active in the 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 wideband intermodulation requirements of subclause 7.8.1A do not apply.

For intra-band contiguous carrier aggegation the downlink SCC shall be configured at nominal channel spacing to the PCC with the PCC configured closest to the uplink band. Downlink PCC and SCC are both activated. 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

Rx parameter	Units		CA	A Bandwidth C	lass					
•		В	С	D	E	F				
Pw in		RE	FSENS + CA B	andwidth Class	specific value b	below				
Transmission										
Bandwidth	dBm		12							
Configuration, per			12							
CC										
PInterferer 1	dBm			-46						
(CW)				40						
PInterferer 2	dBm			-46						
(Modulated)					-	1				
BW Interferer 2	MHz		5							
FInterferer 1	MHz		-F _{offset} -7.5							
(Offset)			/							
			+ F _{offset} +7.5							
FInterferer 2	MHz			2*FInterferer 1						
(Offset)										
NOTE 1: The trans										
NOTE 2: Reference					one sided dynai	mic OCNG				
			ed in Annex A.5.							
			ferer consists of the Reference measurement channel specified in Annex							
			dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex							
		•	ing to Annex C.3							
	•	dulated signal is	5MHz E-UTRA	signal as desci	ibed in Annex D	for channel				
bandwid	th ≥5MHz									

Table 7.8.1A-1: Wide band intermodulation

For intra-band non-contiguous carrier aggregation with one uplink carrier and two downlink carriers, 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 specified in subclause 7.8.1.1 for each component carrier while both downlink carriers are active. The wide band intermodulation requirements shall be supported for out-of-gap test only.

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.

7.8.2 Void

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			
$30MHz \le f < 1GHz$	100 kHz	-57 dBm				
1 GHz \leq f \leq 12.75 GHz	1 MHz	-47 dBm				
12.75 GHz \leq f \leq 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 give by PDCCH_RA/RB as defined in Annex C.3.1.						

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.

Rx parameter	Units	Α	В	С	D	E	F
Receiver image rejection	dB			25			

Table 7.10.1A-1: Receiver image rejection

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 Dual-antenna receiver capability

The performance requirements are based on UE(s) that utilize a dual-antenna receiver.

For all test cases, the SNR is defined as

$$SNR = \frac{\hat{E}_{s}^{(1)} + \hat{E}_{s}^{(2)}}{N_{oc}^{(1)} + N_{oc}^{(2)}}$$

where the superscript indicates the receiver antenna connector. 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

$$SINR = \frac{\hat{E}_{s}^{(1)} + \hat{E}_{s}^{(2)}}{N_{oc}^{(1)'} + N_{oc}^{(2)'}}$$

where the superscript indicates the receiver antenna connector. 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.

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.

8.1.2.2 Applicability of requirements for CA capability

The applicability of the requirements with respect to CA capabilities is given as in Table 8.1.2.2-1. In case the CA capability is omitted, the requirement is applicable to a UE regardless of its CA capability.

Table 8.1.2.2-1: Applicability of the requirement with respect to the CA capability

CA	CA Capability Description			
Capability				
CL_X	The requirement is applicable to a UE that indicates a CA bandwidth			
	class X on at least one E-UTRA band.			
CL_X-Y	The requirement is applicable to a UE that indicates CA bandwidth			
	classes X and Y on at least one E-UTRA band combination.			
Note: The CA bandwidth classes are defined in Table 5.6A-1				

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.

8.1.2.3 Applicability of requirements 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 Table 5.6A.1-1, Table 5.6A.1-2 and Table 5.6A.1-3. For UEs supporting different CA configurations and bandwidth combination sets, the applicability rules are defined for the tests with 2 DL CCs as following. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

For tests specified in Table 8.2.1.1.1-4, Table 8.2.1.3.1-4 and Table 8.2.1.4.3-4, the tests are applicable for any one of the supported FDD CA configurations. Only one of the supported bandwidth combinations from the selected CA configuration is tested. The tested bandwidth combination is determined among the supported bandwidth combinations in the following order: 10+10 MHz, 20+20 MHz.

For tests specified in Table 8.2.2.1.1-4, Table 8.2.2.3.1-4 and Table 8.2.2.4.3-4, the tests are applied to any one of the supported TDD CA configurations covering the largest aggregated CA bandwidth combination.

For tests specified in Table 8.2.1.3.1A-2, the tests are applied to any one of the supported FDD CA configurations covering the largest aggregated CA bandwidth combination.

For tests specified in Table 8.2.2.3.1A-2, the tests are applied to any one of the supported TDD CA configurations covering the largest aggregated CA bandwidth combination.

For tests defined in Table 8.2.1.7.1-2 the tests are applied to the supported FDD intra-band contiguous CA configurations covering the lowest and highest operating bands with bandwidth combination as 20+20MHz.

For tests defined in Table 8.2.2.7.1-2, the tests are applied to the supported TDD intra-band contiguous CA configurations covering the lowest and highest operating bands with bandwidth combination as 20+20MHz.

For tests specified in Table 8.7.1-4, the tests are applied to any one of the supported FDD CA configurations covering the largest aggregated CA bandwidth combination, unless otherwise stated.

For tests specified in Table 8.7.2-4, the tests are applied to any one of the supported TDD CA configurations covering the largest aggregated CA bandwidth combination, unless otherwise stated.

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 component carrier	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
Number of OFDM symbols for PDCCH per component carrier	per 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

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 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.

Para	mete	r	Unit	Test 1- 5	Test 6-8	Test 9- 15	Test 16- 18	Test 19
Deventintener	$ ho_{\scriptscriptstyle A}$		dB	0	0	0	0	0
Downlink pov allocation		$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)				
		σ	dB	0	0	0	0	0
$N_{_{oc}}$ at an	ntenna	a port	dBm/15kHz	-98	-98	-98	-98	-98
Symbols for unused PRBs Modulation PDSCH transmission mode				OCNG (Note 2)				
				QPSK	16QAM	64QAM	16QAM	QPSK
				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 QPSF modulated.								
	Note 3: Void.							

Table 8.2.1.1.1-2: Minimum	performance (FRC)
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				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)	UE 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
0	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
7	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
0	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
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
10	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	1x2 70 2 Low 70 2 Low 70 2 Low 70 2 Low 30 2 Low 70 2 Low 30 2 Low 30 2 Low 30	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								
Note 3	: Test 1 m	ay not be exe	cuted for UE-	s for which T	Fest 1 in Table 8.	.2.1.1.1-4 is ap	olicable.	

Table 8.2.1.1.1-3: Test Parameters for CA

P	arameter	Unit	Test 1-2			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)			
allocation	σ	dB	0			
N _{oc} a	t antenna port	dBm/15kHz	-98			
Symbols	for unused PRBs		OCNG (Note 2)			
N	lodulation		QPSK			
PDSCH tr	ansmission 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: PUCCH format 1b with channel selection is used to feedback ACK/NACK. Note 4: The same PDSCH transmission mode is applied to each component carrier. 						

		Propa-	Correlation	Reference	value				
Te: nur		Reference channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	UE cate gory	CA capa- bility

1	2x10 MHz	R.2 FDD	OP.1 FDD (Note 1)	EVA5	1x2 Low	70	-1.1	≥3	CL_A-A (Note 2)	
2	2x20 MHz	R.42 FDD	OP.1 FDD (Note 1)	EVA5	1x2 Low	70	-1.3	≥5	CL_C	
Note 1	Note 1: The OCNG pattern applies for each CC.									
Note 2	Note 2: 30usec timing difference between two CCs is applied in inter-band CA case.									
Note 3	Note 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined									
	in 8.1.2.3.									

- 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.

Parameter		Unit	Test 1				
	$ ho_{\scriptscriptstyle A}$	dB	0				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)				
	σ	dB	0				
$N_{\scriptscriptstyle oc}$ at antenna	port	dBm/15kHz	-98				
Symbols for MBSFN MBSFN subframes			OCNG (Note 3)				
PDSCH transmission	on mode		1				
whole MBS		an MBSFN subfrar e except the first tv					
Note 3: The MBSF QPSK mod not inserted	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	e 1PKB	(FRC)
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ĺ	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.

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 8.2.1.2.1-1: Test Parameters for Transmit diversity Performance (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference	Reference value	
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
2	10 MHz	R.10 FDD	OP.1 FDD	HST	2x2	70	-2.3	≥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: $P_B = 1$.								

Test	Band- Reference		OCNG	Propagation	Correlation	Reference v	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.

		1		
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
\widehat{E}_{s}/N_{oc2}		dB	Reference Value in Table 8.2.1.2.3-2	6
BW _{Channel}		MHz	10	10
Subframe Configura	ition		Non-MBSFN	Non-MBSFN
Time Offset between	Cells	μs	2.5 (synchror	nous cells)
Cell Id			0	1
ABS pattern (Note	5)		N/A	11000100 11000000 11000000 11000000 11000000
RLM/RRM Measurement Pattern (Note 6)			10000000 10000000 10000000 10000000 1000000	N/A
	C _{CSI,0}		11000100 11000000 11000000 11000000 11000000	N/A
CSI Subframe Sets (Note7)			00111011 00111111 00111111 00111111 00111111	N/A
Number of control OFDM			2	
PDSCH transmission	mode		2	N/A
Cyclic prefix			Normal	Normal
overlapping with th Note 3: This noise is applie ABS. Note 4: This noise is applie Note 5: ABS pattern as de Note 6: Time-domain mea	ne aggressor Å ed in OFDM sy ed in all OFDM fined in [9]. surement reso	ymbols #0, #4, #7, #11 of a A symbols of a subframe ov purce restriction pattern for	a subframe overlapping verlapping with aggress PCell measurements a	with the aggressor or non-ABS s defined in [7]
measurements de	fined in [7].	me-domain measurement s the aggressor cell. The n		

Table 8.2.1.2.3-1: Test Parameters for Transmit diversity Performance (FRC)

is the same. Note 9: SIB-1 will not be transmitted in Cell2 in this test.

Test Number	Reference Channel		OCNG Propagation Pattern Conditions (Note 1)		Correlation Reference Value Matrix and Antenna			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:					Cell2 are	statistically indep	pendent.		
Note 2:	SNR correspo	nds to \widehat{E}	$_{s}/N_{oc2}$	of cell 1.					
Note 3: Note 4:	Note 3: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.								
Note 5:	The maximum	Through	put is cal	culated f	rom the tota	al Payload in 9 s	subframes, avera	aged ove	r 40ms.

Table 8.2.1.2.3-2: Minimum Performance Transmit Diversity (FRC)

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.

Parameter		Unit	Cell 1	Cell 2	Cell 3				
Farameter									
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3				
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 Table8.2.1.2.3A- 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 betwe	en Cells	Hz	N/A	300	-100				
Cell Id			0	126	1				
ABS pattern (Not	e 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 transmission	n 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 									
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-1: Test Parameters for Transmit diversity Performance (FRC)

Test Number	Reference Channel	OC	······································		Correlation Matrix and	Reference	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: Note 2:	The correlation	n matrix a	ind anten	na config	guration ap			y independent. 2 and Cell 3.			
Note 3:	SNR corresponds to \hat{E}_s / N_{ac2} of cell 1.										
Note 4:		the servir	ng cell sul	bframe v	when the s	ubframe i	s overlap	and its associate ped with the ABS			land

Table 8.2.1.2.3A-2: Minimum Performance Transmit Diversity (FRC)

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.

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	Cyclic Prefix			Normal	Normal		
Cell Id	Cell Id			1	2		
Number of control OFDM	symbols		2	2	2		
PDSCH transmission			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	al	ms	5	N/A	N/A		
Reporting mode		PUCCH 1-0	N/A	N/A			
Note 1: $P_B = 1$							
Note 2: The respective rec	eived power s	pectral density of	of each interfering	cell relative to N_a	$_{c}$ 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. 							

Table 8.2.1.2.4-1: Test Parameters for Transmit diversity Performance (FRC) with TM3 interference model

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	Propagation Conditions		Correlation 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 (%)	SINR (dB) (Note 2)	gory
1	R.46 FDD	OP.	N/A	N/A	EV	EV	EV	2x2 Low	70	-1.1	≥1
		1			A70	A70	A70				
		FD									
		D									
Note 1:											
Note 2: SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.											
Note 3:	Correlation ma	trix and	anten	na conf	iguratic	on para	meters	apply for each o	f Cell 1, Cell 2 a	nd 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 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.

Parameter		Unit	Test 1-2
Davadiala a succes	$ 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 transmissio	on mode		3
Note 1: $P_B = 1$.			
Note 2: Void			
Note 3: Void			

Table 8.2.1.3.1-1: Test Parameters for Large Delay CDD (FRC)

				Propa-	Correlation	Reference value				
Test num	Bandwidth	Reference channel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)	UE category		
1	10 MHz	R.11 FDD	OP.1 FDD	EVA70	2x2 Low	70	13.0	≥2		
2	10 MHz	R.35 FDD	OP.1 FDD	EVA200	2x2 Low	70	20.2	≥2		
Note 1:	Void.									
Note 2:	Test 1 may no	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.								

Table 8.2.1.3.1-3: Test Parameters for Large Delay CDD (FRC) for CA

	Parameter		Unit	Test 1-3			
Dourslin	k nowor	$ ho_{\scriptscriptstyle A}$	dB	-3			
alloc	k power ation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)			
		σ	dB	0			
N_{oc}	at antenna	port	dBm/15kHz	-98			
PDSCH	transmissio	on mode		3			
Note 1:	$P_B = 1$.						
Note 2:	PUCCH format 1b with channel selection is used to feedback ACK/NACK.						
Note 3:	The same PDSCH transmission mode is applied to each						
	componen	t carrier.					

				Dropo	Correlation	Correlation Reference va			
Test num	Bandwidt h	Reference channel	OCNG pattern	Propa- gation condi- tion	matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)	UE category	CA capa- bility
1	2x10 MHz	R.11 FDD	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.7	≥3	CL_A-A
2 (Note 2)	2x20 MHz	R.30 FDD	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.2	≥5	CL_C
Note 1: Note 2: Note 3:	The OCNG pattern applies for each CC. Void The applicability of requirements for different CA configurations and bandwidth combination 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 inTable 8.2.1.3.1A-3.

P	Parameter		Unit	Test 1-7		
Downlink	00000	$ ho_{\scriptscriptstyle A}$	dB	-3		
Downlink allocat		$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)		
		σ	dB	0		
$N_{_{oc}}$ a	at antenna	port	dBm/15kHz	-98		
PDSCH t	ransmissio	on mode		3		
Note 1:	$P_B = 1$.					
5	For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK.					
	For CA test cases, the same PDSCH transmission mode is applied to each component carrier.					

Table 8.2.1.3.1A-1: Test Parameters for soft buffer management test (FRC) for CA

Table 8.2.1.3.1A-2: Minimum performance soft buffer management test (FRC) for CA

Prona-							Reference value		
Test num	Bandwi dth	Reference channel	OCNG pattern	gation condi- tion	Correlation matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)	CA capa- bility	
1	2x20 MHz	R.30 FDD	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.2	CL_A-A CL_C	
2	15MHz +	R.35-2 FDD for 15MHz CC	OP.1 FDD (Note 1)	EVA5	2x2 Low	70	15.1	CL_A-A	
2	10MHz	R.35-3 FDD for 10MHz CC	OP.1 FDD (Note 1)		ZXZ LOW	70	15.1		
3	20MHz +	R.30 FDD for 20MHz CC	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.5	CL_A-A	
5	10MHz	R.11 FDD for 10MHz CC	OP.1 FDD (Note 1)		2x2 Low	70	13.5		
4	20MHz +	R.30 FDD for 20MHz CC	OP.1 FDD (Note 1)	EVA70	2v2 Low	70	13.5		
4	15MHz	R.30-1 FDD for 15MHz CC	OP.1 FDD (Note 1)	EVATU	EVA70 2x2 Low	70	13.5	CL_A-A	
5	2x20 MHz	R.35-1 FDD	OP.1 FDD (Note 1)	EVA5	2x2 Low	70	15.8	CL_A-A CL_C	
6	20MHz +	R.35-1 FDD for 20MHz CC	OP.1 FDD (Note 1)	EVA5	2x2 Low	70	15.9	CL_A-A	
0	10MHz	R.35-3 FDD for 10MHz CC	OP.1 FDD (Note 1)	LVAS	ZXZ LOW	70	15.9	CL_A-A	
7	20MHz +	R.35-1 FDD for 20MHz CC	OP.1 FDD (Note 1)	EVA5	2x2 Low	70	15.9		
1	15MHz	R.35-2 FDD for 15MHz CC	OP.1 FDD (Note 1)	EVAS	ZXZ LOW	70	15.9	CL_A-A	
Note 2:	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.								

UE category	Bandwidth combination with maximum aggregated bandwidth (Note 1)							
OE 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.								

Table 8.2.1.3.1A-3: Test points for soft buffer management tests for CA

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.

Parameter		Unit	Test 1
Develiele e ever	$ 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
PDSCH transmission	on mode		3
Note 1: $P_B = 1$			

Table 8.2.1.3.2-2: Minimum performance Large Delay CDD (FRC)	Table 8.2.1.3.2-2: M	linimum performance	Large Delay CDD	(FRC)
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ſ	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	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.

Parameter		Unit	Cell 1	Cell 2			
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3			
Downlink power allocation	$\rho_{\scriptscriptstyle B}$	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			
\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 (synchror	nous cells)			
ABS pattern (Note	÷5)		N/A	11000100, 11000000, 11000000, 11000000, 11000000			
RLM/RRM Measurement Pattern(Note 6)			10000000 10000000 10000000 10000000 1000000	N/A			
CSI Subframe Sets (Note	C _{CSI,0}		11000100 11000000 11000000 11000000 11000000	N/A			
7)	C _{CSI,1}		00111011 00111111 00111111 00111111 00111111	N/A			
Number of control OFD	1 symbols		2				
PDSCH transmission	mode		3 Normal	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 OFDI and OFDI							
Cell2 is the same Note 9: SIB-1 will not be t		Cell2 in this test.					

Table 8.2.1.3.3-1: Test Parameters for Large Delay CDD (FRC) – Non-MBSFN ABS

Test Number	Reference Channel	OCNG	Pattern	Cond	gation itions te 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:		pagation conditions for Cell 1 and Cell2 are statistically independent.							
Note 2:	SNR correspo	SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.							
Note 3: Note 4:	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 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 9 subframes, averaged over 40ms.								
Note 5:									10ms

Table 8.2.1.3.3-2: Minimum Performance 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_{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 8.2.1.3.3-4	6			
BW _{Channel}		MHz	10	10			
Subframe Configura	ation		Non-MBSFN	MBSFN			
Cell Id			0	126			
Time Offset between	Cells	μs	2.5 (synchror	nous cells)			
ABS pattern (Note	9 5)		N/A	0001000000 010000010 0000001000 00000000			
RLM/RRM Measurement Pattern (Note 6			0001000000 010000010 000001000 00000000	N/A			
C _{CSI,0} CSI Subframe Sets (Note			0001000000 010000010 000001000 00000000	N/A			
7)	C _{CSI,1}		1110111111 1011111101 1111110111 1111110111 111111	N/A			
MBSFN Subframe Allocation	on (Note 10)		N/A	001000 100001 000100 000000			
Number of control OFDN			2				
PDSCH transmission Cyclic prefix	mode		3 Normal	N/A 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 4th, 12th, 19th and 27th 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], four frames with 24 bits is chosen for MBSFN 							
Note 11: The maximum nu	subframe allocation. te 11: The maximum number of uplink HARQ transmission is limited to 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test.						

Table 8.2.1.3.3-3: Test Parameters for Large Delay CDD (FRC) – MBSFN ABS

Test Number	Reference Channel	OCNG	Pattern	Cond	gation itions te 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:		agation conditions for Cell 1 and Cell2 are statistically independent.							
Note 2:	SNR correspo	IR corresponds to \hat{E}_s/N_{oc2} of cell 1.							
Note 3: Note 4:	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 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.								

 Table 8.2.1.3.3-4: Minimum Performance Large Delay CDD (FRC) – MBSFN ABS

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.

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
\widehat{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 betwe	en Cells	Hz	N/A	300	-100
Cell Id			0	1	126
ABS pattern (Not	e 5)		N/A	11000000 11000000 11000000 11000000 11000000	11000000 11000000 11000000 11000000 11000000
RLM/RRM Measur Subframe Pattern (f			10000000 10000000 10000000 10000000 1000000	N/A	N/A
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 transmission	n mode		3	Note 9	Note 9
Cyclic prefixNote 1: $P_B = 1$.Note 2:This noise is	applied in		Normal #1, #2, #3, #5, #6, #8, #	Normal	Normal
overlappingNote 3:This noise is aggressor ANote 4:This noise is Note 5:Note 5:ABS patternNote 6:Time-domai [7]Note 7:As configure	with the ag applied in BS. applied in as defined n measurer ed according	gressor ÅBS. OFDM symbols all OFDM symbo in [9]. nent resource re g to the time-don	#0, #4, #7, #11 of a sub ols of a subframe overla striction pattern for PCe nain measurement reso	oframe overlappi apping with aggre ell measurement	ng with the essor non-ABS s as defined in
indicated by Note 9: Downlink ph OCNG patter	of control ("0" of ABS sysical chan ern as define	DFDM symbols is pattern. nel setup in Cell ed in Annex A.5.	s not available for ABS 2 and Cell 3 in accorda Cell 2 and Cell 3 is the	ance with Annex	

Table 8.2.1.3.4-1: Test Parameters for Large Delay CDD (FRC) – Non-MBSFN ABS

Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Test Numb	Refer ence	$\widehat{E}_{s}/$	\hat{E}_{s}/N_{oc2}		NG Patt	ern		ropagatio		Correlatio n Matrix				
er	Chan nel	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	and Antenna Configurat ion (Note 2)	Fraction of Maximu m Through put (%) 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:										ependent.				
Note 2:						•	n apply f	or Cell 1,	Cell 2 ar	nd Cell 3.				
Note 3:				37 002	of cell 1									
Note 4:	transm	nitted in	the se	rving cell	subfram		ne subfra	me is ove	erlapped	l its associated with the ABS s				
Note 5:	The m	aximun	n Throu	ighput is	calculate	d from th	e total Pa	ayload in	9 subfrai	mes, averaged	over 40ms.			

Table 8.2.1.3.4-2: Minimum Performance Large Delay CDD (FRC) – Non-MBSFN ABS

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.

Parameter		Unit	Test 1	Test 2	
Downlink nowor	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	
	σ	dB	0	0	
$N_{\scriptscriptstyle oc}$ at antenna	port	dBm/15kHz	-98	-98	
Precoding granul	arity	PRB	6	50	
PMI delay (Note	e 2)	ms	8	8	
Reporting inter	val	ms	1	1	
Reporting mod	le		PUSCH 1-2	PUSCH 3-1	
CodeBookSubsetR on bitmap	estricti		001111	001111	
PDSCH transmis mode	sion		4	4	
Note 1: $P_{R} = 1$.					
SF#n ba	sed on I), this re	in an available upl PMI estimation at a ported PMI cannot	downlink SF not la	iter than	

Table 8.2.1.4.1-1: Test Parameters for Si	ngle-Layer Spatial Multiplexing (FRC)
---	---------------------------------------

Test	Band-	Band- Reference OCNG		Propagation	Correlation	Reference v	UE	
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.10 FDD	OP.1 FDD	EVA5	2x2 Low	70	-2.5	≥1
2	10 MHz	R.10 FDD	OP.1 FDD	EPA5	2x2 High	70	-2.3	≥1

 Table 8.2.1.4.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

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.

Parameter		Unit	Test 1			
Downlink nowor	$ ho_{\scriptscriptstyle A}$	dB	-6			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)			
	σ	dB	3			
$N_{_{oc}}$ at antenna p	ort	dBm/15kHz	-98			
Precoding granula	arity	PRB	6			
PMI delay (Note	2)	ms	8			
Reporting interv	al	ms	1			
Reporting mode	e		PUSCH 1-2			
CodeBookSubsetRe	estricti		000000000000000000000000000000000000000			
on bitmap			000000000000000000000000000000000000000			
			0000000000000000			
			111111111111111111			
PDSCH transmiss	sion		4			
mode						
Note 1: $P_B = 1$.						
Note 2: If the UE r	eports	in an available uplin	k reporting instance			
at subram	e SF#n	based on PMI estimation at a downlink				
SF not late	er than	SF#(n-4), this reported PMI cannot be				
applied at	the eN	B downlink before SF#(n+4).				

Table 8.2.1.4.1A-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	Reference value	
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	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 rankone 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.

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 p	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	l symbols		2	2	2		
PDSCH transmission			6	N/A	N/A		
Interference mod	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				
transmission rank in interfering cells	Rank 2	%	N/A	20	20		
Precoding granula	rity	PRB	50	6	6		
PMI delay (Note		ms	8	N/A	N/A		
Reporting interva	al	ms	5	N/A	N/A		
Reporting mode	•		PUCCH 1-1	N/A	N/A		
CodeBookSubsetRestrict	on bitmap		001111	N/A	N/A		
Note 1: $P_{R} = 1$							
5	ceived power	spectral density of	of each interfering	cell relative to N_a	$_{c}$ is defined by		
 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 8.2.1.4.1B-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model

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		opagat onditio		Correlation 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 (%)	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:								e statistically inc	dependent.		
Note 2:	SINR correspo	onds to	\widehat{E}_{s}/N	oc' of (Cell 1 a	s define	ed in cla	ause 8.1.1.			
Note 3:	Correlation ma	trix and	anten	na conf	iguratic	on parai	meters	apply for each o	f Cell 1, Cell 2 a	nd 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.

Downlink power allocation ρ_{I} Downlink power allocation ρ_{I} σ_{I} σ_{I} σ_{oc} N_{oc} N_{oc} at antenna port N_{oc} \hat{E}_{s}/N_{oc2} N_{oc2} BW ChannelBW ChannelSubframe ConfigurationTime Offset between CellsFrequency abit between Configuration	dB dB dB/15kHz dBm/15kHz dBm/15kHz	-3 -3 (Note 1) 0 -98 (Note 2)	-3 -3 (Note 1) N/A	-3 -3 (Note 1)
$\begin{tabular}{ c c c c } \hline Downlink power allocation & $$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$$	dB dB dB/15kHz dBm/15kHz dBm/15kHz	0 -98 (Note 2)	N/A	. ,
σ N_{oc} at antenna port N_{oc} \widehat{E}_s/N_{oc2} $\widehat{BW}_{Channel}$ Subframe Configuration Time Offset between Cells	dBm/15kHz dBm/15kHz	-98 (Note 2)		
$\begin{array}{c c} N_{oc} \text{ at antenna port} & \hline N_{oc} \\ \hline N_{o} \\ \hline \hat{E}_s / N_{oc2} \\ \hline \\ BW_{\text{Channel}} \\ \hline \\ Subframe Configuration \\ \hline \\ Time Offset between Cells \\ \hline \end{array}$	dBm/15kHz		(Note 2) N/A (Note 3) N/A (Note 4) N/A nce Value in 3.2.1.4.1C-2 12 10 10 -MBSFN Non-MBSFN N/A 3 N/A 300 0 126 11000000 10	N/A
$\begin{array}{c c} N_{oc} \text{ at antenna port} & \hline N_{oc} \\ \hline N_{o} \\ \hline \hat{E}_s / N_{oc2} \\ \hline \\ BW_{\text{Channel}} \\ \hline \\ Subframe Configuration \\ \hline \\ Time Offset between Cells \\ \hline \end{array}$	dBm/15kHz		N/A	N/A
$\frac{\widehat{E}_{s}/N_{oc2}}{\text{BW}_{\text{Channel}}}$ Subframe Configuration Time Offset between Cells	dBm/15kHz	-30 (14018-3)	N/A	N/A
BW _{Channel} Subframe Configuration Time Offset between Cells		-93 (Note 4)	N/A	N/A
Subframe Configuration Time Offset between Cells	dB	Reference Value in Table 8.2.1.4.1C-2	12	10
Time Offset between Cells	MHz	10	10	10
		Non-MBSFN	Non-MBSFN	Non-MBSFN
Eroquopov shift hotware Or	μs	N/A	3	-1
Frequency shift between Ce	lls 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 Measurement Subframe Pattern (Note 6)		1000000 1000000 1000000 1000000 1000000 1000000	N/A	N/A
C _{CS} CSI Subframe Sets	1,0	11000000 11000000 11000000 11000000 11000000	N/A	N/A
(Note7) C _{CS}	I,1	00111111 00111111 00111111 00111111 00111111	N/A	N/A
Number of control OFDM symbols		2	Note 8	Note 8
PDSCH transmission mode	9	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
CodeBookSubsetRestrictio bitmap	n			
Cyclic prefix		1111	N/A	N/A

Table 8.2.1.4.1C-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) – Non-MBSFN ABS

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:	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

Test Number	Reference Channel	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 Configurati on (Note 2)	Fraction of Maximum Throughput (%) Note 5	SNR (dB) (Note 3)	gory
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: Note 2:								ally independen Cell 2 and Cell 3.			
Note 3:	SNR correspo	onds to \hat{I}	\hat{E}_{s}/N_{oc2} of	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	n Throug	hput is ca	alculated	from the	total Pay	load in 9	subframes, ave	raged over 40ms	S.	

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.

Parameter		Unit	Test 1-2	
Downlink nowor	$ 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 (Note 2)		ms	8	
Reporting interval		ms	1	
Reporting mo	de		PUSCH 3-1	
CodeBookSubsetRestriction bitmap			110000	
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).				

Table 8.2.1.4.2-1: Test Parameters 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.35 FDD	OP.1 FDD	EPA5	2x2 Low	70	18.9	≥2
2	10 MHz	R.11 FDD	OP.1 FDD	ETU70	2x2 Low	70	14.3	≥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 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.

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

$N_{_{oc}}$ at antenna port	dBm/15kHz	-98		
Precoding granularity	PRB	6		
PMI delay (Note 2)	ms	8		
Reporting interval	ms	1		
Reporting mode		PUSCH 1-2		
CodeBookSubsetRestrictio		000000000000000000000000000000000000000		
n bitmap		0000000111111111111111100		
		0000000000000		
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-Laye	r Spatial Multi	plexing (I	FRC)

				Propa-	Correlation	Reference value		
Test num.	Band- width	Referencechannel	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	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	Test 1	Test 2	
Develiele e ever	$ ho_{\scriptscriptstyle A}$	dB	-6	-6	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)	-6 (Note 1)	
	σ	dB	3	3	
$N_{_{oc}}$ at antenna	port	dBm/15kHz	-98 -98		
Precoding granu	Ilarity	PRB	6	8	
PMI delay (Not	e 2)	ms	8	8	
Reporting inter	rval	ms	1	1	
Reporting mo	de		PUSCH 1-2 PUSCH 1-2		
CodeBookSubsetRe	estriction		0000000000000000000	0000000000000	
bitmap			000000000000 00000000000000000000000000		
			0000001111111	0000001111111	
			1111111110000	1111111110000	
			000000000000	000000000000	
CSI request field (Note 3)		'1	0'	
PDSCH transmission	on mode		4	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 1 st set of serving cells by higher layers.					
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured.					
		ansmission mode is	applied to each con	nponent carrier.	

			Propa-		Correlation	Reference value			
Test num.	Band- width	Referencechannel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	UE cate- Gory	CA capa- bility
1	2x10 MHz	R.14 FDD	OP.1 FDD (Note 1)	EVA5	4x2 Low	70	10.8	≥3	CL_A- A
2	2x20 MHz	R.14-3 FDD	OP.1 FDD (Note 1)	EVA5	4x2 Low	70	10.9	≥5	CL_C
Note 1: The OCNG pattern applies for each CC.									
Note 2:	Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined								
	in 8.1.2	2.3.							

Table 8.2.1.4.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC) for CA

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

The requirements in this section verify the ability of an intraband adjancent carrier aggregation UE to demodulate the signal transmitted by the PCell in the presence of a stronger SCell signal on an adjacent frequency. Throughput is measured on the PCell only.

8.2.1.7.1 Minimum Requirement

For CA 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.

Parameter		Unit	Test 1
Devertister	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
	σ	dB	0
$\hat{E}_{s} - {}^{PCell}$ at anter PCell	ina port of	dBm/15kHz	-85
\hat{E}_{s} _ $SCell$ at anter Scell	ina port of	dBm/15kHz	-79
$N_{\scriptscriptstyle oc}$ at antenn	a port	dBm/15kHz	Off (Note 2)
Symbols for unus	ed PRBs		OCNG (Note 3)
Modulatio	n		64 QAM
Maximum number transmissi	••••••		1
Redundancy versi sequence	-		{0}
PDSCH transmiss of PCell	sion mode		1
PDSCH tramsmiss of SCell			3
Note 1: $P_{B} = 0$.			
Note 2:No external noise sources are appliedNote 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
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Test Number	Band- width		rence nnel	OCNG I	Pattern	Propa Cond	gation itions	Correlation Matrix and Antenna		Matrix and		Matrix and		Referen Fracti Maxi Througi	ion of Category mum		CA capabi lity
		PCell	SCell	PCell	SCell	PCell	SCell	PCell	SCell	PCell	SCell						
1	2x20M Hz	R.49 FDD	NA	OP.1 FDD	OP.5 FDD	AWGN	Clause B.1	1x2	2x2	85%	NA	≥5	CL-C				
Note 1: Note 2:	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. The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.																

8.2.2 TDD (Fixed Reference Channel)

The parameters specified in Table 8.2.2-1 are valid for all TDD tests unless otherwise stated.

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						
Cross carrier scheduling		Not configured						
	Note 1: as specified in Table 4.2-2 in TS 36.211 [4].							

Table 8.2.2-1: Common Test Parameters (TDD)

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 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.

Paramete	er	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
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)

Table 8.2.2.1.1-1: Test Parameters

	σ	dB	0	0	0	0	0			
N _{oc} at ante	enna	dBm/15kHz	-98	-98	-98	-98	-98			
Symbols	for		OCNG	OCNG	OCNG	OCNG	OCNG			
unused Pl	RBs		(Note 2)	(Note 2)	(Note 2)	(Note 2)	(Note 2)			
Modulati	on		QPSK	16QAM	64QAM	16QAM	QPSK			
ACK/NAG	ACK/NACK		Multiplexing	Multiplexing	ultiplexing Multiplexing		Multiplexing			
feedback n	node									
PDSCH	1		1	1	1	1	1			
transmission	mode									
	=0		blocks are as	igned to an ar	hitrary number	of virtual LIEs y	with one			
PE	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									
		ndom data, wh	iich is QPSK m	odulated.						
	id.									
Note 4: Vo	id.									

Table 8.2.2.1.1-2: Min	imum performance (FRC)
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Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE
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	Test 1
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0
power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
	σ	dB	0
N_{i}	$_{pc}$ at antenna port	dBm/15kHz	-98
Symb	ols for unused PRBs		OCNG (Note 2)
	Modulation		QPSK
ACK/N	ACK feedback mode		PUCCH format 1b with channel selection
PDSC	H transmission mode		1
Note 1:	$P_B = 0$		
Note 2:	These physical resource blo	ocks are assigne	ed to an arbitrary number of virtual UEs with one
F	PDSCH per virtual UE; the	data transmitted	over the OCNG PDSCHs shall be uncorrelated
F	oseudo random data, which	n is QPSK modu	lated.
Note 3:	The same PDSCH transmis	ssion mode is ap	pplied to each component carrier.

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE	CA
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category	capability
1	2x20MHz	R.42 TDD	OP.1 TDD (Note 1)	EVA5	1x2 Low	70	-1.2	≥5	CL_C, CL_A-A
Note 1:		attern applies							
Note 2:	The applicab	ility of require	ments for c	lifferent CA conf	igurations and ba	ndwidth combin	ation se	ets is defined	in 8.1.2.3.

- 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.

	Parameter		Unit	Test 1		
		$ ho_{\scriptscriptstyle A}$	dB	0		
	nk power cation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)		
		σ	dB	0		
N_{i}	_{oc} at antenna	port	dBm/15kHz	-98		
	s for MBSFN N subframes			OCNG (Note 3)		
ACK/N	IACK feedba	ck mode		Multiplexing		
PDSC	H transmissio	on mode		1		
Note 1: Note 2:	$P_B = 0$ The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the first slot.					
Note 3:						

Table 8.2.2.1.4-1: Test Parameters for Testing 1 PRB allocation

 Table 8.2.2.1.4-2: Minimum performance 1PRB (FRC)

Test	Bandwidth	Reference	OCNG	Propagation		Reference	value	UE
number		Channel	Pattern	Condition	Matrix and	Fraction of	SNR	Category
					Antenna Configuration	Maximum Throughput	(dB)	
					g	(%)		
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.

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: $P_B = 1$			

Test	Bandw	Bandw Reference OCNG		Propagation	Correlation	Reference	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	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

Table 8.2.2.2.1-2: Minimum performance Transmit Diversity (FRC)

8.2.2.2.2 Minimum Requirement 4 Tx Antenna Port

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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.

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 transmissio	on mode		2				
Note 1: $P_B = 1$							

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 8.2.2.3-2, with the addition of parameters in Table 8.2.2.3-1 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 8.2.2.3-1, 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.

	Parameter		Unit	Cell 1	Cell 2
Uplink o	downlink confi	iguration		1	1
	subframe con			4	4
		$ ho_{\scriptscriptstyle A}$	dB	-3	-3
Downlin alloca		$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)
		σ	dB	0	N/A
			dBm/15kHz	-102 (Note 2)	N/A
N_{oc} at ant	N_{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 8.2.2.2.3-2	6
	BWChannel		MHz	10	10
Subf	rame Configu	ration		Non-MBSFN	Non-MBSFN
Time (Offset betwee	n Cells	μs	2.5 (synch	ronous cells)
	Cell Id			0	1
ABS	S pattern (No	te 5)		N/A	0000010001 0000000001
	Measuremer Pattern (Note			0000000001 0000000001	N/A
CSI Subfr	ame Sets	C _{CSI,0}		0000010001 0000000001	N/A
(Not	e 7)	C _{CSI,1}		1100101000 1100111000	N/A
Number of	f control OFD	M symbols		2	
	ACK feedbac			Multiplexing	
	H transmissio			2	N/A
	Cyclic prefix			Normal	Normal
Note 1: Note 2: TI	$P_B = 1$ his noise is an ubframe overl	oplied in OFDN apping with th	I symbols #1, #2, #3, #5, e aggressor ABS.		
th	e aggressor	ABS.	M symbols #0, #4, #7, #1		
no	on-ABS.		DM symbols of a subfrar	ne ovenapping v	
	•	defined in [9]			
		neasurement r	esource restriction patter	n for PCell meas	surements as
Note 7: A			ne time-domain measuren	nent resource re	striction pattern
Note 8: C	ell 1 is the se	rements define rving cell. Cell is the same.	2 is the aggressor cell. T	he number of the	e CRS ports in
			in Cell2 in this test.		

Table 8.2.2.2.3-1: Test Parameters for Transmit diversity	Performance (FRC)

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.11-4 TDD (Note 4)	OP.1 TDD	OP.1 TDD	EVA5	EVA5	2x2 Medium	70	3.8	≥2
Note 1:					Cell2 are s	statistically indepe	endent.		
Note 2:	SNR corresp	onds to E	C_s/N_{oc2} of	of cell 1.					
Note 3: Note 4:	: The correlation matrix and antenna configuration apply for Cell 1 and Cell 2.								
Note 5:	The maximur	n Through	put is cale	culated fro	om the tota	al Payload in 2 su	bframes, averag	ged over :	20ms.

Table 8.2.2.3-2: Minimum Performance Transmit Diversity (FRC)

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.

Parameter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink conf	iguration		1	1	1
Special subframe cor	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	N _{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A
N_{oc} at antenna port	N _{oc2}	dBm/15kHz	dB -3 -3 dB -3 (Note 1) -3 (Note 1) -3 (Note 1) dB 0 N/A N dB 0 N/A N /15kHz -98 (Note 2) N/A N /15kHz -98 (Note 3) N/A N /15kHz -93 (Note 4) N/A N /15kHz -93 (Note 4) N/A N /15kHz -93 (Note 4) N/A N dB Reference 12 - dB N/A 3 - MHz 10 10 - N/A 300 -1 0 126 - N/A 3000 -1 0 126 - N/A 0000000001 00000 0000000001 N/A N 0000000001 N/A N 1100111000 N/A N 2 Note 8 Note <td< td=""><td>N/A</td></td<>	N/A	
	N _{oc3}	dBm/15kHz		N/A	N/A
\widehat{E}_s/N_{oc2}		dB	Value in Table	12	10
BW _{Channel}		MHz	10	10	10
Subframe Configu	iration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	en Cells	μs	N/A	3	-1
Frequency shift betw	een Cells	Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (No	te 5)		N/A		0000000001 0000000001
RLM/RRM Measur Subframe Pattern (N/A	N/A
CSI Subframe Sets	C _{CSI,0}		000000001	N/A	N/A
(Note7)	C _{CSI,1}		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				Note 9	Note 9
Cyclic prefix			Normal	Normal	Normal
Note 1: $P_{B} = 1$.		•			
Note 2: This noise i subframe o Note 3: This noise i aggressor A	verlapping v s applied in \BS.	vith the aggresso OFDM symbols	or ABS. #0, #4, #7, #11 of a	subframe overlap	ping with the
Note 4: This noise i	s applied in		ols of a subframe ov	erlapping with age	gressor non-ABS
Note 5: ABS patterr					
	in measurer	ment resource re	striction pattern for	PCell measureme	nts as defined in
			nain measurement i	esource restriction	n pattern for CSI
	r of control	OFDM symbols is	s not available for A	BS and is 2 for the	e subframe
	nysical char		2 and Cell 3 in acc	ordance with Anne	ex C.3.3 applying
Note 10: The numbe	r of the CRS	S ports in Cell 1,	Cell 2 and Cell 3 is ad Cell 3 in this test.		

 Table 8.2.2.2.3A-1: Test Parameters for Transmit diversity Performance (FRC)

Test Number	Reference Channel	OCNG Pattern		Propagation Conditions (Note 1)				Reference	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
Note 1: Note 2: Note 3:	Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.										
Note 4: Note 5:	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.									ell and	

Table 8.2.2.2.3A-2: Minimum Performance	ce Transmit Diversity (FRC)
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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.

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			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	d	ms	5	N/A	N/A			
Reporting mode			PUCCH 1-0	N/A	N/A			
ACK/NACK feedback	mode		Multiplexing	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-s								

Table 8.2.2.2.4-1: Test Parameters for Transmit diversity Performance (FRC) with TM3 interference model

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	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 (%)	SINR (dB) (Note 2)	gory
1	R.46 TDD	OP.	N/A	N/A	EV	EV	EV	2x2 Low	70	-1.4	≥1
		1			A70	A70	A70				
		TD									
		D									
Note 1:								e statistically inc	dependent.		
Note 2:	SINR corresponds to \hat{E}_s / N_{oc} of Cell 1 as defined in clause 8.1.1.										
Note 3:	Correlation ma	trix and	anten	na conf	iguratic	n para	meters	apply for each o	f Cell 1, Cell 2 a	nd 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 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.

Parameter	•	Unit	Test 1-2
Deverliek newer	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{_{oc}}$ at antenna	a port	dBm/15kHz	-98
ACK/NACK feedba	ck mode		Bundling
PDSCH transmissi	on mode		3
Note 1: $P_B = 1$			
Note 2: Void.			
Note 3: Void.			

Table 8.2.2.3.1-1: Test Parameters for Large Delay CDD (FRC)

Test	Bandwidth	Reference OCNG Propagation C		Correlation	Reference v	Reference value		
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
Note 1	: Void							

Table 8.2.2.3.1-3: Test Parameters for Large Delay CDD (FRC) for CA

Parameter		Unit	Test 1					
Deumlink neuron	$ ho_{\scriptscriptstyle A}$	dB	-3					
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)					
	σ	dB	0					
$N_{\scriptscriptstyle oc}$ at antenna	port	dBm/15kHz	-98					
ACK/NACK feedba	ck mode		PUCCH format 1b with channel selection					
PDSCH transmission	on mode		3					
Note 1: $P_B = 1$								
Note 2: The same PDSCH transmission mode is applied to each component carrier.								

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	Reference value		CA	
num ber		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Cate gory	capabil ity	
1	2x20 MHz	R.30-1 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.7	≥5	CL_C	
			(Note 1)							
Note 1	Note 1: The OCNG pattern applies for each CC.									
Note 2	Note 1: The opticability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.									

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.

Parameter		Unit	Test 1-2				
Downlink nowor	$ 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		- (Note 2)				
PDSCH transmissi	on mode		3				
Note 1: $P_{B} = 1$							
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-1: Test Parameters for soft buffer management test (FRC) for CA

Table 8.2.2.3.1A-2: Minimum performance soft buffer management test (FRC) for CA

Test	Bandwidth	ndwidth Reference			Correlation	Reference	value	UE	CA
num ber		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Cate gory	capabil ity
1	2x20 MHz	R.30-2 TDD	OP.1 TDD (Note 1)	EVA70	2x2 Low	70	13.2	3	CL_C, CL_A-A
2	2x20 MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA5	2x2 Low	70	15.7	4	CL_C, CL_A-A
Note 1	Note 1: For CA test cases, the OCNG pattern applies for each CC.								
Note 2	: The applical 8.1.2.3.	bility of require	ments for dif	iferent CA config	urations and band	width combinati	on sets is	s defined	in

8.2.2.3.2 Minimum Requirement 4 Tx Antenna Port

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.

Parameter		Unit	Test 1
Develiele e ever	$ 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
ACK/NACK feedba	ck mode		Bundling
PDSCH transmission	on mode		3
Note 1: $P_B = 1$.			

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.

Par	ameter		Unit	Cell 1	Cell 2
Uplink downl	ink config	guration		1	1
Special subfra	ame conf	iguration		4	4
		$ ho_{\scriptscriptstyle A}$	dB	-3	-3
	Downlink power allocation		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	a 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 8.2.2.3.3-2	6
BV	Channel		MHz	10	10
Subframe	Configur	ration		Non-MBSFN	Non-MBSFN
C	ell Id			0	1
Time Offse	betweer	n Cells	μs	2.5 (synchro	nous cells)
ABS pat	tern (Not	e 5)		N/A	0000010001, 0000000001
RLM/RRM Measurement Subframe Pattern (Note 6)				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 cont	rol OFD	V symbols		2	
ACK/NACK	feedbacl	k mode		Multiplexing	
PDSCH trar	nsmissior	n mode		3	N/A
	ic prefix			Normal	Normal
subfrai	bise is ap me overla	apping with th	e aggressor ABS.	3, #5, #6, #8, #9, #10,#	
aggres	sor ABS		•	7, #11 of a subframe ov	
ABS.	-	-	-	ubframe overlapping wit	h aggressor non-
Note 5: ABS p	attern as	defined in [9]			
Note 6: Time-c in [7].	lomain m	easurement r	esource restriction p	pattern for PCell measu	rements as defined
	figured a	according to th	e time-domain mea	surement resource rest	riction pattern for
	•	ents defined in			
Note 8: Cell 1		ving cell. Cell		cell. The number of the	CRS ports in Cell1
			in Cell2 in this test.		

Table 8.2.2.3.3-1: Test Parameters for Large Delay CDD (FRC) – Non-MBSFN ABS

Test Number	Reference Channel	OCNG	Pattern		gation itions te 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 TDD (Note 4)	OP.1 TDD	OP.1 TDD	EVA 5	EVA 5	2x2 Low	70	14.0	≥2
Note 1:					Cell2 are s	statistically indepe	ndent.		
Note 2:	SNR corresp	onds to \widehat{E}	\hat{C}_s/N_{oc2} of	of cell 1.					
Note 3: Note 4:	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 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 maximur	n Through	put is cale	culated fro	om the tota	al Payload in 2 su	bframes, averag	ged over	20ms.

Table 8.2.2.3.3-2: Minimum Performance 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
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.2.3.3-4	6
BW _{Channel}		MHz	10	10
Subframe Configur	ation		Non-MBSFN	MBSFN
Cell Id			0	126
Time Offset betweer	n Cells	μs	2.5 (synchro	nous cells)
ABS pattern (Not	e 5)		N/A	0000000001 0000000001
RLM/RRM Measurement Pattern (Note 6			0000000001 0000000001	N/A
CSI Subframe Sets	C _{CSI,0}		0000000001 0000000001	N/A
(Note 7)	C _{CSI,1}		1100111000 1100111000	N/A
MBSFN Subframe Alloca 10)	ation (Note		N/A	000010
Number of control OFD	V symbols		2	
ACK/NACK feedback	k mode		Multiplexing	
PDSCH transmissior	n mode		3	N/A
Cyclic prefix			Normal	Normal
#13 of a subfrai	me overlappir	ig with the aggresso	3, #4, #5, #6, #7, #8, #9 or ABS. bframe overlapping with	
ABS.	-		ubframe overlapping wit	
		. The 10 th and 20 th s	subframes indicated by	ABS pattern are
		esource restriction	pattern for PCell measu	rements as defined
			surement resource rest	riction pattern for
CSI measureme Note 8: Cell 1 is the ser and Cell2 is the	ving cell. Cell		cell. The number of the	CRS ports in Cell1
Note 9: SIB-1 will not be	e transmitted me Allocation	in Cell2 in this test. as defined in [7], or	ne frame with 6 bits is cl	nosen for MBSFN

Test Number	Reference Channel	OCNG	Pattern	Cond	gation itions te 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 TDD (Note 4)	OP.1 TDD	OP.1 TDD	EVA 5	EVA 5	2x2 Low	70	12.2	≥2					
Note 1:					Cell2 are s	statistically indepe	endent.							
Note 2:	SNR correspo	onds to \widehat{E}	\hat{C}_s/N_{oc2} of	of cell 1.										
Note 3: Note 4:	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 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:						he maximum Throughput is calculated from the total Payload in 2 subframes, averaged over 20ms.								

Table 8.2.2.3.3-4: Minimum Performance Large Delay CDD (FRC) – MBSFN ABS

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.

Parameter		Unit	Cell 1	Cell 2	Cell 3	
Uplink downlink conf			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	iration		Non-MBSFN	Non-MBSFN	Non-MBSFN	
Time Offset betwee	en Cells	μs	N/A	3	-1	
Frequency shift betwe	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 (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	n mode		3	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 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	r of the CRS	S ports in Cell1, 0	Cell2 and Cell 3 is the d Cell 3 is the	e same.		

Table 8.2.2.3.4-1: Test Parameters for Large Delay CDD (FRC) – Non-MBSFN ABS

Test Num	Refer ence	$\widehat{E}_{s}/$	N _{oc2}	00	NG Patt	ern		ropagations (N		Correlation Matrix and			
ber	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: Note 2:									cally inde Cell 2 and	pendent.			
Note 3:							i appiy ic						
Note 4: Note 5:	 e 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. 												

Table 8.2.2.3.4-2: Minimum Performance Large Delay CDD (FRC) – Non-MBSFN ABS

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.

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			
$N_{\scriptscriptstyle oc}$ at antenna po	ort	dBm/15kHz	-98	-98			
Precoding granular	ity	PRB	6	50			
PMI delay (Note 2	2)	ms	10 or 11	10 or 11			
Reporting interva		ms	ms 1 or 4 (Note 3) 1				
Reporting mode			PUSCH 1-2	PUSCH 3-1			
CodeBookSubsetRest	riction		001111	001111			
bitmap							
ACK/NACK feedback	mode		Multiplexing	Multiplexing			
PDSCH transmission	mode		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 - c and 4ms.	lownlink	configuration 1 the rep	orting interval will alte	ernate between 1ms			

Table 8.2.2.4.1-1: Test Parameters for 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

 Table 8.2.2.4.1-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

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))
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Parameter		Unit	Test 1
Downlink nowor	$ 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 granul	arity	PRB	6
PMI delay (Note	e 2)	ms	10 or 11
Reporting inter-	val	ms	1 or 4 (Note 3)
Reporting mod	le		PUSCH 1-2
CodeBookSubsetR	estricti		00000000000000000
on bitmap			00000000000000000
			0000000000000111
			1111111111111
ACK/NACK feed	back		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
			stimation at a downlink
SF not la	ter than	SF#(n-4), this rep	orted PMI cannot be
		IB downlink before	
			1 the reporting interval
		ween 1ms and 4m	

Table 8.2.2.4.1A-2: Minimum performance	Single-Layer	Spatial Mult	tiplexing (FRC)
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Test	Bandwidth	Reference	OCNG	Propagation	Correlation	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	əl		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 granula	rity	PRB	50	6	6	
PMI delay (Note 4	1)	ms	10 or 11	N/A	N/A	
Reporting interva	l	ms	5	N/A	N/A	
Reporting mode		PUCCH 1-1	N/A	N/A		
CodeBookSubsetRestricti		001111	N/A	N/A		
ACK/NACK feedback		Multiplexing	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.

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		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 (%)	SINR (dB) (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:											
Note 2:	SINR corresponds to \hat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.										
Note 3:									of Cell 1, Cell 2 a	nd 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.

Paramete	r	Unit	Cell 1	Cell 2	Cell 3		
Uplink downlink cor			1	1	1		
Special subframe co	nfiguration		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 8.2.2.4.1C-2	12	10		
BW _{Channel}		MHz	10	10	10		
Subframe Config	uration		Non-MBSFN	Non-MBSFN	Non-MBSFN		
Time Offset betwe	en Cells	μs	N/A	3	-1		
Frequency shift betw	veen Cells	Hz	N/A	300	-100		
Cell Id			0	126	1		
ABS pattern (N	•		N/A	0000000001 0000000001	0000000001 0000000001		
RLM/RRM Measu Subframe Pattern			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 contro symbols	OFDM		2	Note 8	Note 8		
ACK/NACK feeba	ck mode		Multiplexing	N/A	N/A		
PDSCH transmissi	on mode		6	Note 9	Note 9		
Precoding gran		PRB	50	N/A	N/A		
PMI delay (Not		ms	10 or 11	N/A	N/A		
Reporting inte	rval	ms	1 or 4 (Note 11)	N/A	N/A		
Peporting mo	ode		PUSCH 3-1	N/A	N/A		
CodeBookSubsetR bitmap	estriction		1111	N/A	N/A		
Cyclic pref	х		Normal	Normal	Normal		
Note 1: $P_B = 1$. Note 2: This noise overlappin	is applied in g with the ag	gressor ABS.	#1, #2, #3, #5, #6, #8, ;	#9, #10,#12, #13	of a subframe		
 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							
Note 9: Downlink p		nnel setup in Cell	2 and Cell 3 in accorda	ance 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).							
			e reporting interval will a	alternate betwee	n 1ms and		

Table 8.2.2.4.1C-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) – Non-MBSFN ABS

Note 13: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.

Test Number	Reference Channel	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	OP.1	OP.1	OP.1	EPA5	EPA5	EPA5	2x2 High	70	6.4	≥2
	Note 4	TDD	FDD	TDD							
Note 1:	The propagation	on conditi	ons for C	ell 1, Cel	ll 2 and C	ell 3 are	statistical	lly independent.			
Note 2:	The correlation				juration a	pply for (Cell 1, Ce	ell 2 and Cell 3.			
Note 3:	SNR correspor	nds to \widehat{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	Through	put is cal	culated fr	om the to	otal Paylo	ad in 2 s	ubframes, averag	ed over 20ms.		

Table 8.2.2.4.1C-2: Minimum Performance Single-Layer Spatial Multiplexing (FRC)– Non-MBSFN ABS

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.

Parameter		Unit	Test 1-2			
Downlink nowor	$ 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			
Precoding granu	Ilarity	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			
CodeBookSubsetR	estriction		110000			
bitmap						
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).						
		configuration 1 the 1ms and 4ms.	reporting interval			

Table 8.2.2.4.2-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Table 8.2.2.4.2-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference	/alue	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.35 TDD	OP.1 TDD	EPA5	2x2 Low	70	19.5	≥2
2	10 MHz	R.11-1 TDD	OP.1 TDD	ETU70	2x2 Low	70	13.9	≥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 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.

Paramete	r	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	a port	dBm/15kHz	-98		
Precoding gran	ularity	PRB	6		
PMI delay (No	te 2)	ms	10 or 11		
Reporting inte	erval	ms	1 or 4 (Note 3)		
			D UDOUL 4 0		
Reporting mo			PUSCH 1-2		
ACK/NACK feedba			Bundling		
CodeBookSubsetR	estriction		000000000000000000000000000000000000000		
bitmap			0000011111111111111111000000		
			000000000		
PDSCH transmiss	on mode		4		
Note 1: $P_{B} = 1$.					
based or	reporting instance at subrame SF#n SF not later than SF#(n-4), this eNB downlink before SF#(n+4)				
Note 3: For Uplink - downlink configuration 1 the reporting interval will alternat between 1ms and 4ms.					
Note 4: Void.					
Note 5: Void.					
Note 6: Void.					

Table 8.2.2.4.3-1: Test Parameters for Multi-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagatio	Correlation	Reference v	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							

Parameter		Unit	Test 1
Develiel: newer	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3

N_{oc} at a	ntenna port	dBm/15kHz	-98
Precoding	g granularity	PRB	8
PMI dela	ay (Note 2)	ms	10 or 11
Reporti	ng interval	ms	1 or 4 (Note 3)
Report	ing mode		PUSCH 1-2
ACK/NACK	feedback mode		PUCCH format 1b with channel
			selection
CodeBookSu	ubsetRestriction		000000000000000000000000000000000000000
bit	tmap		0000111111111111111100000000
			0000000
CSI reques	t field (Note 4)		'10'
PDSCH tran	smission mode		4
Note 1: P_B	=1.		
	•	•	porting instance at subrame SF#n
			F not later than SF#(n-4), this
			IB downlink before SF#(n+4)
	•	•	reporting interval will alternate
	ween 1ms and 4m		is the 1 st set of serving cells by high
Note 4: Mul	•	est are configured a	is the 1 set of serving cells by high
Note 5: The	e same PDSCH tra	Insmission mode is	applied to each component carrier.

Table 8.2.2.4.3-4: Minimum performance Mu	Iti-Layer Spatial Multiplexing (FRC) for CA
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Test	Band-	Reference	OCNG	Propagation	Correlation	Reference	UE	CA		
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Cate- gory	capa- bility	
1	2x20 MHz	R.43 TDD	OP.1 TDD (Note 1)	EVA5	4x2 Low	70	11.1	≥5	CL_C , CL_A -A	
Note 1: Note 2:	The OCNG pattern applies for each CC. The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.									

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 adjancent carrier aggregation UE to demodulate the signal transmitted by the PCell in the presence of a stronger SCell signal on an adjacent frequency. Throughput is measured on the PCell 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.

Paramet	er	Unit	Test 1				
Develiate a surray	$ ho_{\scriptscriptstyle A}$	dB	0				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)				
anooanon	σ	dB	0				
\hat{E}_{s} _ PCell at ante PCell	nna port of	dBm/15kHz	-85				
\hat{E}_{s} _ <i>SCell</i> at ante Scell	nna port of	dBm/15kHz	-79				
N_{oc} at anten	na port	dBm/15kHz	Off (Note 2)				
Symbols for unu	sed PRBs		OCNG (Note 3)				
Modulati	on		64 QAM				
Maximum numbe transmiss		1					
Redundancy vers	-		{0}				
PDSCH transmis of PCe	sion mode		1				
PDSCH transmis of SCe			3				
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 8.2.2.7.1-1: Test Parameters for CA

Table 8.2.2.7.1-2	: Minimum	performance	(FRC) for CA
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Test Number	Band- width	Reference OCNG Channel		OCNG F	OCNG Pattern Propagation Conditions		Correlation Matrix and Antenna		Reference value Fraction of Maximum Throughput (%)		UE Category	CA capabi lity	
		PCell	SCell	PCell	SCell	PCell	SCell	PCell	SCell	PCell	SCell		
1	2x20M	R.49	NA	OP.1		AWGN	Clause	1x2	2x2	85%	NA	≥5	CL-C
Note 1: Note 2:	control	Iz TDD TDD B.1 e OCNG pattern for PCell is used to fill the control channel. The OCNG pattern for SCell is used to fill the netrol channel and PDSCH. e applicability of requirements for different CA configurations and bandwidth combination sets is defined 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.

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			
Number of OFDM symbols for PDCCH	OFDM symbols	2			
Precoder update granularity		Frequency domain: 1 PRG for Transmission mode 9 and 10 Time domain: 1 ms			
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].					

Table 8.3.1-1: Common Test Parameters for User-specific Reference Symbols

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.

parameter		Unit	Test 1	Test 2						
Devertisher	$ ho_{\scriptscriptstyle A}$	dB	0	0						
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)						
	σ	dB	-3	-3						
Beamforming mo			Annex B.4.1	Annex B.4.1						
Cell-specific refere signals	ence		Antenna	ports 0,1						
CSI reference sign	nals		Antenna ports 15,,18	Antenna ports 15,,18						
CSI-RS periodicity subframe offse <i>T</i> _{CSI-RS} / Δ _{CSI-RS}	t	Subframes	5/2	5/2						
CSI reference sig configuration	nal		0	3						
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap		Subframes / bitmap	3 / 0001000000000000000	3 / 0001000000000000						
$N_{\scriptscriptstyle oc}$ at antenna p	ort	dBm/15kHz	-98	-98						
Symbols for unus PRBs	ed		OCNG (Note 4)	OCNG (Note 4)						
Number of allocative resource blocks (No.		PRB	50	50						
Simultaneous transmission			No	Yes (Note 3, 5)						
PDSCH transmiss mode	sion		9	9						
Note 1: $P_B = 1$.Note 2:The modu port 7 or 8Note 3:Modulatic port (7 or Note 4:Note 4:These ph virtual UE OCNG PI	modelote 1: $P_B = 1$.lote 2:The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.lote 3:Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.									
			ties $n_{ m SCID}$ are set to 0							
DIM RS W	ith inte	riering simultar	neous transmission test	DM RS with interfering simultaneous transmission test cases.						

Table 8.3.1.1-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI RS configurations

 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	e OCNG Propagation Correlation		Correlation	Reference	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.43 FDD	OP.1 FDD	EVA5	2x2 Low	70	-1	≥1	

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	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	

Table 8.3.1.1-3: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations

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.

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 referen	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 _{CS}	-RS / Δ CSI-RS	Subframes	5/2	N/A
CSI reference configuration			0	N/A
$N_{\scriptscriptstyle oc}$ at antenn	a port	dBm/15kH z	-98	N/A
DIP (Note	2)	dB	N/A	-1.73
BW _{Channe}	l	MHz	10	10
Cyclic Pref	ïx		Normal	Normal
Cell Id			0	126
Number of contro symbols	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 inte	erval	Ms	5	N/A
Reporting m	ode		PUCCH 1-1	N/A
CodeBookSubsetF bitmap	Restriction		0000000000000000 0000000000000000 000000	N/A
Symbols for unus	ed PRBs		OCNG (Note 6)	N/A
Simultaneous trar	smission		No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test	N/A
Note 1: $P_B = 1$				
Note 2: The resp			tral density of each inter P value as specified in c	-
Note 3: The mode			al under test in Cell 1 are	
Note 4: The prece Note 5: If the UE	oder in claus reports in ar	i available upli	s UE recommended PMI. nk reporting instance at s not later than SF#(n-4), s	subrame SF#n based

Table 8.3.1.1A-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model

	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 8.3.1.1A-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:							ly 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 ar	nd antenr	na configu	uration pa	arameters appl	y 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.

Parameter		Unit	Cell 1	Cell 2	Cell 3
		dB	0	-3	-3
Downlink power	ρ_A	dB	0 (Note 1)	-3 (Note 1)	-3 (Note 1)
allocation	$ ho_{\scriptscriptstyle B}$ σ	dB	-3	N/A	N/A
	N _{oc1}	dBm/15kHz	-	N/A	N/A
N at antonna port	N_{oc1} N_{oc2}	dBm/15kHz	-98 (Note 2) -98 (Note 3)	N/A N/A	N/A N/A
N_{oc} at antenna port	N _{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A
\widehat{E}_{s}/N_{oc2}	1 v oc3	dB	Reference Value	12	10
BW _{Channel}		MHz	in Table 2 10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
-					
Time Offset betwee		μs	N/A	3	-1
Frequency shift betwe	en Cells	Hz	N/A	300	-100
Cell Id			0	1	126
Cell-specific reference	e signals			ntenna ports 0,1	
CSI reference sig			Antenna ports 15,16	N/A	N/A
CSI-RS periodicity subframe offse $T_{CSI-RS} / \Delta_{CSI-R}$	et	Subframes	5 / 2	N/A	N/A
CSI reference sig configuration			8	N/A	N/A
Zero-power CSI- configuration	-RS	Subframes / bitmap	[3 / 0010000000000 00]	N/A	N/A
ABS pattern (Not	te 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		TM9-1layer	Note 9	Note 9
Precoding granul			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

Table 8.3.1.1B-1: Test parameters of TM9-Single-Layer (2 CSI-RS ports) – Non-MBSFN ABS

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
N / /0	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 12:	
Note 13:	The modulation symbols of the signal under test are mapped onto antenna port 7 or 8.

Table 8.3.1.1B-2: Minimum Performance of TM9-Single-Layer (2 CSI-RS ports) – Non-MBSFN ABS

Test Number	Reference Channel	00	NG Patt	ern	Propagation Conditions (Note1)		Correlation Reference Value Matrix and			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 FDD	OP.1 FDD	OP.1 FDD	OP.1 FDD		EVA5		2x2 Low	70	[7.8]	≥2
Note 1: Note 2: Note 3:	The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.										

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	Tes	st 1
		Cell 1		Cell 2
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	4	0
	$ 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 $T_{CSI-RS} / \Delta_{CSI-RS}$	Subframes	5/2	NA				
CSI reference signal configuration		8	NA				
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap	Subframes / bitmap	3 / 001000000000000000	NA				
$N_{_{oc}}$ at antenna port	dBm/15kHz	-98	-98				
\widehat{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: $P_B = 1$ 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 8.3.1.2-2: 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]	2-8
Note 1: Note 2:	Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2.									
Note 3:	SNR correspon	ds to E_s/N_{oc}	of Cell	1.						

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 Table 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.

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		
Cell-specific referer	nce signals		Antenna ports 0,1	(Note 2)		
CSI-RS 0 antenr	na ports		NA	Port {15,16}		
<i>qcl-CSI-RS-Configl</i> CSI-RS 0 period subframe offset <i>T</i> _{CSI}	icity and $_{-RS} / \Delta_{CSI-RS}$	Subframes	NA	5/2		
qcl-CSI-RS-Configl CSI-RS 0 config			NA	8		
csi-RS-ConfigZPId power CSI-RS 0 co I _{CSI-RS} / ZeroPower CSI-R	<i>-r11,</i> Zero- nfiguration		NA	2/ 000001000000000		
$N_{\it oc}$ at antenn	a port	dBm/15kH z	-98	-98		
\widehat{E}_{s}/N_{oc}		dB	Reference point in Table 8.3.1.3.1-3	Reference point in Table 8.3.1.3.1-3		
BW _{Channe}	I	MHz	10	10		
Cyclic Pref	ïx		Normal	Normal		
Cell Id			0	0		
Number of contro symbols	OFDM		2	2		
PDSCH transmiss	ion mode		Blanked	10		
Number of alloca	ted PRB	PRB	NA	50		
<i>qcl-Operation, '</i> PE Mapping and Qu Location Indic	iasi-Co-		Туре	B, '00'		
Time offset betwe	een TPs	μs	NA	Reference point in Table 8.3.1.3.1-3		
Frequency error be	tween TPs	Hz	NA	0		
Beamforming I	model		NA	As specified in clause B.4.1		
Symbols for unus	Symbols for unused 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	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

Test Number	Reference Channel			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 FDD	NA	OP.1 FDD	2	EPA	EPA	2x2 Low	70	12.1	≥2
2	R.52 FDD	NA	OP.1 FDD	-0.5	EPA	EPA	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.										

Table 8.3.1.3.1-3: Minimum performance for quasi co-location type B: same Cell ID

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 Table 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 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 configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of 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.

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.4.1
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 $T_{CSI-RS} / \Delta_{CSI-RS}$	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 $T_{CSI-RS} / \Delta_{CSI-RS}$	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/ 0010000000000000000000000000000000000	2/ 00100000000000000
Zero-power CSI-RS1 configuration I _{CSI-RS} / ZeroPower CSI-RS bitmap _S	Subframes /bitmap	2/ 0000010000000000	2/ 0000010000000000
\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
$N_{_{oc}}$ 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 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. The probability of occurrence of PQI set in each TP is equal.
 Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs

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.

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	PDSCH	Blanked
PQI set 1	CSI-RS 0	ZP CSI-RS 1	PDSCH	Blanked
PQI set 2	CSI-RS 1	ZP CSI-RS 0	Blanked	PDSCH
PQI set 3	CSI-RS 1	ZP CSI-RS 1	Blanked	PDSCH

Table 8.3.1.3.2-2 Configurations of PQI and DL transmission hypothesis for each PQI set

Table 8.3.1.3.2-3 Performance Requirements for timing offset compensation with DPS transmission

Test Number	Timing offset(us)	Reference Channel		NG tern	Propagation 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 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: 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.									

8.3.1.3.3 Minimum requirement with Different Cell ID and Colliding CRS (with single NZP CSI-RS resource)

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 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	er	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 $T_{CSI-RS} / \Delta_{CSI-RS}$	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		
\widehat{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		
<i>qcl-Operation, '</i> PDSCH RE Mapping and Quasi-Co- Location Indicator'		Туре В, '00'			
PDSCH transmission mode		Blank	10		
Number of allocated resource block		N/A	50		
Symbols for unused PRBs		N/A	OCNG(Note2)		
Note 1: $P_B = 1$ 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 8.3.1.3.3-2 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	UE Category		
		TP 1	TP 2	TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	R.54 FDD	N/A	N/A OP.1 EPA5 ETU5 2x2 Low 70 14.4 ≥2 FDD						
Note 1: Note 2: Note 3:	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. SNR corresponds to \hat{E}_s/N_{oc} of TP 2 as defined 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
Number of OFDM symbols for PDCCH	OFDM symbols	2
Precoder update granularity		Frequency domain: 1 PRB for Transmission mode 8, 1 PRG for Transmission mode 9 and 10Time domain: 1 ms
ACK/NACK feedback mode		Multiplexing
	Table 4.2-2 in TS 36. Table 4.2-1 in TS 36.	

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.

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 (Note 1)	0 (Note 1)		
	σ	dB	0	0	0	0		
Cell-specific refere signals	ence			Antenn	a port 0			
Beamforming mo	del		Annex B.4.1					
$N_{_{oc}}$ at antenna p	$N_{\scriptscriptstyle oc}$ at antenna port		-98	-98	-98	-98		
Symbols for unused	PRBs		OCNG (Note 2)	OCNG (Note 2)	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 8.3.2.1-1: Test Parameters for Testing DRS

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

Table 8.3.2.1-2: Minimum performance DRS (FRC)

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.

Parameter		Unit	Test 1	Test 2	Test 3	Test 4	Test 5			
Downlink power	$ 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	-3	-3	-3	-3	-3			
Cell-specific referend signals	e		Antenna port 0 and antenna port 1							
Beamforming mode					Annex B.4.1					
$N_{\scriptscriptstyle oc}$ at antenna por	N_{oc} at antenna port		-98	-98	-98	-98	-98			
Symbols for unused Pl		OCNG (Note 4)	OCNG (Note 4)	OCNG (Note 4)	OCNG (Note 4)	OCNG (Note 4)				
Simultaneous transmis	Simultaneous transmission			No	No	Yes (Note 3, 5)	Yes (Note 3, 5)			
PDSCH transmission m	node		8	8	8	8	8			
Note 3: Modulation sy input signal up	 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'	scram	bling identities	$n_{\rm SCID}$ are se	t to 0 for CDN	/I-multiplexed	DM RS with in	nterfering			
simultaneous	transm	nission test cas	es.							

 Table 8.3.2.1-3: Test Parameters for Testing CDM-multiplexed DM RS (single layer)

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 8.3.2.1-4: Minimum performance for CDM-multiplexed DM RS without simultaneous transmission (FRC)

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:	Note 1: 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.

Parameter		Unit	Test 1	Test 2		
Devertister	$ ho_{\scriptscriptstyle A}$	dB	0	0		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)		
	σ	dB	-3	-3		
Cell-specific refere signals	nce			ports 0,1		
CSI reference sigr	nals		Antenna ports 15,,22	Antenna ports 15,,18		
Beamforming mod	del		Annex B.4.1	Annex B.4.1		
CSI-RS periodicity subframe offset <i>T</i> _{CSI-RS} / ∆ _{CSI-RS}	t	Subframes	5 / 4	5 / 4		
CSI reference sign configuration	nal		1	3		
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap		Subframes / bitmap	4 / 0010000100000000	4 / 001000000000000000		
$N_{\scriptscriptstyle oc}$ at antenna p	ort	dBm/15kHz	-98	-98		
Symbols for unus PRBs	ed		OCNG (Note 4)	OCNG (Note 4)		
Number of allocat resource blocks (No		PRB	50	50		
Simultaneous transmission			No	Yes (Note 3, 5)		
PDSCH transmiss mode	ion		9	9		
port 7 or 8 Note 3: Modulatio port (7 or Note 4: These phy virtual UE OCNG PE	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:Modulation symbols of an interference signal is mapped onto the antenna port (7 or 8) not used for the input signal under test.					
			ties $n_{ m SCID}$ are set to 0 neous transmission test			

Table 8.3.2.1A-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with multiple CSI-RS configurations

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
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.50 TDD	OP.1 TDD	EVA5	2x2 Low	70	-0.6	≥1

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	value	UE Category
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:		ı channel applie	s to both the	input signal unde	er test and the inte	rfering signal.		1

Table 8.3.2.1A-3: Minimum performance for CDM-multiplexed DM RS with interfering simultaneous transmission (FRC) with multiple CSI-RS configurations

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.

$ ho_{\scriptscriptstyle A}$		Cell 1	Cell 2
	dB	0	0
$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
σ	dB	-3	-3
e signals		Antenna ports 0,1	Antenna ports 0,1
nals		Antenna ports 15,,18	N/A
and Δ_{CSI-RS}	Subframes	5 / 4	N/A
Inal		0	N/A
oort	dBm/15kH z	-98	N/A
	dB	N/A	-1.73
	MHz	10	10
		Normal	Normal
		0	126
OFDM		2	2
n mode		9	N/A
del		As specified in clause B.4.3 (Note 4, 5)	N/A
del		N/A	As specified in clause B.5.4
Rank 1		N/A	70
Rank 2		N/A	30
nularity	PRB	50	6
5)	ms	10 or 11	N/A
ral	ms	5	N/A
е		PUCCH 1-1	N/A
striction		0000000000000000 0000000000000000 000000	N/A
PRBs		OCNG (Note 6)	N/A
nission		No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal	N/A
	$rac{1}{2}$	nals Subframes and (\Delta CSI-RS nal Subframes nal dBm/15kH z dB MHz dB MHz DFDM n mode del Gel Rank 1 Rank 2 nularity PRB 5) ms al ms	nalsAntenna ports $15,,18$ and $/ \Delta_{CSI-RS}$ Subframes $5/4$ inal0oortdBm/15kH z -98 dBN/AdBN/AdBN/AMHz10oord0DFDM2omode9delAs specified in clause B.4.3 (Note 4, 5)delN/ARank 1N/AnularityPRB505)ms10 or 11ralms5PUCCH 1-1striction000000000000000000000000000000000

Table 8.3.2.1B-1: Test Parameters for Testing CDM-multiplexed DM RS (single layer) with TM9 interference model

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 8.3.2.1B-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model

Test Number	Referenc e		NG tern		gation itions	Correlatio n Matrix	Reference V	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:							ly 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 ar	nd antenr	a configu	uration pa	arameters appl	y 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.

Parameter	Parameter		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)
anoodion	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 Cells		Hz	N/A	300	-100
Cell Id			0 1		126
Cell-specific referenc	e signals		A	ntenna ports 0,1	
CSI reference signals			Antenna ports 15,16	N/A	N/A
CSI-RS periodicity subframe offs $T_{CSI-RS} / \Delta_{CSI-R}$	et	Subframes	5 / 4	N/A	N/A
CSI reference si configuration			8	N/A	N/A
Zero-power CSI configuration I _{CSI-RS} / ZeroPowe bitmap	-RS	Subframes / bitmap	[4 / 0010000000000 00]	N/A	N/A
ABS pattern (No	te 5)		N/A	0000000001 00000000001	0000000001 0000000001
RLM/RRM Measur Subframe Pattern (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
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 me			Annex B.4.1	N/A	N/A
Cyclic prefix			Normal	Normal	Normal

Table 8.3.2.1.C-1: Test parameters of TM9-Single-Layer (2 CSI-RS ports) – Non-MBSFN ABS

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.
	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	00	NG Patt	ern	Propagation Conditions (Note1)		Correlation Reference Value Matrix and		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	R.51 TDD	OP.1	OP.1	OP.1		EVA5		2x2 Low	70	[8.5]	≥2
		TDD	TDD	TDD							
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. SNR corresponds to \hat{E}_s / N_{oc2} 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.

Parame	ter	Unit	Test 1	Test 2		
Downlink ρ_A		dB	0	0		
power	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)		
allocation	σ	dB	-3	-3		
Cell-spe referend symbol	ce		Antenna port 0 ar 1	nd antenna port		
Beamforn mode			Annex	B.4.2		
$N_{_{oc}}$ at antenna port		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:	$P_{R} = 1$					
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 8.3.2.2-1: Test Parameters for Testing CDM-multiplexed DM RS (dual layer)

Table 8.3.2.2-2: Minimum performance 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 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	

8.3.2.3 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

noromotor		Unit	Test 1			
parameter		Unit	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		

OCNG PDSCH modulated.	s shall be unco	prrelated pseudo rando	m data, which is QPSK					
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								
Note 1: $P_B = 1$								
PDSCH transmission mode		9	Blanked					
Simultaneous transmission		No	NA					
Number of allocated resource blocks (Note 2)	PRB	50	NA					
Symbols for unused PRBs		OCNG (Note 2)	NA					
\widehat{E}_{s}/N_{oc}		Reference Value in Table 8.3.2.3-2	Test specific, 7.25dB					
N_{oc} at antenna port	dBm/15kHz	-98	-98					
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap	Subframes / bitmap	4 / 00100000000000000000	NA					
CSI reference signal configuration		8	NA					
CSI-RS periodicity and subframe offset <i>T</i> _{CSI-RS} / Δ _{CSI-RS}	Subframes	5 / 4	NA					
Beamforming model		Annex B.4.2	NA					
CSI reference signals		Antenna ports 15,16	NA					
Cell ID		0	126					
Cell-specific reference signals		Antenna ports 0 and 1	Antenna ports 0 and 1					

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			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 16QAM 1/2	R.51 TDD	OP.1 TDD	N/A	ETU5	ETU5	2x2 Low	70	[14.8]	2-8
Note 1: Note 2: Note 3:	The propagation Correlation matr SNR correspond	ix and antenna	a configu	ration par				nd Cell 2.		

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 Table 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.

Paramete	er	Unit	TP 1	TP 2
Deverlight newser	$ 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	(Note 2)
CSI-RS 0 anteni	na ports		NA	Port {15,16}
<i>qcl-CSI-RS-Configl</i> CSI-RS 0 period subframe offset <i>T</i> _{CS}	icity and $_{\rm I-RS}$ / $\Delta_{\rm CSI-RS}$	Subframes	NA	5/4
qcI-CSI-RS-Config CSI-RS 0 config	juration		NA	8
csi-RS-ConfigZPId power CSI-RS 0 co I _{CSI-RS} / ZeroPower CSI-R	nfiguration		NA	4/ 0000010000000000
$N_{\scriptscriptstyle oc}$ at antenn	a 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}	I	MHz	10	10
Cyclic Pret	fix		Normal	Normal
Cell Id			0	0
Number of contro symbols	OFDM		2	2
PDSCH transmiss	ion mode		Blanked	10
Number of alloca	ted PRB	PRB	NA	50
<i>qcl-Operation, '</i> PE Mapping and Qu Location Indic	iasi-Co-		Туре	B, '00'
Time offset betwe	een TPs	μs	NA	Reference point in Table 8.3.2.4.1-3
Frequency error be	tween TPs	Hz	NA	0
Beamforming	model		NA	As specified in clause B.4.1
Symbols for unus	Symbols for unused PRBs		NA	OCNG (Note 3)
Note 1: $P_B = 1$				
Noet 2: REs for a Note 3: These ph with one	iysical resou PDSCH per	rce blocks are virtual UE; the	zero transmission powe assigned to an arbitrary data transmitted over th n data, which is QPSK r	number of virtual UEs e OCNG PDSCHs

PQI set index	Parameter	s in each PQI set	hypothesi	smission s for each 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 8.3.2.4.1-2 Configurations of PQI and DL transmission hypothesis for each PQI set

Table 8.3.2.4.1-3: Minimum performance for quasi co-location type B: same Cell ID

Test Number	Reference Channel		CN tern	Time offset between	Propag Condi (Not	tions	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	EPA	EPA	2x2 Low	70	12	≥2
2	R.52 TDD	NA	OP.1 TDD	-0.5	EPA	EPA	2x2 Low	70	12.4	≥2
Note 1:	The propagation	on condi	tions for	TP 1 and TP	2 are sta	tistically	independent.			
Note 2:		The correlation matrix and antenna configuration apply for TP 1 and TP 2.								
Note 3:	SNR correspo	nds to \hat{E}	\hat{Z}_s / N_{oc}	of TP 2 as de	efined in o	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 Table 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]. In8.3.2.4.2-1 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 configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of PDSCH RE Mapping and Quasi-Co-Location Indicator configuration (PQI). Configurations of 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.

paramete	er	Unit	TP 1	TP 2
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Beamforming mode	1		N/A	As specified in clause B.4.1
Cell-specific referer	nce signals		Antenna ports 0,1	(Note 2)
CSI reference signa			Antenna ports {15,16}	N/A
CSI-RS 0 periodicity subframe offset T_{CS}	$_{\rm I-RS}$ / $\Delta_{\rm CSI-RS}$	Subframes	5 / 4	N/A
CSI reference signa configuration	al O		0	N/A
CSI reference signa			N/A	Antenna ports {15,16}
CSI-RS 1 periodicity subframe offset T _{CS}	I-RS / Δ_{CSI-RS}	Subframes	N/A	5 / 4
CSI reference signa configuration			N/A	8
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPower CSI-RS	bitmap	Subframes /bitmap	4/ 0010000000000000000000000000000000000	4/ 00100000000000000
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPower CSI-RS		Subframes /bitmap	4/ 0000010000000000	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 por	t	dBm/15kH z	-98	-98
BW _{Channel}		MHz	10	10
Cyclic Prefix			Normal	Normal
Cell Id			0	0
Number of control C symbols	DFDM		2	2
Timing offset betwe	en TPs		N/A	Reference Value in Table 8.3.2.4.2-3
Frequency offset be		Hz	N/A	0
Number of allocated blocks	d resource	PRB	50	50
PDSCH transmissio			10	10
Probability of occur PDSCH transmission		%	30	70
Symbols for unused	PRBs		OCNG (Note 4)	OCNG (Note 4)
Note 1: $P_B = 1$ Note 2: REs for a	antenna ports		zero transmission powe	<u>г.</u>

Table 8.3.2.4.2-1 Test Parameters for timing offset compensation with DPS transmission

Note 3: PDSCH transmission from TPs shall be randomly determined independently for each subframe. Probabilities of occurrence of PDSCH transmission from TPs are specified. The probability of occurrence of PQI set in each TP is equal.
 Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs

bote 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.

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	PDSCH	Blanked
PQI set 1	CSI-RS 0	ZP CSI-RS 1	PDSCH	Blanked
PQI set 2	CSI-RS 1	ZP CSI-RS 0	Blanked	PDSCH
PQI set 3	CSI-RS 1	ZP CSI-RS 1	Blanked	PDSCH

Table 8.3.2.4.2-2 Configurations of PQI and DL transmission hypothesis for each PQI set

Table 8.3.2.4.2-3 Performance Requirements for timing offset compensation with DPS transmission

Test Number	Timing offset(us)	Reference Channel	OC Pat	NG tern		gation itions	Correlation 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 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:	The propaga	ation conditior	is for TF	1and 7	FP 2 are	statistica	ally independent.			
Note 2:		Correlation matrix and antenna configuration parameters apply for each of TP 1 and TP 2.								
Note 3:	SNR corresp	ponds to $ \widehat{E}_{s} ig/ $	N_{oc} of	both TF	P 1 and 1	FP 2 as o	defined in clause 8	3.1.1.		

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 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.

parameter		Unit	TP 1	TP 2
Downlink nowor	$ 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.4.2				
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/ 001000000000000000				
\widehat{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				
$N_{\scriptscriptstyle oc}$ 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				
<i>qcl-Operation, '</i> PDSCH RE Mapping and Quasi-Co- Location Indicator'		Туре	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: $P_B = 1$ 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 8.3.2.4.3-2 Performance Requirements for quasi co-location type B with different Cell ID and Colliding CRS

Test Number	Reference Channel		NG tern	Cond	gation itions te1)	Correlation Matrix and Antenna	Reference	Reference Value	
		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: Note 2: Note 3:	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. 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.

Parame	eter	Unit	Single antenna port	Transmit diversity
Number of PDC	CH symbols	symbols	2	2
Number of PHICH	H groups (<i>N</i> g)		1	1
PHICH du	ration		Normal	Normal
Unused RE-s a	and PRB-s		OCNG	OCNG
Cell I	D		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_{oc} at anter	N_{oc} at antenna port		-98	-98
Cyclic prefix			Normal	Normal

Table 8.4.1-1: Test Parameters for PDCCH/PCFICH

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	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	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.

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference value	
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
1	10 MHz	4 CCE	R.16 FDD	OP.1 FDD	EVA70	2 x 2 Low	1	-0.6

Table 8.4.1.2.1-1: Minimum performance PDCCH/PCFICH

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.

ſ	Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference value	
	number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
-							Inati ix		
	1	5 MHz	2 CCE	R.17 FDD	OP.1 FDD	EPA5	4 x 2 Medium	1	6.3

Table 8.4.1.2.2-1: Minimum performance PDCCH/PCFICH

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.

Parameter		Unit	Cell 1	Cell 2			
	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 8.4.1.2.3- 2	1.5			
BW _{Channel}		MHz	10	10			
Subframe Config	uration		Non-MBSFN	Non-MBSFN			
Time Offset betwe		μs	2.5 (synchro	nous cells)			
Cell Id			0	1			
ABS pattern (N	ote 4)		N/A	00000100 00000100 00000100 01000100 00000100			
RLM/RRM Measureme Pattern (Note			00000100 00000100 00000100 00000100 00000100	N/A			
C _{CSI,0} CSI Subframe Sets			00000100 00000100 00000100 01000100 00000100	N/A			
(Note 6)	C _{CSI,1}		11111011 11111011 11111011 10111011 10111011 11111011	N/A			
Number of control OF			3				
Number of PHICH g PHICH durat			1 Extended				
Unused RE-s and			OCNG				
Cyclic prefi Note 1: This noise is a		ymbols #1, #2, #3, #5,	Normal	Normal			
 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 8.4.1.2.3-1: Test Parameters for 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
Note 1:	The propagation conditions for Cell 1 and Cell 2 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.								

Table 8.4.1.2.3-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS

Parameter		Unit	Cell 1	Cell 2	
Downlink power	PCFICH_RA 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_{ot}		dB	Reference Value in Table 8.4.1.2.3- 4	1.5	
BW _{Chanr}	nel	MHz	10	10	
Subframe Conf	Subframe Configuration		Non-MBSFN	MBSFN	
Time Offset betw	Time Offset between Cells		2.5 (synchronous cells)		
Cell Id	Cell Id		0	126	
ABS pattern (Note 4)			N/A	0001000000 0100000010 0000001000 0000000	
RLM/RRM Measurement Subframe Pattern (Note 5)			0001000000 010000010 000001000 00000000	N/A	
CSI Subframe Sets	C _{CSI,0}		000100000 010000010 000001000 000000000	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 OFDM symbols			3		
Number of PHICH groups (Ng)			1		
PHICH duration			extended		
Unused RE-s and PRB-s			OCNG		
Cyclic pre	TIX	l	Normal	Normal	

Table 8.4.1.2.3-3: Test Parameters for PDCCH/PCFICH – MBSFN ABS

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:	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 limited to 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 Propagation Pattern Conditions (Note 1)		Correlation Matrix and Antenna	Reference 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:									
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.								

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.

Param	eter	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		
\widehat{E}_{s}/N	l _{oc2}	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	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	00000100 00000100 00000100 00000100 00000100	00000100 00000100 00000100 00000100 00000100		
	RLM/RRM Measurement Subframe Pattern (Note 5)		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 11111011	N/A	N/A		
Number of control			2	Note 7	Note 7		
Number of PHIC			1	N/A	N/A		
PHICH d Unused RE-s			Normal OCNG	N/A OCNG	N/A OCNG		
Cyclic			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];							
	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.							
		oorts in Cell1, Cell2 a ted in Cell2 and Cell		me.			

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	-2.2
Note 1:	The propagati	on conditions f	or Cell 1,	Cell 2 ar	nd Cell 3	are statis	stically ind	depender	nt.		
Note 2:	Note 2: The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.										
Note 3:	SNR correspo	nds to \hat{E}_s / N_o	of cell	1.							

Table 8.4.1.2.4-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS

Paran	neter	Unit	Cell 1	Cell 2	Cell 3	
Downlink power	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	
\widehat{E}_s/N_{oc2}		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 between Cells		μs	N/A	3	-1	
Frequency shift between Cells		Hz	N/A	300	-100	
Cell	Cell Id		0	126	1	
ABS patter	n (Note 4)		N/A	0001000000 010000010 0000001000 00000000	0001000000 010000010 0000001000 00000000	
RLM/RRM Measu Pattern (0001000000 010000010 000001000 00000000	N/A	N/A	
CSI Subframe	C _{CSI,0}		0001000000 010000010 000001000 00000000	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 contro			2	Note 8	Note 8	
Number of PHIC			1	N/A	N/A	
PHICH o Unused RE-s			Normal OCNG	N/A OCNG	N/A OCNG	
Cyclic			Normal	Normal	Normal	

Table 8.4.1.2.4-3: Test Parameters for PDCCH/PCFICH – MBSFN ABS

Note 1:	This noise is applied in OFDM symbols #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13 of
1.0.0 1.	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 limited to 2 so that each PHICH channel
	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			nel Conditions (Note 1)		jj								Referen	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: 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. 														

8.4.2 TDD

The parameters specified in Table 8.4.2-1 are valid for all TDD tests unless otherwise stated.

Parame	eter	Unit	Single antenna port	Transmit diversity
Uplink downlink o (Note	•		0	0
Special subframe configuration (Note 2)			4	4
Number of PDC	CH symbols	symbols	2	2
Number of PHICH groups (Ng)			1	1
PHICH du	ration		Normal	Normal
Unused RE-s a	and PRB-s		OCNG	OCNG
Cell II	D		0	0
Deurslink neuen	PDCCH_RA PHICH_RA OCNG_RA	dB	0	-3
Downlink power allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	0	-3
$N_{\scriptscriptstyle oc}$ at anter	nna port	dBm/15kHz	-98	-98
Cyclic pi	refix		Normal	Normal
ACK/NACK feed	back mode		Multiplexing	Multiplexing
		2-2 in TS 36.211 [4 2-1 in TS 36.211 [4		

Table 8.4.2-1: Test Parameters for PDCCH/PCFICH

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.

Test	Bandwidth		Reference	OCNG	Propagation	Antenna	Reference 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	andwidth Aggregation		OCNG	Propagation	Antenna	Reference value	
number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
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.

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 TDD	OP.1 TDD	EPA5	4 x 2 Medium	1	6.5

Table 8.4.2.2.2-1: Minimum performance PDCCH/PCFICH

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 8.4.2.2.3-1, 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.

Paramet	er	Unit	Cell 1	Cell 2
Uplink downlink co	onfiguration		1	1
Special subframe of	configuration		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_{oc}	2	dB	Reference Value in Table 8.4.2.2.3-2	1.5
BW _{Chann}	el	MHz	10	10
Subframe Conf	iguration		Non-MBSFN	Non-MBSFN
Time Offset betw	veen Cells	μS	2.5 (synchro	nous cells)
Cell Id			0	1
ABS pattern (Note 4)		N/A	0000010001 0000000001
RLM/RRM Measuren Pattern(No			0000000001 0000000001	
CSI Subframe	C _{CSI,0}		0000010001 0000000001	N/A
Sets(Note 6)	C _{CSI,1}		1100101000 1100111000	N/A
Number of control O	FDM symbols		3	
ACK/NACK feed			Multiplexing	
Number of PHICH			1	
PHICH dura			extended	
Unused RE-s ar			OCNG	
Cyclic pre			Normal	Normal
overlapping v	vith the aggressor a applied in OFDM s	ymbols #1, #2, #3, #5, # ABS. ymbols #0, #4, #7, #11 (
Note 3: This noise is Note 4: ABS pattern a are transmitte	applied in OFDM s as defined in [9]. P	ymbols of a subframe ov DCCH/PCFICH other the Il subframe when the su	an that associated wi	th SIB1/Paging
		ource restriction pattern	for PCell measureme	ents as defined in
Note 6: As configured	l according to the t ts defined in [7].	ime-domain measureme	ent resource restrictio	n pattern for CSI
	erving cell. Cell 2 i	s the aggressor cell. The	e number of the CRS	ports in Cell1
	be transmitted in (Cell2 in the test.		

Test Numbe r	Aggregatio n Level	Referenc e 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 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	2x2 Low	1	-3.9
Note 1:	The propagation				are statisti	cally indep	endent.		
Note 2:	SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.								
Note 3:	The correlation	n matrix and a	ntenna co	nfiguration	apply for	Cell 1 and	Cell 2.		

Table 8.4.2.2.3-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS

Paramet	er	Unit	Cell 1	Cell 2			
Uplink downlink co			1	1			
Special subframe of			4	4			
Downlink power	PCFICH_RA 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_{oc}		dB	Reference Value in Table 8.4.2.2.3-4	1.5			
BW _{Chann}	el	MHz	10	10			
Subframe Conf	iguration		Non-MBSFN	MBSFN			
Time Offset betw	een Cells	μS	2.5 (synchro	onous cells)			
Cell Id			0	126			
ABS pattern (I	Note 4)		N/A	0000000001 0000000001			
RLM/RRM Measurem Pattern(Not			0000000001 0000000001				
CSI Subframe	C _{CSI,0}		000000001 0000000001	N/A			
Sets(Note 6)	C _{CSI,1}		1100111000 1100111000	N/A			
MBSFN Subframe Allo	ocation (Note 9)		N/A	000010			
Number of control O	FDM symbols		3				
ACK/NACK feedb			Multiplexing				
Number of PHICH			1				
PHICH dura			extended				
Unused RE-s ar			OCNG	Niew			
Cyclic pre			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]. 							
and Cell2 is t Note 8: SIB-1 will not	he same. be transmitted in rame Allocation as	is the aggressor cell. Th Cell2 in this test. s defined in [7], one fran					

Table 8.4.2.2.3-3: Test Parameters for PDCCH/PCFICH – MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	OCNG	Pattern			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	n matrix and ar	ntenna confi	iguration ap	ply for Cell 1	and Cell 2			

 Table 8.4.2.2.3-4: Minimum performance PDCCH/PCFICH – MBSFN ABS

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.

Param	eter	Unit	Cell 1	Cell 2	Cell 3		
Uplink downlink		0	1	1	1		
Special subframe			4	4	4		
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3	-3		
allocation	allocation PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB		-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		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			N/A	0000000001 0000000001	0000000001 0000000001		
RLM/RRM Measurement Subframe Pattern (Note 5)			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		
Number of con symb			2	Note 7	Note 7		
ACK/NACK fee			Multiplexing	N/A	N/A		
Number of PHIC	H groups (<i>N</i> _q)		1	N/A	N/A		
PHICH d			Normal	N/A	N/A		
Unused RE-s	and PRB-s		OCNG	OCNG	OCNG		
Cyclic p			Normal	Normal	Normal		
overlap Note 2: This no	ping with the agg ise is applied in C	0FDM symbols #1, # ressor ABS. 0FDM symbols #0, #					
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-do [7];	omain measurem	ent resource restric					
	igured according ements defined ir	to the time-domain	measurement res	ource restriction p	attern for CSI		
Note 7: The nur		FDM symbols is not	available for ABS	and is 2 for the s	ubframe		
Note 8: The nur	mber of the CRS	ports in Cell1, Cell2 tted in Cell2 and Ce		ame.			

Table 8.4.2.2.4-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	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 TDD	OP.1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	EVA5	2x2 Low	1	-2.0
	The propagation The correlation SNR correspo	n matrix and a	ntenna co	onfiguratio							

Table 8.4.2.2.4-2: Minimum performance PDCCH/PCFICH – Non-MBSFN ABS

Paran	neter	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/l	V _{oc2}	dB	Reference Value in Table 8.4.2.2.4-4	5	3		
BW _{CI}	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	0000000001 0000000001	0000000001 0000000001		
RLM/RRM M Subframe Pat			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 Subfra (Note			N/A	000010	000010		
Number of contro			2	Note 8	Note 8		
ACK/NACK fe			Multiplexing	N/A	N/A		
Number of PHIC			1	N/A	N/A		
PHICH of			Normal	N/A	N/A		
Unused RE-s			OCNG	OCNG	OCNG		
Cyclic			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 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 10 th and 20 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-d [7].	omain measureme	ent resource restriction					
measu	ements defined in	to the time-domain n [7]. tion as defined in [7]					
subfran Note 8: The nu	ne allocation. mber of control OF	- DM symbols is not a					
Note 9: Cell 1 is		attern. Cell 2 is the aggress	or cell. The numbe	er of the CRS por	rts in Cell1 and		
	the same. vill not be transmit	ted in Cell2 in this te	st.				

Table 8.4.2.2.4-3: Test Parameters for PDCCH/PCFICH – MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	00	OCNG Pattern		Propagation Conditions (Note 1)		Conditions (Not		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 TDD	OP.1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	EVA5	2x2 Low	1	-1.8			
Note 1: Note 2: Note 3:	The propagation The correlation SNR correspo	n matrix and a	ntenna co	onfiguration										

 Table 8.4.2.2.4-4: Minimum performance PDCCH/PCFICH – MBSFN ABS

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.

Param	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 n aligned with A.3.6.
Unused RE-s	Unused RE-s and PRB-s		OCNG	OCNG
Cell ID N_{oc} at antenna port			0	0
		dBm/15kHz	-98	-98
Cyclic p	orefix		Normal	Normal
Note 1: accordin	g to Clause 6.9 in	TS 36.211 [4]		

Table 8.5.1-1: Test Parameters for PHICH

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.

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 2 Low	0.1	5.5
2	10 MHz	R.24	OP.1 FDD	ETU70	1 x 2 Low	0.1	0.6

Table 8.5.1.1-1: Minimum performance PHICH

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	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 2 Low	0.1	4.4

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.

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 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.

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
\hat{E}_s/N_{oc2}		dB	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 betw	een Cells	μs	2.5 (synchron	ous cells)
Cell Id			0	1
ABS pattern (N	lote 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)	C _{CSI,0}		00000100 00000100 00000100 01000100 00000100	N/A
	C _{CSI,1}		11111011 11111011 11111011 10111011 10111011 11111011	N/A
Number of control OF			3	
Number of PHICH PHICH dura			1 extended	
Unused RE-s an			OCNG	OCNG
Cyclic pre Note 1: This noise is a		ymbols #1, #2, #3, #5, #	Normal	Normal
Note 2: This noise is a aggressor AB Note 3: This noise is a Note 4: ABS pattern a subframe is ov indicated by th Note 5: Time-domain [7] Note 6: As configured measurement	b s defined in OFDM s s defined in [9]. Pl verlapped with the ne ABS pattern. measurement reso according to the t s defined in [7]	ymbols #0, #4, #7, #11 o ymbols of a subframe ov HICH is transmitted in th ABS subframe of aggre purce restriction pattern ime-domain measureme	verlapping with aggress the serving cell subfram essor cell but not in the for PCell measuremen ent resource restriction	sor non-ABS e when the 26 th subframe ts as defined in pattern for CSI
Note 7: Cell 1 is the se	erving cell. Cell 2 i	s the aggressor cell. The	e number of the CRS p	orts in Cell1 and

Table 8.5.1.2.3-1: Test Parameters for PHIC

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 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	SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.								
Note 3:	The correlation	matrix ar	nd antenna	a configura	ation appl	y for Cell 1 and Ce	ll 2.			

Table 8.5.1.2.3-2: Minimum performance PHICH

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.

	PDCCH_RA			Cell 2	Cell 3
Downlink power	PHICH_RA		-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_{oc}		dB	Reference Value in Table 8.5.1.2.4- 2	5	3
BW _{Chanr}	nel	MHz	10	10	10
Subframe Conf	figuration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betv	ween Cells	μs	N/A	3	-1
Frequency shift be	etween Cells	Hz	N/A	300	-100
Cell Id	ł		0	126	1
PDCCH Content			UL Grant should be included with the proper information aligned with A.3.6.	N/A	N/A
ABS pattern ((Note 4)		N/A	00000100 00000100 00000100 00000100 00000100	00000100 00000100 00000100 00000100 00000100
RLM/RRM Mea Subframe Patter			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 11111011	N/A	N/A
Number of control OFDM symbols			2	Note 7	Note 7
Number of PHICH			1	N/A	N/A
PHICH dur			Normal	N/A	N/A
Unused RE-s an Cyclic pre			OCNG Normal	OCNG Normal	OCNG 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	00	NG Patt	Pattern Propagation Conditions (Note 1)			Antenna Configuration	Reference Value			
		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:											

8.5.2 TDD

The parameters specified in Table 8.5.2-1 are valid for all TDD tests unless otherwise stated.

Param	eter	Unit	Single antenna port	Transmit diversity	
Uplink downlink cor 1)			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	uration		Normal	Normal	
Number of PHICH	groups (Note 3)		Ng = 1	Ng = 1	
PDCCH C	Content		UL Grant should be included with the proper information aligned with A.3.6.		
Unused RE-s			OCNG	OCNG	
Cell	D		0	0	
N_{oc} at ante	$N_{\scriptscriptstyle oc}$ at antenna port		-98	-98	
Cyclic prefix			Normal	Normal	
ACK/NACK fee			Multiplexing	Multiplexing	
	ied in Table 4.2-2				
	ied in Table 4.2-1		.]		
Note 3: accordin	g to Clause 6.9 in	15 36.211 [4]			

Table 8.5.2-1: Test Parameters for PHICH

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.

Test	Bandwidth	Bandwidth Reference OCNG Propagation Antenna	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

Table 8.5.2.1-1: Minimum performance PHICH

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.

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 TDD	EVA70	2 x 2 Low	0.1	4.2	

Table 8.5.2.2.1-1: Minimum performance PHICH

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.

Test	Bandwidth	width Reference OCNC		Propagation	Antenna	Reference value		
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)	
1	5 MHz	R.20	OP.1 TDD	EPA5	4 x 2 Medium	0.1	6.2	

Table 8.5.2.2-1: Minimum performance PHICH

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.

Parameter			Unit	Cell 1	Cell 2
Uplink downlink configuration				1	1
Special subfra				4	4
Doumlink nous	-	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3
Downlink powe allocation	r	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 p	ort	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		MHz	10	10
Subframe	Configu	ration		Non-MBSFN	Non-MBSFN
Time Offset	betwee	n Cells	μs	2.5 (synchronous cells)	
С	Cell Id			0	1
ABS patt	ABS pattern (Note 4)			N/A	0000010001 0000000001
	RLM/RRM Measurement Subframe Pattern (Note 5)			000000001 0000000001	N/A
CSI Subframe Se	ets	C _{CSI,0}		0000010001 0000000001	N/A
(Note 6)		C _{CSI,1}		1100101000 1100111000	N/A
Number of cont	rol OFD	M symbols		3	
ACK/NACK	feedbac	k mode		Multiplexing	
Number of PH	ICH gro	oups (<i>N</i> g)		1	
	duratio			extended	
Unused RE				OCNG	OCNG
	ic prefix			Normal	Normal
overlapp	oing with se is ap	the aggressor	ABS	#6, #8, #9, #10,#12, #1	
Note 3:This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABSNote 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 confi					
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.					
			Cell2 in the test.		

Test Number	Reference Channel	OCNG	Pattern	Propagation Conditions (Note 1)		Antenna Configuration and	Reference 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:	The propagation conditions for Cell 1 and Cell 2 are statistically independent.							
Note 2:	SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.							
Note 3:	The correlation	matrix ar	nd antenna	a configura	ation appl	y for Cell 1 and Ce	ll 2.	

Table 8.5.2.2.3-2: Minimum performance PHICH

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.

Paran	neter	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
\widehat{E}_s/N	V _{oc2}	dB	Reference Value in Table 8.5.2.2.4-2	5	3
BW _{Cr}	nannel	MHz	10	10	10
Subframe Co	onfiguration		Non-MBSFN	Non-MBSFN	Non- 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
PDCCH	PDCCH Content		UL Grant should be included with the proper information aligned with A.3.6.	N/A	N/A
ABS patter	ABS pattern (Note 4)		N/A	0000000001 0000000001	0000000001
RLM/RRM Measu	rement Subframe		0000000001		000000001
Pattern (000000001	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
Number of contro	OFDM symbols		2	Note 7	Note 7
ACK/NACK fee			Multiplexing	N/A	N/A
Number of PHIC			1	N/A	N/A
PHICH c			Normal	N/A	N/A
Unused RE-s			OCNG	OCNG	OCNG
Cyclic Note 1: This noi			Normal #2, #3, #5, #6, #8, #9	Normal	Normal
Note 2: This noi aggress Note 3: This noi Note 4: ABS pa subfram Note 5: Time-do [7] Note 6: As confi measur Note 7: The nur	or ABS se is applied in OF ttern as defined in he is overlapped wi omain measuremen igured according to ements defined in nber of control OFI	DM symbols #0, # DM symbols of a [9]. PHICH is tran th the ABS subfra th resource restric the time-domain [7] DM symbols is not	#4, #7, #11 of a subf subframe overlappir smitted in the servin me of aggressor cel tion pattern for PCel measurement resou	ng with aggressor g cell subframe w l but not in subfra l measurements a urce restriction pa	non-ABS when the me 5 as defined in ttern for CSI
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 8.5.2.2.4-1: Test Parameters for PHICH

Test Number	Reference Channel	00	NG Patt	ern	Propagation Conditions (Note 1)		Antenna Configuration			
		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 TDD	OP.1 TDD	OP.1 TDD	EPA5	EVA5	EVA5	2x2 Low	0.1	5.7
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}_{v}/N_{ac2} of Cell 1.								

Table 8.5.2.2.4-2: Minimum performance PHICH

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	na port	dBm/15kHz	-98	-98	
Cyclic pr	Cyclic prefix		Normal	Normal	
Cell I)		0	0	
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]					

8.6.1.1 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

Γ	Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
	number		Channel	Condition	configuration and correlation Matrix	Pm-bch (%)	SNR (dB)
	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.

				-		
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

Table 8.6.1.2.1-1: Minimum performance PBCH

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.

Parameter		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
	<u>e</u>	dB	Reference Value in Table 8.6.1.2.3-2	4	2
BW _{Cr}	nannel	MHz	1.4	1.4	1.4
Time Offset be	Time Offset between Cells		N/A	3	-1
Frequency shift	Frequency shift between Cells		N/A	300	-100
Cell	ld		0	126	1
ABS Patter	n (Note 4)		N/A	01000000 01000000 01000000 01000000 01000000	01000000 01000000 01000000 01000000 01000000
Unused RE-s	and PRB-s		OCNG	OCNG	OCNG
Cyclic	prefix		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
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Test	Reference	Propagation Conditions (Note 1)		Antenna Configuration	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: Note 2:							
Note 3:	SNR correspon	nds to \hat{E}_s / N_o	$_c$ of cell 1.				

8.6.2 TDD

Parame	ter	Unit	Single antenna port	Transmit diversity	
Uplink downlink o (Note 1			1	1	
Special subframe (Note 2	0		4	4	
Downlink power allocation	PBCH_RA PBCH_RB	dB dB	0	-3 -3	
N_{oc} at antenna port		dBm/15kHz	-98	-98	
Cyclic pr	efix		Normal	Normal	
Cell I)		0	0	
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].					

Table 8.6.2-1: Test Parameters for PBCH

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.

1	Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
	number		Channel	Condition	configuration and correlation Matrix	Pm-bch (%)	SNR (dB)
	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.

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Referen Pm-bch (%)	ce value SNR (dB)
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.

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
number		Channel	Condition	configuration and correlation Matrix	Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.23	EVA5	4 x 2 Medium	1	-4.1

Table 8.6.2.2.2-1: Minimum performance PBCH

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 8.6.2.3-2, 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 C.3.3, respectively. The CRS assistance information [7] including Cell 2 and Cell 3 is provided.

Parameter		Unit	Cell 1	Cell 2	Cell 3	
Downlink power		PBCH_RA OCNG_RA	dB	-3	-3	-3
allocati	ion	PBCH_RB OCNG_RB	dB	-3	-3	-3
No	$_{c}$ at ante	enna port	dBm/15kHz	-98	N/A	N/A
	$\frac{\widehat{E}_s}{N_{oc}}$,	dB	Reference Value in Table 8.6.2.2.3-2	4	2
	BW _{Cha}	annel	MHz	1.4	1.4	1.4
Time Offset between Cells			μs	N/A	3	-1
Frequency shift between Cells			Hz	N/A	300	-100
	Cell	ld		0	126	1
ABS	S Patterr	n (Note 4)		N/A	0000000001 0000000001	0000000001 0000000001
Unuse	ed RE-s	and PRB-s		OCNG	OCNG	OCNG
	Cyclic p			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 with the	/PCFICH are tran	smitted in the servi	than SIB1/paging a ing cell subframe w I the subframe is av	hen the subframe	e is overlapped

Table 8.6.2.2.3-1: Test Parameters for PBCH

Test	Reference	Propagation Conditions (Note 1)		Antenna Configuration	Refe	erence 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: 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_{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.

Table 8.7-1: SDR test applicability

	Single carrier UE not supporting EPDCCH	CA UE not supporting EPDCCH	Single carrier UE supporting EPDCCH	CA UE supporting EPDCCH
FDD	8.7.1	8.7.1	8.7.3	8.7.1, 8.7.3
TDD	8.7.2	8.7.2	8.7.4	8.7.2, 8.7.4

8.7.1 FDD

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
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)

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, CA capability and bandwidth combination with maximum aggregated bandwidth as specified inTable 8.7.1-4. The TB success rate shall be sustained during at least 300 frames.

Test	Bandwidth Transm	Transmission	nsmission Antenna	Codebook subset	Downlink power allocation (dB)			$\hat{E}_{_{s}}$ at	Symbols for
Test	(MHz)	mode	configuration	restriction	$ ho_{\scriptscriptstyle A}$	$ ho_{\scriptscriptstyle B}$	σ	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
ЗA	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
Note 1:	For CA test	cases. PUCCH fo	rmat 1b with char	nel selection	is used t	to feedb	ack ACK	(NACK	

Table 8.7.1-2: test parameters for sustained downlink data rate (FDD)

Note 1: For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK.

Table 8.7.1-3: 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.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	
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 succes	s rate = 100%*N _{DL_correct_rx} / (N _{DL_newtx} ·	+ N _{DL_retx}), where N _{DL_newtx} is
	the number of newly transmitted DL transport		insmitted DL transport
	blocks, and N _{DL_correct_rx} is the number of corre	ectly received DL transport blocks.	
Note 5:	52752bits for sub-frame 5.		

CA config	Maximum supported Bandwidth/ Bandwidth combination (MHz)	Category 1	Category 2	Category 3	Category 4	Category 6	Category 7
Single	10	1	2	3A	3A	-	-
Single carrier	15	-	-	3C	4B	-	-
Carrier	20	-	-	3	4	6	6
	10+10	-	-	3B	4A	4A	4A
	10+15	-	-	3B	4A	6B	6B
CL_A_ A	10+20	-	-	3B	4A	6C	6C
A	15+20	-	-	3B	4A	6D	6D
	20+20	-	-	3B	4A	6A	6A
CL_C	20+20	-	-	3 (Note 4)	4 (Note 4)	6A	6A
Note 1:	If UE can be tested	for CA configu	ration, single	carrier test is sl	kipped.		
Note 2:							
Note 3:							
	among all CA configuration supported by UE.						
Note 4:	If CL_C is the only						
Note 5:	The applicability of in 8.1.2.3.	requirements f	or different CA	a configurations	and bandwidth	combination s	ets is defined

Table 8.7.1-4: Test points for sustained data rate (FRC)

8.7.2 TDD

The parameters specified in Table 8.7.2-1 are valid for all TDD tests unless otherwise stated.

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				
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].						

Table 8.7.2-1: Common Test Parameters (TDD)

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, CA capability and bandwidth combination with maximum aggregated bandwidth as specified inTable 8.7.2-4. The TB success rate shall be sustained during at least 300 frames.

Test	Bandwidth (MHz)	Transmission mode	Antenna configuration	Codebook subset restriction			power allocatio (dB)		•	\hat{E}_s at antenna port (dBm/15kHz)	ACK/NACK feedback mode	Symbols for unused PRBs
					\mathcal{O}_A	$ ho_{\scriptscriptstyle B}$	σ	. ,				
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		
ЗA	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		
Note 1:	PUCCH for	mat 1b with chan	nel selection is us	sed to feedbac	k A	CK/NA	CK.					

Table 8.7.2-2: test parameters	for sustained downlink data rate	(TDD)
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Table 8.7.2-3: Minimum requirement (TDD)

Test	Number of bits of a DL-SCH transport block received within a TTI for normal/special sub- frame	Measurement channel	Reference value TB success rate [%]	
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	
	yer transmissions, 2 transport blocks are bits for sub-frame 5.	received within a TTI.		
Note 3: The TB	success rate is defined as TB success rate	ate = 100%*N _{DL correct rx} / (N _{DL newtx}	+ N _{DL retx}), where N _{DL newtx}	

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)
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CA config	Bandwidth/ Bandwidth combination (MHz)	Category 1	Category 2	Category 3	Category 4	Category 6	Category 7
Cingle	10	1	2	-	-	-	-
Single	15	-	-	ЗA	3A	-	-
carrier	20	-	-	3	4	6	6
CL_C	20+20		-	3 (Note 4)	4 (Note 4)	6A	6A
CL_A-A	20+20		-	3 (Note 4)	4 (Note 4)	6A	6A
Note 1:	If UE can be tested f	or CA configur	ation, single ca	rrier test is skip	ped.		
Note 2:	For non-CA UE, test						
Note 3:	3: For CA UE, test is selected for bandwidth combination corresponding to maximum aggregated bandwidth						
	among all CA configuration supported by UE.						
Note 4:	If CL_C is the only C						
Note 5:							
	8.1.2.3.						

8.7.3 FDD (EPDCCH scheduling)

The parameters specified in Table 8.7.3-1 are valid for all FDD tests unless otherwise stated.

	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 640AM
coding sequence		{0,0,1,2} for 64QAM
Number of OFDM		
symbols for PDCCH per	OFDM symbols	1
component carrier		
Cross carrier scheduling		Not configured
Number of EPDCCH		1
sets		I
EPDCCH transmission		Localized
type		Localized
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		Derived nom of 1 (i.e. deradit behaviour)
ECCE Aggregation		2 ECCEs
Level		2 20023
Number of EREGs per		4
ECCE		•
EPDCCH scheduling		EPDCCH candidate is randomly assigned
5		in each subframe
EPDCCH precoder		Fixed PMI 0
(Note 1)		
EPDCCH monitoring SF		111111111 000000000
pattern		111111111 000000000
Timing advance	μs	100
Propagation condition		Static propagation condition
		No external noise sources are applied
	oder parameters are	defined for tests with 2 x 2 antenna
configuration		

Table 8.7.3-1: Common test	parameters ((FDD)
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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.

Test	Bandwidth	Transmission	Antenna	Codebook subset		ownlini Ilocatio	-		\hat{E}_{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
ЗA	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

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					
ЗA	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 corre	ectly received DL transport blocks.						
Note 5:	52752 bits for sub-frame 5.							

Table 8.7.3-3: Minimum requirement (FDD)

Table 8.7.3-4: 1	Fest points fo	or sustained	data rate	(FRC)
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CA config	Bandwidth (MHz)	Category 1	Category 2	Category 3	Category 4	Category 6	Category 7			
Cingle	10 1		2	3A	3A	-	-			
Single carrier	15	-	-	3C	4B	-	-			
	20	-	-	3	4	6	6			
Note 1:	ote 1: The test is selected for maximum supported bandwidth.									

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 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				
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 $n_{PRB} = 98$, 99				
EPDCCH Starting Symbol		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 0000000000				
Timing advance	μs	100				
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]. Note 2: EPDCCH precoder parameters are defined for tests with 2 x 2 antenna configuration						

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 inTable 8.7.4-4. The TB success rate shall be sustained during at least 300 frames.

Test	Bandwidth (MHz)	Transmission mode	Antenn a configu	Codebook subset		nlink/ ncatio			$\hat{E}_{_{s}}$ at antenna port	Symbols for unused	ACK/NACK feedback
	(101712)	mode	ration	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
3A	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 8.7.4-2: Test parameters for SDR test for PDSCH scheduled by EPDCCH (TDD)

Table 8.7.4-3: Minimum requirement (TDD)

frame		Reference value TB success rate [%]					
10296/0	R.31E-1 TDD	95					
25456/0	R.31E-2 TDD	95					
51024/0	R.31E-3 TDD	95					
51024/0	R.31E-3A TDD	85					
75376/0 (Note 2)	R.31E-4 TDD	85					
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							
	10296/0 25456/0 51024/0 51024/0 75376/0 (Note 2) 75376/0 (Note 2) er transmissions, 2 transport blocks ar s for sub-frame 5. uccess rate is defined as TB success er of newly transmitted DL transport b	10296/0 R.31E-1 TDD 25456/0 R.31E-2 TDD 51024/0 R.31E-3 TDD 51024/0 R.31E-3A TDD 75376/0 (Note 2) R.31E-4 TDD 75376/0 (Note 2) R.31E-4 TDD 75376/0 (Note 2) R.31E-4 TDD r transmissions, 2 transport blocks are received within a TTI. s for sub-frame 5. uccess rate is defined as TB success rate = 100%*N _{DL_correct_rx} / (N _{DL_newtx})					

CA config	Bandwidth/ Bandwidth combination (MHz)	Category 1	Category 2	Category 3	Category 4	Category 6	Category 7		
Single carrier	10	1	2	-	-	-	-		
	15	-	-	ЗA	ЗA	-	-		
	20	-	-	3	4	6	6		
Note 1	The test is selected for maximum supported bandwidth								

The test is selected for maximum supported bandwidth. Note 1:

Demodulation of EPDCCH 8.8

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.

Distributed Transmission 8.8.1

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.

1							
	Parame	Unit	Value				
	PDCCH syr	symbols	2 (Note 1)				
PHICH dura			Normal				
	-s and PRB		OCNG				
Cell ID				0			
		$ ho_{\scriptscriptstyle A}$	dB	-3			
Downlink p	ower	$ ho_{\scriptscriptstyle B}$	dB	-3			
allocation		σ	dB	0			
		δ	dB	3			
N_{oc} at ante	enna port		dBm/15 kHz	-98			
Cyclic prefi	х			Normal			
Subframe C	Configuratio	n		Non-MBSFN			
Droodor	ndata Cran	ulority	PRB	1			
Flecodel O	pdate Gran	ulanty	ms	1			
Beamformi	ng Pre-Code	er		Annex B. 4.4			
Cell Specifi	c Reference	e Signal		Port 0 and 1			
Number of	EPDCCH S	ets Configured		2 (Note 2)			
Number of	PRB per EF	PDCCH Set		4 (1 st Set) 8 (2 nd Set)			
EPDCCH S	Subframe Mo	onitoring		NA			
PDSCH TM	1			TM3			
DCI Forma	t			2A			
Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling epdcch-StartSymbol-r11 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 second set for Test 2, respectively. Both sets are always configured.							

 Table 8.8.1.1-1: Test Parameters for Distributed EPDCCH

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

Test	Bandwidth	Aggregatio	Reference	OCNG	Propagation	Antenna	Reference value	
number		n 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 2 Low	1	2.60
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.

	Parame		Unit	Value		
Number	PDCCH sy	symbols	2 (Note 1)			
PHICH du		Symbols	Normal			
	E-s and PRE		OCNG			
	E-S and PRE					
Cell ID			0			
		$\rho_{\scriptscriptstyle A}$	dB	-3		
Downlink p allocation	ower	$ ho_{\scriptscriptstyle B}$	dB	-3		
anocation		σ	dB	0		
		δ	dB	3		
$N_{\scriptscriptstyle oc}$ at and	enna port	dBm/15 kHz	-98			
Cyclic pret	ïx			Normal		
Subframe	Configuratio	n		Non-MBSFN		
Draadar	Indata Cran	ulority	PRB	1		
Precoder	Jpdate Gran	ulanty	ms	1		
Beamform	ing Pre-Cod		Annex B. 4.4			
Cell Speci	fic Reference	e Signal		Port 0 and 1		
Number 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 T	M			TM3		
DCI Forma	at			2A		
TDD UL/D	L Configurat	ion		0		
TDD Spec	ial Subframe	;		1 (Note 3)		
 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 second set for Test 2, respectively. Both sets are always configured. Note 3: Demodulation performance is averaged over normal and special subframe. 						

 Table 8.8.1.2-1: Test Parameters for Distributed EPDCCH

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

ſ	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	2.8
[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.

Paran	neter	Unit	Value				
Number of PDCCH s	ymbols	symbols	1 (Note 1)				
EPDCCH starting symbol		symbols	2 (Note 1)				
PHICH duration			Normal				
Unused RE-s and PRB-s			OCNG				
Cell ID			0				
	$ ho_{\scriptscriptstyle A}$	dB	0				
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0				
allocation	σ	dB	-3				
	δ	dB	0				
$N_{\scriptscriptstyle oc}$ at antenna port	·	dBm/15 kHz	-98				
Cyclic prefix			Normal				
Subframe Configurat	ion		Non-MBSFN				
Brooder Undete Cro	nulority	PRB	1				
Precoder Opdate Gra	Precoder Update Granularity		1				
Beamforming Pre-Co			Annex B.4.5				
Cell Specific Referen	ce Signal		Port 0 and 1				
CSI-RS Reference S	ignal		Port 15 and 16				
CSI-RS reference sig	nal resource		0				
configuration			0				
CSI reference signal	subframe		2				
configuration I _{CSI-RS}							
ZP-CSI-RS configura	tion bitmap		000001000000000				
ZP-CSI-RS subframe	e configuration I_{ZP} .		2				
CSI-RS Number of EPDCCH	Coto		2 (Noto 2)				
EPDCCH Subframe I			2 (Note 2) 111111110 11111101 111111011				
subframePatternCon			111110111 (Note 3)				
PDSCH TM	iig-i i i		TM9				
	a symbol for EPDC(.H is signalle	d with epdcch-StartSymbol-r11. However, CFI is				
set to 1.		Si i is signalie	a with epacen-stansymbol-in the newever, of this				
	et is distributed trans	mission with	PRB = {0, 49} and the second set is localized				
			5, 42, 49}. ePDCCH is scheduled in the second set				
for all tests.							
		/ SF. UE is re	equired to monitor ePDCCH for UE-specific search				
			PatternConfig-r11. Legacy PDCCH is not scheduled.				

Table 8.8.2.1-1: Test Parameters for Localized EPDCCH with TM9

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.

Test	Bandwidt	Aggregatio	Reference	OCNG	Propagatio	Antenna	Reference value	
numbe	r h	n level	Channel	Pattern	n 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.

Parame	eter	Unit	Value			
Number of PDCCH symbols		symbols	1 (Note 1)			
EPDCCH starting syml	loc	symbols	2 (Note 1)			
PHICH duration			Normal			
Unused RE-s and PRE	-s		OCNG			
Cell ID	-		0			
	$ ho_{\scriptscriptstyle A}$	dB	0			
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB	-3			
	δ	dB	0			
$N_{\scriptscriptstyle oc}$ at antenna port		dBm/15 kHz	-98			
Cyclic prefix			Normal			
Subframe Configuratio	n		Non-MBSFN			
		PRB	1			
Precoder Update Gran	ularity	ms	1			
Beamforming Pre-Cod	er		Annex B.4.5			
Cell Specific Reference			Port 0 and 1			
CSI-RS Reference Sig	nal		Port 15 and 16			
CSI-RS reference sign	al resource		0			
configuration			-			
CSI reference signal su	ubtrame		0			
configuration I _{CSI-RS}	an hitman		000001000000000			
ZP-CSI-RS configuration	on bilinap		00000100000000			
CSI-RS	configuration IZP-		0			
Number of EPDCCH S	ets		2 (Note 2)			
EPDCCH Subframe MosubframePatternConfig			1100011000 1100010000 1100011000 1100001000 1100011000 1000011000 1100011000 (Note 3)			
PDSCH TM			TM9			
TDD UL/DL Configurat	ion		0			
TDD Special Subframe			1 (Note 4)			
		H is signalle	d with epdcch-StartSymbol-r11. However, CFI is			
Note 2: The first set transmission for all tests.	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					
space only i	Note 3: EPDCCH is scheduled in every SF. UE is required to monitor ePDCCH for UE-specific search space only in SFs configured by <i>subframePatternConfig-r11</i> . Legacy PDCCH is not scheduled.					
Note 4: Demodulation	on performance is a	veraged over	er normal and special subframe.			

Table 8.8.2.2-1: Test Parameters for Localized EPDCCH with TM9

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

ſ	Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
	number		level	Channel	Pattern	Condition	configuration and correlation Matrix	Pm-dsg (%)	SNR (dB)
ſ	1	10 MHz	2 ECCE	R.57 TDD	OP.7 TDD	EVA5	2 x 2 Low	1	12.8
ſ	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 8.8.2.2.2-2: 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

Parameter		Unit	Те	est 1	Tes	st 2			
			TP 1	TP 2	TP 1	TP 2			
PHICH durat	PHICH duration				ormal				
Downlink	$ ho_{\scriptscriptstyle A}$	dB			0				
power	$ ho_{\scriptscriptstyle B}$	dB		0					
allocation	σ	dB dB			-3				
	δ			1	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- 2	Reference value in Table 8.8.3.1- 2	Reference value in Table 8.8.3.1- 2			
$N_{\scriptscriptstyle oc}$ at anten	ina port	dBm/ 15kH z		-	98				
Bandwidth		MHz	10	10	10	10			
Number of co EPDCCH Se	ts		2 (N	lote 1)	2 (N	ote1)			
EPDCCH-PF (setConfigId)			0	1	0	1			
PRB-set	n type of EPDCCH-		Localized	Localized	Localized	Localized			
Number of P EPDCCH-PF	RB-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			
PDSCH trans	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)			
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>I</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 000	N/A	100001000000 000			
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 000	N/A			
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	Non-Zero power CSI RS Identity (NZPId)		N/A	N/A	2	N/A			
(Note 4)	Zero power CSI RS Identity (ZPId)		N/A	N/A	2	N/A			
Number o	f PDCCH symbols	Symb ols	1 (Note 2)						
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	configuration		Non-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN			
Time offs	et between TPs	μs	N/A	2	N/A	2			
Frequenc	y shift between TPs	Hz	N/A	200	N/A	200			
Cell ID			0	126	0	126			
Note 1: Note 2:	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 3:	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, PDSCF transmitted from TP1.					and EPDCCH are			

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

Pa	arameter	Unit		est 1		st 2			
PHICH durat	tion		TP 1	TP 2	TP 1	TP 2			
1 mon duid	ρ_A	dB			0				
Downlink		dB			0				
power	$\rho_{\scriptscriptstyle B}$	-							
allocation	$\frac{\sigma}{\delta}$	dB dB			<u>-3</u> 0				
	0	иБ	0dB power		0				
\hat{E}_s/N_{oc}	\hat{E}_s/N_{oc}		imbalance is considered between TP 1 and TP 2,	Reference value in Table 8.8.3.2- 2	Reference value in Table 8.8.3.2- 2	Reference value in Table 8.8.3.2- 2			
$N_{\scriptscriptstyle oc}$ at anter	nna port	dBm/ 15kH z		-98					
Bandwidth		MHz	10	10	10	10			
	PDCCH Sets		2 (N	lote 1)	2 (N	ote1)			
EPDCCH-PF (setConfigId))		0	1	0	1			
PRB-set	n type of EPDCCH-		Localized	Localized	Localized	Localized			
Number of P EPDCCH-PF	RB-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 tran	smission mode		TM10	TM10	TM10	TM10			
PDSCH tran 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	ns		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 _{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 000	N/A	100001000000 000			
signal (ZPId=1)	CSI-RS subframe configuration I _{CSI-RS}		N/A	0	N/A	0			
Zero power CSI	CSI-RS Configuration list (ZeroPowerCSI- RS bitmap)	Bitma p	N/A	N/A	1000010000000 000	N/A			
reference signal (ZPId=2)	CSI-RS subframe configuration I _{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	Non-Zero power CSI RS Identity (NZPId)		N/A	N/A	2	N/A		
(Note 4)	Zero power CSI RS Identity (ZPId)		N/A	N/A	2	N/A		
Number o	f PDCCH symbols	Symb ols	1 (Note 2)					
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	configuration		Non-MBSFN	Non-MBSFN Non-MBSFN Non-MBSFN		Non-MBSFN		
Time offse	et between TPs	μs	N/A	2	N/A	2		
Frequency	y shift between TPs	Hz	N/A	200	N/A	200		
Cell ID			0	126	0	126		
TDD UL/D	DL configuration				0			
TDD spec	ial subframe				1			
Note 1:	Resource blocks n _{PRB}							
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.						or each subframe.		
Probabilities of occurrence of PDSCH transmission from TP 1 and TP 2 are specified.								
Note 4:	ote 4: For PQI set 0, PDSCH and EPDCCH are transmitted from TP 2. For PQI set 1, PDSCH and EPDCCH a					and EPDCCH are		
	transmitted from TP1. EPDCCH and PDSCH are transmitted from same TP.							

Table 8.8.3.2-2: Minimum Performance

Γ	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

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 is in accordance with the one given in clause 8.1.1, where SA

$$NR = \frac{\sum \hat{I}_{or}^{(j)}}{\sum N_{oc}^{(j)}}.$$

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.

9.1.1.2 Applicability of requirements for different CA configurations and bandwidth combination sets

The performance requirement for CA CQI tests in Clause 9 are defined independent of CA capability as well as CA configurations and bandwidth combination sets specified in Table 5.6A.1-1, Table 5.6A.1-2 and Table 5.6A.1-3. For UEs supporting different CA configurations and bandwidth combination sets, the applicability rules are defined for the tests with 2 DL CCs as following. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set. For tests specified in Table 9.6.1.1-2, the tests are applicable for any one of the supported FDD CA configurations. Only one of the supported bandwidth combinations from the selected CA configuration is tested. The tested bandwidth combination is determined among the supported bandwidth combinations in the following order: 10+10 MHz, 20+20 MHz.

For tests specified in Table 9.6.1.2-2, the tests are applied to any one of the supported TDD CA configurations covering the largest aggregated CA bandwidth combination.

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 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 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	Te	st 1	Те	st 2	
Bandwidth		MHz			10		
PDSCH transmission	on mode				1		
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0				
allocation	$ ho_{\scriptscriptstyle B}$	dB			0		
	σ	dB			0		
Propagation condit antenna configur				AWGI	N (1 x 2)		
SNR (Note 2	<u>/)</u>	dB	0	1	6	7	
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-98 -97		-92	-91	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98		98		
Max number of H transmission					1		
Physical channel f reporting	or CQI			PUCCH	I Format 2		
PUCCH Report	Туре				4		
Reporting period	dicity	ms		Np	_d = 5		
cqi-pmi-ConfigurationIndex					6		
OCNG Pat Note 2: For each te	tern OP.1 est, the mir	nent channel RC.1 F FDD as described ir nimum requirements	h Annex A.5.1 shall be fulfil	Ĩ.1.			
and the res	spective wa	anted signal input le	vei.				

Table 9.2.1.1-1: PUCCH 1-0 static test (FDD)

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 + 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.

Paramete	r	Unit	Те	st 1	Те	st 2
Bandwidth	1	MHz			10	
PDSCH transmissi	on mode				1	
Uplink downlink cor	figuration				2	
Special subfra	ame				4	
configuratio	n				4	
Downlink nowor	$ ho_{\scriptscriptstyle A}$	dB			0	
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB			0	
	σ	dB			0	
Propagation condi antenna configu				AWGI	N (1 x 2)	
SNR (Note		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 transmission					1	
Physical channel reporting	-		PUSCH (Note 3)			
PUCCH Report	Туре				4	
Reporting perio		ms		Np	_d = 5	
cqi-pmi-Configurat	tionIndex			·	3	
ACK/NACK feedba	ick mode			Multi	plexing	
OCNG Pa	attern OP.1	ent channel RC.1 T	n Annex A.5.2	2.1.		-
Note 2: For each test, the min and the respective wa				lled for at leas	t one of the tw	vo SNR(s)
Note 3: To avoid collisions between CQI reports and HAF PUSCH instead of PUCCH. PDCCH DCI format (#8 to allow periodic CQI to multiplex with the HAF and #2.			and HARQ-A format 0 sha	II be transmitt	ed in downlinl	sF#3 and

Table 9.2.1.2-1: PUCCH 1-0 static test (TDD)

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 the transport format indicated by the median CQI is greater than 0.1, the BLER in non-ABS subframes using transport format indicated by the 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 $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ 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.

Deremeter		l le:4		Tes	t 1		Te	st 2	
Parameter		Unit	Ce		Cell 2	Ce	ell 1	Cell 2	
Bandwidth		MHz		1(-			0	
PDSCH transmission	on mode		2		Note 10		2	Note 10	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		-3	3		-	3	
allocation	$ ho_{\scriptscriptstyle B}$	dB		-3	3	-3			
	σ	dB		0	1		0		
Propagation condit antenna configu			(Clause B	3.1 (2x2)		Clause I	B.1 (2x2)	
$\widehat{E}_{s}ig/N_{oc2}$ (Not		dB	4	5	6	4	5	-12	
$\mathbf{r}(i)$	$N_{oc1}^{(j)}$	dBm/15kHz	-102 (N	Note 7)	N/A	,	lote 7)	N/A	
$N_{oc}^{(j)}$ at antenna port	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (N	ote 8)	N/A		lote 8)	N/A	
pon	$N_{oc3}^{(j)}$	dBm/15kHz	-94.8 (1	Note 9)	N/A	-98(N	lote 9)	N/A	
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-94	-93	-92	-94	-93	-110	
Subframe Config	uration		Non-M		Non-MBSFN		/BSFN	Non-MBSFN	
Cell Id	o "		C		1		0	1	
Time Offset betwee	en Cells	μs	2.5	(synchro	nous cells)	2.5	(synchr	onous cells)	
ABS pattern (Note 2)			N/A		01010101 01010101 01010101 01010101 01010101 01010101	N/A 0 0 0		01010101 01010101 01010101 01010101 01010101 01010101	
RLM/RRM Measu Subframe Pattern			00000100 00000100 00000100 00000100 00000100		N/A	00000100 00000100 00000100 00000100 00000100		N/A	
CSI Subframe Sets	C _{CSI,0}		0101 0101 0101 0101 0101	0101 0101 0101 0101 0101	N/A	0101 0101 0101 0101	10101 10101 10101 10101 10101	N/A	
(Note 3)	C _{CSI,1}		1010 1010 1010 1010 1010 1010	1010 1010 1010 1010	N/A	1010 1010 1010 1010)1010)1010)1010)1010)1010)1010	N/A	
Number of control symbols	OFDM			3	6		:	3	
Max number of HARQ transmissions				1				1	
Physical channel for C _{CSI,0} CQI reporting			F	PUCCH F	Format 2		PUCCH	Format 2	
Physical channel for C _{CSI,1} CQI reporting			P	PUSCH (Note 12)		PUSCH	(Note 12)	
PUCCH Report		Ms		4				4 = 5	
Reporting period cqi-pmi-Configurati C _{CSI,0} (Note 1	ionIndex	IVIS	6	N _{pd}	= 5 N/A		N _{pd}	= 5 N/A	
cqi-pmi-Configuratio C _{CSI,1} (Note 1	onIndex2		5		N/A		5	N/A	

Table 9.2.1.3-1: PUCCH 1-0 static test (FDD)

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:	cqi-pmi-ConfigurationIndex is applied for C _{CSI,0.}
Note 14:	cqi-pmi-ConfigurationIndex2 is applied for C _{CSI,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 + 1) 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 the 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 $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ minus the median CQI obtained by reports in CSI subframe sets 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.

Parameter		Unit		Tes	st 1		Te	st 2
			Ce		Cell 2	Ce	ll 1	Cell 2
Bandwidth		MHz		1	-			0
PDSCH transmission			2	2	Note 10		2	Note 10
Uplink downlink con					1			1
Special subfra configuration				2	1		4	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		-	3		-	3
allocation	$ ho_{\scriptscriptstyle B}$	dB			3			3
	σ	dB		()			0
Propagation condit antenna configu				Clause E	B.1 (2x2)		Clause I	B.1 (2x2)
$\widehat{E}_{s} ig / N_{oc2}$ (Not	e 1)	dB	4	5	6	4	5	-12
	$N_{oc1}^{(j)}$	dBm/15kHz	-102 (1	Note 7)	N/A	-98 (N	lote 7)	N/A
$N_{oc}^{(j)}$ at antenna	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (N	lote 8)	N/A	-98 (N	lote 8)	N/A
port	$N_{oc3}^{(j)}$	dBm/15kHz	-94.8 (Note 9)	N/A	-98 (N	lote 9)	N/A
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-94	-93	-92	-94	-93	-110
Subframe Config	uration		Non-M	IBSFN	Non-MBSFN	Non-N	IBSFN	Non-MBSFN
Cell Id)	1		0	1
Time Offset betwee	en Cells	μs	2.5	(synchr	onous cells)	2.5 (synchr		onous cells)
ABS pattern (No	ote 2)		N/A		0100010001 0100010001	N/A		0100010001 0100010001
RLM/RRM Measu Subframe Pattern			0000000001 0000000001		N/A	0000000001 0000000001		N/A
CSI Subframe Sets	C _{CSI,0}		0100010001 0100010001		N/A	0100010001 0100010001		N.A
(Note 3)	C _{CSI,1}		10001	01000	N/A	10001	01000	N/A
Number of control	,		10001	01000		10001	01000	
symbols				3	3		:	3
Max number of H	IARO							
transmission					1			1
Physical channel for reporting				PUCCH	Format 2		PUCCH	Format 2
Physical channel for $C_{CSI,1}$ CQI				PUSCH	(Note 12)		PUS	SCH
reporting								
PUCCH Report Type		me			4 = 5			4 = 5
Reporting periodicity cqi-pmi-ConfigurationIndex		ms						
C _{CSI,0} (Note 1	3)		3	3	N/A	;	3	N/A
<i>cqi-pmi-Configuratio</i> C _{CSI,1} (Note 1			4	1	N/A		4	N/A
ACK/NACK feedba				Multip	lexing		Multip	lexing

Table 9.2.1.4-1: PUCCH 1-0 static test (TDD)

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
Note 7.	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
11010 111	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.
Noto 12	
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 $C_{CSI,0}$ 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 the set of the median CQI is greater than 0.1. If the PDSCH BLER in ABS subframes using 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 $C_{CSI,1}$ 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 the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using 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.

		· · ·		Test	t 1	Tes	st 2	
Parameter		Unit	Cell 1		Cell 2 and 3	Cell 1	Cell 2 and 3	
Bandwidth		MHz		10			0	
PDSCH transmission	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 condit antenna configu			Claus	se B	.1 (2x2)	Clause I	B.1 (2x2)	
$\widehat{E}_{s} ig / N_{oc2}$ (Not		dB	4 5	5	Cell 2: 12 Cell 3: 10	13 14	Cell 2: 12 Cell 3: 10	
$\mathbf{v}(i)$	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (Note 7	7)	N/A	-98 (Note 7)	N/A	
$N_{\scriptscriptstyle oc}^{(j)}$ 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 Configu	uration		Non-MBSF	N	Non-MBSFN	Non-MBSFN	Non-MBSFN	
Cell Id			0		Cell 2: 6 Cell 3: 1	0	Cell 2: 6 Cell 3: 1	
Time Offset betwee	en Cells	μs			3 usec 1usec		3 usec -1usec	
		11-			300Hz		300Hz	
Frequency Shift betw	veen Cells	Hz			100Hz		-100Hz	
ABS pattern (Note 2)			N/A		01010101 01010101 01010101 01010101 01010101 01010101	N/A	01010101 01010101 01010101 01010101 01010101 01010101	
RLM/RRM Measu Subframe Pattern (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 01010101		N/A	01010101 01010101 01010101 01010101 01010101 01010101	N/A	
(Note 3)	C _{CSI,1}		10101010 10101010 10101010 10101010 10101010 10101010)))	N/A	10101010 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			PUC	CH F	Format 2	PUCCH	Format 2	
Physical channel for C _{CSI,1} CQI			PUSC	1) HC	Note 12)	PUSCH	(Note 12)	
reporting PUCCH Report Type			1	4		4	4	
Reporting period	dicity	Ms		N _{pd} =	= 5	N _{pd}	= 5	
cqi-pmi-Configurati C _{CSI,0} (Note 1	3)		6		N/A	6	N/A	
cqi-pmi-Configuratio			5		N/A	5	N/A	

Table 9.2.1.5-1: PUCCH 1-0 static test (FDD)

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:	
	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.
	<i>cqi-pmi-ConfigurationIndex</i> is applied for C _{CSI,0.}
Note 14:	cqi -pmi-ConfigurationIndex2 is applied for $C_{CSI,1}$

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 $C_{CSI,0}$ 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 the set of the median CQI is greater than 0.1. If the PDSCH BLER in ABS subframes using 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 $C_{CSI,1}$ 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 the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using transport format indicated by the median CQI is greater than 0.1. If the PDSCH BLER in non-ABS subframes using 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.

_			Tes	st 1		Te	st 2	
Parameter		Unit			Cell 2 and 3	Cell 1		Cell 2 and 3
Bandwidth		MHz		1	0		1	0
PDSCH transmission	on mode			2	Note 10		2	Note 10
Uplink downlink con	figuration				1			1
Special subfra configuratio				2	4			4
Deumlink neuron	$ ho_{\scriptscriptstyle A}$	dB		-	3		-	3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB		-	3		-	3
	σ	dB		(0		(0
Propagation condi antenna configu				Clause I	B.1 (2x2)		Clause I	B.1 (2x2)
\widehat{E}_{s}/N_{oc2} (No		dB	4	5	Cell 2: 12 Cell 3: 10	13	14	Cell 2: 12 Cell 3: 10
	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (N	lote 7)	N/A	-98 (N	lote 7)	N/A
$N_{oc}^{(j)}$ at antenna	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (N	lote 8)	N/A	-98 (N	lote 8)	N/A
port	$N_{oc3}^{(j)}$	dBm/15kHz	-93 (N	lote 9)	N/A	-93 (N	lote 9)	N/A
Subframe Config	uration		Non-M	1BSFN	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 betwee	en Cells	μs	Cell 2: 3 usec Cell 3: -1usec		Cell 2: 3 usec Cell 3: -1usec		3 usec	
Frequency shift between 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			000000001 0000000001		N/A	000000001 0000000001		N/A
CSI Subframe Sets	C _{CSI,0}		0100010001 0100010001		N/A	0100010001 0100010001		N.A
(Note 3)	C _{CSI,1}		10001	01000 01000	N/A	10001	01000	N/A
Number of control symbols	OFDM		3		3		3	
Max number of H transmission			1		1		1	
Physical channel for reporting	C _{CSI,0} CQI			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		4	
Reporting periodicity		ms		Npd	= 5			= 5
cqi-pmi-Configurata C _{CSI,0} (Note 1	ionIndex		3	3	N/A		3	N/A
cqi-pmi-Configuratio	onIndex2		4	4	N/A		4	N/A
ACK/NACK feedba	ck mode			Multip	lexing		Multip	lexing

Table 9.2.1.6-1: PUCCH 1-0 static test (TDD))
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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
1	CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
Note 13:	
Note 14:	cqi-pmi-ConfigurationIndex2 is applied for C _{CSI,1}

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 $CQI_1 + 1$ } 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.

Paramet	er	Unit	Те	st 1	Те	st 2		
Bandwidth		MHz	10					
PDSCH transmis	sion mode			4				
Develiate a surra	$ ho_{\scriptscriptstyle A}$	dB						
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3					
	σ	dB			0			
Propagation con antenna config				Clause	B.1 (2 x 2)			
CodeBookSubset bitmap	Restriction			01	0000			
SNR (Note	2)	dB	10	11	16	17		
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-88	-87	-82	-81		
$N_{oc}^{(j)}$	$N_{oc}^{(j)}$		-98 -98			98		
Max number of transmissi			1					
Physical channel f reportine			PUCCH Format 2					
PUCCH Report CQI/PM			2					
PUCCH Report T	ype for RI				3			
Reporting per	odicity	ms		Np	_{od} = 5			
cqi-pmi-Configura	ationIndex				6			
ri-ConfigIndex					lote 3)			
OCNG F Note 2: For each	Pattern OP.1 test, the mir	nent channel RC.2 F FDD as described ir nimum requirements	n Annex A.5.1 shall be fulfi	Ī.1.		-		
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.								

Table 9.2.2.1-1: PUCCH 1-1 static test (FDD)

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 $CQI_1 + 1$ } 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.

Para	meter		Unit	Те	Test 1 Test 2			
Bandwidth			MHz			10		
PDSCH tran	smissic	on mode				4		
Uplink downli	nk conf	iguration				2		
Special confid	subfrai guratior					4		
Downlink po		$ ho_{\scriptscriptstyle A}$	dB			-3		
allocation		$ ho_{\scriptscriptstyle B}$	dB			-3		
		σ	dB			0		
Propagation antenna c					Clause I	3.1 (2 x 2)		
CodeBookSu	bsetRe map	estriction			010	0000		
	(Note 2)	dB	10	11	16	17	
	r(j) or	,	dB[mW/15kHz]	-88	-87	-82	-81	
Ν	$N_{oc}^{(j)}$			-98 -98			98	
Max numb				1				
	nission					-		
Physical char rep	nel for orting	CQI/PMI		PUSCH (Note 3)				
PUCCH F		Туре		2				
Reporting			ms	$N_{\rm pd} = 5$				
cqi-pmi-Con	figurati	onIndex		3				
ri-Cor	figInde	x		805 (Note 4)				
ACK/NACK f						olexing		
OC	NG Pat	tern OP.1	ent channel RC.2 T TDD as described ir	n Annex A.5.2	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 subframe							
	SF#7 and #2.							
-	RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions							
bety	veen R	Î, CQI/PMI	and HARQ-ACK re	ports. In the	case when all	three reports	collide, it is	
			Il reports will be dro					
eNE	3, CQI i	report colle	eNB, CQI report collection shall be skipped every 160ms during performance verification.					

Table 9.2.2.2-1: PUCCH 1-1 static test (TDD)

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 CQI₁ shall be within the set {median CQI₁ -1, median CQI₁ +1} for more than 90% of the time, where the resulting wideband values CQI₁ 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 CQI₀ – 1 and median CQI₁ – 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	Tes	st 1	Tes	st 2
Bandwidth		MHz			10		
PDSCH tra	nsmissi	on mode				9	
		$ ho_{\scriptscriptstyle A}$	dB	0			
Downlink pov	ver	$ ho_{\scriptscriptstyle B}$	dB			0	
allocation		P_c	dB			-3	
		σ	dB			-3	
Cell-specific	referen	ce signals			Antenna	a ports 0, 1	
CSI refe						orts 15,,18	
CSI-RS period						, ,	
	offset				:	5/1	
T _{CSI-F}	$_{\rm S}$ / $\Delta_{\rm CSI}$	RS					
CSI reference						0	
Propagation co					Clause	B.1 (4 x 2)	
	iguratio					· · ·	
Beamfo				As specified in Section B.4.3			
CodeBookSubs				0x0000 0000 0100 0000			
SNR	(Note 2	2)	dB	7	8	13	14
	$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-91	-90	-85	-84
	$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98		8	
Max number of	HARQ t	ransmissions				1	
Physical cha	nnel for	· CQI/PMI			DUSCI	J (Noto2)	
	porting			PUSCH (Note3)			
PUCCH Repor				2			
Physical chan					PUCCH Format 2		
PUCCH Re				3			
Reportir	ng perio	dicity	ms	$N_{\rm pd} = 5$			
	CQI delay		ms			8	
cqi-pmi-ConfigurationIndex					2		
	nfigInde					1	
			annel RC.7 TDD ac		ble A.4-1 with	n one sided dyr	namic OCNG
			ibed in Annex A.5.1				
			requirements shall	be fulfilled for	at least one	of the two SNR	(s) and the
		anted signal inp			<i></i>		
			CQI/PMI reports an				
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.							
allow	periodic		iuitipiex with the HA	RQ-ACK ON H	-USCH in upi	INK SF#U and #	FO.

Table 9.2.3.1-1: PUCCH 1-1 static test (FDD)

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 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 +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	Te	st 1	Tes	st 2		
Bandwidth		MHz			10		
PDSCH transmission mode					9		
Uplink downlink con					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				Antenna	ports 0, 1		
CSI reference si				Antenna po	orts 15,,22		
CSI-RS periodicity an offset <i>T</i> _{CSI-RS} / Δ _{CSI-}				5	i/ 3		
CSI reference signal c					0		
Propagation condition	and antenna			Clause I	B.1 (8 x 2)		
configuratio Beamforming M				As specified i	n Section B.4.	3	
CodeBookSubsetRestr					0000 0000 000		
SNR (Note 2		dB	4	5	10	11	
$\hat{I}_{or}^{(j)}$	/	dB[mW/15kHz]	-94	-93	-88	-87	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-9	-98	
Max number of HARQ t	ransmissions				1		
Physical channel for			PUSCH (Note 3)				
reporting				1 0001	(11010-0)		
PUCCH Report Type fo PMI	r CQI/second		2b				
Physical channel for F	RI reporting		PUSCH				
PUCCH Report Type fo	r RI/ first PMI		5				
Reporting perio	dicity	ms		Np	d = 5		
CQI delay		ms		10	or 11		
cqi-pmi-Configurat	ionIndex				3		
ri-ConfigInde					Note 4)		
ACK/NACK feedba					plexing		
		annel RC.7 TDD ac		ble A.4-1 with	one sided dyr	namic OCNG	
Note 2: For each test respective wa	, the minimum anted signal inp		be fulfilled for				
PUSCH inste	ad of PUCCH.	CQI/PMI reports an PDCCH DCI forma outtiplex with the HA	t 0 shall be tr	ansmitted in d	lownlink SF#3	and #8 to	
Note 4: RI reporting i RI, CQI/PMI a CQI/PMI repo	nterval is set to and HARQ-AC orts will be drop	the maximum allow K reports. In the cas oped, while RI and F every 160ms during	vable length o se when all th HARQ-ACK w	of 160ms to m ree reports co rill be multiple	inimise collisio ollide, it is expe	ons between ected that	

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 $CQI_1 + 1$ } 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	Tes			Tes						
			TP1	TP2		TP1	TF	2				
Bandwidth		MHz				10						
PDSCH transmis	² DSCH transmission mode		PDSCH transmission mode							10		
	$ ho_{\scriptscriptstyle A}$	dB	0	0		0	0					
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0	0		0	()				
allocation (Note 1)	Pc	dB	-3	-3	3	-3	-:	3				
	σ	dB	-3	N/.	A	-3	N/	/A				
Cell ID			C)		0)					
Cell-specific refere	nce signals		Antenna ports 0, 1	(Note	e 2)	Antenna ports 0, 1	(Not	e 2)				
CSI reference	signals		Antenna ports 15,,18	N/.	A	Antenna ports 15,,18	N	/Α				
CSI-RS periodi subframe offset <i>T</i> _C			5/1	N/	A	5/1	N	/A				
CSI-RS config			0	N/	A	0	N	/Α				
Zero-Power C configurat I _{CSI-RS} / <i>ZeroPow</i> bitmap	ion erCSI-RS		1 / 00100000000 0000	1 100000 000	00000	1 / 00100000000 0000	1 100000 000	000000				
CSI-IM config I _{CSI-RS} / ZeroPow bitmap	uration erCSI-RS		1 / 00100000000 0000	N/A		1 / 00100000000 0000	N/A					
CSI process configuration Signal/Interference/Reporting mode			CSI-RS/CSI-IN	M/PUCCH 1-1		CSI-RS/CSI-I	//PUCCH 1-1					
Propagation condition and antenna configuration			Clause B.1 (4 x 2)	Clause B.1 (2 x 2)		Clause B.1 (4 x 2)	Clause B.1 (2 x 2)					
CodeBookSubsetRestriction bitmap			0x0000 0000 0100 0000	100000		0x0000 0000 0100 0000	100000					
SNR (Note	e 3)	dB	20	6	7	20	14	15				
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-78	-92	-91	-78	-84	-83				
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98							
Modulation / Infor payload			(Note4)	QPSK / 4392		(Note4)	QPSK / 4392					
Max number of transmission	ons		1	N/A		1	N/A					
Physical channel for reporting	g		PUSCH (Note5)	N/	A	PUSCH (Note5)	N/A					
PUCCH Report CQI/PM			2	N/.	A	2	N	/A				
PUCCH Report T			3	N/.		3	N					
Reporting peri	iodicity	ms	$N_{\rm pd} = 5$	N/.		$N_{\rm pd} = 5$	N					
CQI Dela		ms	8	N/.		8	N					
cqi-pmi-ConfigurationIndex			2	N/.		2	N					
ri-ConfigIndex			1	N/.	A	1	N/	/A				
PDSCH scheduled sub-frames			1,2,3,4,6,7,8,9			1,2,3,4,6,7,8,9						
Timing offset between TPs Frequency offset between TPs		us Hz										
Note1: Referenc OP.1 FDI Note 2: REs for a Note 3: For each	e measureme D as described ntenna ports (test, the minir	nt channel RC.10 d in Annex A.5.1.1) and 1 CRS have num requirements	FDD according to zero transmission	Table A.4 power.		ne sided dynamic	OCNG F					
Note 4: Void	ignal input lev		orts and HARQ-AC	W it is no		to report both on I		1				

Table 9.2.4.1-1: PUCCH 1-1 static test (FDD)

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 $CQI_1 + 1$ } 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 $CQI_0 + 1$ and median $CQI_1 + 1$ shall be greater than or equal to 0.1.

Paramete	or	Unit	Tes			Tes			
			TP1	TP1 TP2		TP1 TP2		P2	
Bandwidt		MHz	10						
PDSCH transmiss						0			
Uplink downlink co Special subframe c						2 4			
Special subframe c		15				-			
	$ ho_{\scriptscriptstyle A}$	dB	0	0		0	()	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0	0		0	(C	
allocation (Note 1)	Pc	dB	-6	-6	6	-6	-	6	
	σ	dB	-3	N/	A	-3	N	/A	
Cell ID			C)		0)		
Cell-specific refere	nce signals		Antenna ports 0, 1	(Not	e 2)	Antenna ports 0, 1	(No	te 2)	
CSI reference	signals		Antenna ports 15,,22	N/	A	Antenna ports 15,,22	N	/A	
CSI-RS periodi subframe offset T_{CS}			5/3	N/	A	5/3	N	/A	
CSI-RS config			0	N/	A	0	N	/A	
Zero-Power C configurati I _{CSI-RS} / ZeroPowe bitmap	ion erCSI-RS		3 / 00100000000 0000	3 / 10000100000 00000		3 / 00100000000 0000	10000	; / 100000 200	
CSI-IM configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap			3 / 00100000000 0000	N/A		3 / 00100000000 0000	N/A		
CSI process configuration Signal/Interference/Reporting mode			CSI-RS/CSI-IN	-		CSI-RS/CSI-I	M/PUCCI	H 1-1	
Propagation condition and antenna configuration			Clause B.1 (8 x 2)	Clause B.1 (2 x 2)		Clause B.1 (8 x 2)	Clause B.1 (2 x 2)		
CodeBookSubsetRestriction bitmap			0x0000 0000 0020 0000 0000 0001 0000	100000		0x0000 0000 0020 0000 0000 0001 0000	100	000	
SNR (Note	e 3)	dB	17	6	7	17	14	15	
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-81	-92	-91	-81	-84	-83	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-9	8		-9	98		
Modulation / Infor payload			(Note4)	QPSK / 4392		(Note4)	QPSK / 4392		
Max number of transmissio	ons		1	N/	A	1	N/A		
Physical channel for reporting	g		PUSCH (Note5)	N/	A	PUSCH (Note5)	N	/A	
PUCCH Report CQI/second	PMI		2b	N/		2b		/A	
Physical channel for RI reporting			PUSCH	N/	A	PUSCH	N	/A	
PUCCH Report Type for RI/ first PMI			5	N/		5		/A	
Reporting periodicity		ms	$N_{\rm pd} = 5$	N/		$N_{\rm pd} = 5$	N/A		
CQI Delay cqi-pmi-ConfigurationIndex		ms	10 or 11 3	N/		10 or 11 3		/A /A	
ri-ConfigIn			3 805 (Note 6)	N/		3 805 (Note 6)		/A /A	
ACK/NACK feedb			Multiplexing	N/		Multiplexing		/A /A	
PDSCH scheduled			3,4,			3,4,			
Timing offset bety		us	0,4,			(
Frequency offset be		Hz	C			-	0		

Table 9.2.4.2-1: PUCCH 1-1 static test ((100)	

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:	Void
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.

9.3 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.

Parameter		Unit	Tes	Test 1 Test 2		
Bar	ldwidth	MHz	10 MHz			
Transmission mode			1 (port 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
	$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-89	-88	-84	-83
1	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	98	-9	98
			Clause	B.2.4 wi	th $ au_d = 0$).45 <i>μ</i> s,
Propaga	tion channel		$a = 1, f_D = 5 \text{ Hz}$			
Antenna	configuration		1 x 2			
	ng interval	ms	5			
CQ	l delay	ms	8			
	ting mode		PUSCH 3-0			
	and size	RB	6 (full size)			
	ber of HARQ missions		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 						
Note 3: F	Annex A.5.1.1/2. 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 9.3.1.1.1-1 Sub-band test for single antenna transmission (FDD)

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.

Para	meter	Unit	Те	st 1	Tes	st 2
Banc	lwidth	MHz	10 MHz			
Transmis	Transmission mode		1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB				
power	$ ho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB			0	
	downlink uration				2	
	subframe uration				4	
SNR (Note 3)	dB	9	10	14	15
Î	(j) or	dB[mW/15kHz]	-89	-88	-84	-83
N	v(j) oc	dB[mW/15kHz]	-98 -98			8
			Clause B.2.4 with			1
Propagatio	on channel		$ au_{d} = 0.45 \mu { m s}, a = 1,$			1,
			$f_D = 5 \text{ Hz}$ 1 x 2			
Antenna co	onfiguration					
Reportin	g interval	ms	5			
CQI	delay	ms	10 or 11			
Reporti	ng mode		PUSCH 3-0			
0	and size	RB	6 (full size)			
	er of HARQ				1	
	nissions					
	edback mode				plexing	-
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)						than
Note 2: Ref with						
		ninimum requirement (s) and the respect				

Table 0.2.1.1.2.1 Sub band toot for single antenna transmission (TI	וחר
Table 9.3.1.1.2-1 Sub-band test for single antenna transmission (TI	וטכ

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.

Parameter		Unit		Tes		Te	est 2
			Cell 1 Cell 2 and 3		Cell 1	Cell 2 and 3	
Bandwidth PDSCH transmission mode		MHz	1	10	Note 10	1	10 Note 10
1 00011 (18/13/11/33/	ρ_A	dB	0		0		
Downlink power		dB		0			0
allocation	$ ho_{\scriptscriptstyle B}$ σ	dB		0			0
	0	QD	Clause	-		Clause B.2.4	
Propagation con	dition		with Td = 0.45 us, a = 1, fd = 5 Hz		EVA5 Low antenna correlation	with Td = 0.45 us, a = 1, fd = 5 Hz	EVA5 Low antenna correlation
Antenna configu	ration			1x		1	x2
${\widehat E}_{s} ig/ N_{oc2}$ (Not	e 1)	dB	4	5	Cell 2: 12 Cell 3: 10	14 15	Cell 2: 12 Cell 3: 10
(<i>i</i>)	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (No	ote 7)	N/A	-98 (Note 7)	N/A
$N_{oc}^{(j)}$ at antenna port	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (No	ote 8)	N/A	-98 (Note 8)	N/A
•	$N_{oc3}^{(j)}$	dBm/15kHz	-93 (No	,	N/A	-93 (Note 9)	N/A
Subframe Config	uration		Non-M	BSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN
Cell Id			0		Cell 2: 6	0	Cell 2: 6
			Cell 3: 1 Cell 2: 3 usec			Cell 3: 1 Cell 2: 3 usec	
Time Offset betwee	en Cells	μs	Cell 3: -1usec		Cell 3: -1usec		
Frequency Shift betw	veen Cells	Hz	Cell 2: 300Hz Cell 3: -100Hz		Cell 2: 300Hz Cell 3: -100Hz		
ABS pattern (Note 2)			0101010 0101010 N/A 0101010 0101010		01010101 01010101 01010101 01010101 01010101 01010101	N/A	01010101 01010101 01010101 01010101 01010101 01010101
RLM/RRM Measurement Subframe Pattern (Note 4)			00000 00000 00000 00000 00000	0100 0100 0100	N/A	00000100 00000100 00000100 00000100 00000100	N/A
C _{CSI,0}			01010 01010 01010 01010 01010	0101 0101 0101 0101 0101	N/A	01010101 01010101 01010101 01010101 01010101 01010101	N/A
(Note 3)	C _{CSI,1}		10101010 10101010 10101010 10101010 10101010 10101010		01010 101010 01010 101010 01010 N/A 10101010 01010 101010		N/A
Number of control symbols	OFDM			3		3	
Max number of F transmission				1		1	
CQI delay	-	ms			8	3	
Reporting interval (Note 13)		ms	10				
Reporting mo			PUSCH 3-0				
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].
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).
N / / / O	

Note 13: The CSI reporting is such that reference subframes belong to C_{csi,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 9.3.1.1.3-2 Minimum requirement (FDD)

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 $\geq \gamma$;
- 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.

Parameter		Unit		Tes	st 1	Test 2		
			Ce		Cell 2 and 3	Ce		Cell 2 and 3
Bandwidth		MHz		1	0		1	0
PDSCH transmission mode			1	1	Note 10	-	1	Note 10
Uplink downlink conf	iguration				1			1
Special subframe				4	1			4
configuration	1							
Downlink power	$ ho_{\scriptscriptstyle A}$	dB)			0
allocation	$ ho_{\scriptscriptstyle B}$	dB		()			0
	σ	dB)			0
Propagation conditio	n		Clause with Td us, a = 5 I	1, fd =	EVA5 Low antenna correlation	us a – 1 td –		EVA5 Low antenna correlation
Antenna configuratio	n			1)	<2		1:	x2
$\widehat{E}_{s} ig / N_{oc2}$ (Note 1)		dB	4	5	Cell 2: 12 Cell 3: 10	14	15	Cell 2: 12 Cell 3: 10
(;)	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (N	lote 7)	N/A	-98 (N	lote 7)	N/A
$N_{oc}^{(j)}$ at antenna port	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (Note 8)		N/A	-98 (Note 8)		N/A
port	$N_{oc3}^{(j)}$	dBm/15kHz	-93 (Note 9)		N/A	-93 (Note 9)		N/A
Subframe Configuration			Non-MBSFN		Non-MBSFN	Non-MBSFN		Non-MBSFN
Cell Id			0		Cell 2: 6 Cell 3: 1	0		Cell 2: 6 Cell 3: 1
Time Offset between	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			
ABS pattern (Note 2))		N	/A	0100010001 0100010001	N	/A	0100010001 0100010001
RLM/RRM Measurer Subframe Pattern (N			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	01000 01000	N/A		01000 01000	N/A
Number of control OFDM symbols			3		3			
Max number of HARQ transmissions			1				1	
CQI delay		ms			1	4		
Reporting interval (N	ote 13)	ms				0		
Reporting mode					PUSC	CH 3-0		
Sub-band size		RB	6 (full size)					
ACK/NACK feedback	< mode			Multip	lexing		Multip	lexing

Table 9.3.1.1.4-1 Sub-band test for single antenna transmission (TDD)

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].
Noto 5	
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 C

Note 13: The CSI reporting is such that reference subframes belong to C_{csi,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)

9.3.1.2 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.

Para	meter	Unit	Test 1 Test			st 2
Band	lwidth	MHz	10 MHz			
Transmis	sion mode		9			
$ ho_{\scriptscriptstyle A}$		dB			0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0	
allocation	P _c	dB	0			
	σ	dB				
SNR (Note 3)	dB	4	5	11	12
Î	(j) pr	dB[mW/15kHz]	-94	-93	-87	86
N	v(j) oc	dB[mW/15kHz]	-(98	-9	98
			Clause	e B.2.4 wi	th $ au_d = 0$).45 μs,
Propagati	on channel			a = 1, <i>f</i>	$f_D = 5 \text{Hz}$	
Antenna co	onfiguration			$a = 1, f_D = 5 \text{ Hz}$ 2x2		
	ning Model		As specified in Section B.4.3		B.4.3	
CRS refere	ence signals			Antenna ports 0		
CSI refere	nce signals		Antenna ports 15, 16		16	
	and subframe offset			5	/ 1	
	$/\Delta_{CSI-RS}$					
	signal configuration				4	
	Restriction bitmap				0001	
	erval (Note 4)	ms			5	
	delay	ms			8	
	ng mode				<u>CH 3-1</u>	
	and size	RB		6 (ful	l size)	
	ARQ transmissions				1	
CQI estim	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	e measurement chann amic OCNG Pattern C	el RC.8 FDD accordir	ng to Tab	ble A.4-1	with one/	′two
Note 3: For each	test, the minimum req nd the respective want	uirements shall be full				two
Note 4: PDCCH	DCI format 0 with a trig I #6 to allow aperiodic	ger for aperiodic CQI				

Table 9.3.1.2.1-1	Sub-band	l test for FDD
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	Test 1	Test 2
α[%]	2	2
β[%]	40	40
γ	1.1	1.1
UE Category	≥1	≥1

Table 9.3.1.2.1-2 Minimum requirement (FDD)

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.

Parameter Unit Test				st 1	Te	st 2	
Bandwidth		MHz		10 MHz			
Transmission mode					9		
Uplink downlink configuration					2		
Special subfra	me 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	4	5	11	12	
	$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-94	-93	-87	-86	
1	$V_{oc}^{(j)}$	dB[mW/15kHz]	-6	98	-6	98	
			Clause	B.2.4 wi	th $\tau_{J} = 0$).45 μs,	
Propaga	tion channel			Clause B.2.4 with $\tau_d = 0.45 \mu \text{s}$ $a = 1, f_D = 5 \text{Hz}$			
Antenna	configuration		2x2				
	ming Model		As sp	pecified in	n Section	B.4.3	
CRS reference signals			· · · ·		a port 0		
	CSI reference signals				port 15,1	6	
	and subframe offset				/ 3		
	$_{\rm S}$ / $\Delta_{\rm CSI-RS}$			5	/ 3		
CSI-RS reference	signal configuration				4		
	etRestriction bitmap			000	0001		
Reporting ir	iterval (Note 4)	ms			5		
CQ	l delay	ms	10				
	ing mode				CH 3-1		
	and size	RB	6 (full size)				
Max number of H	IARQ transmissions				1		
	feedback mode				blexing		
	reports in an available						
	mation at a downlink su					bband	
	and CQI cannot be app						
	ce measurement chann					′two	
	namic OCNG Pattern C						
	test, the minimum req		filled for a	at least o	ne of the	two	
	and the respective wan						
	DCI format 0 with a trig						
SF#3 ar	d #8 to allow aperiodic	CQI/PMI/RI to be trar	nsmitted	on uplink	SF#2 ar	nd #7.	

-	
Table 9.3.1.2.2-1	Sub-band test for TDD

Table 9.3.1.2.2-2 Minimum	requirement (TDD)
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	Test 1	Test 2
α[%]	2	2
β [%]	40	40
γ	1.1	1.1
UE Category	≥1	≥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 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 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

Parameter		Unit	Te	st 1	Tes	st 2
Bandwidth		MHz	10 MHz			
Transmission mode				1 (po	ort 0)	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$ ho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB	0			
SNR (Note 3)	dB	6	7	12	13
ĺ	c(j) or	dB[mW/15kHz]	-92	-91	-86	-85
Λ	$V_{oc}^{(j)}$	dB[mW/15kHz]	-6	98	-9	8
Propagati	on channel			EP	A5	
	ation and onfiguration			High ((1 x 2)	
	ng mode			PUCC	`H 1_0	
	periodicity	ms			= 2	
	delay	ms				
	channel for		PUSCH (Note 4)			
	eporting			· · · ·		
	Report Type			4	1	
	-pmi- ationIndex				1	
	er of HARQ					
	nissions				1	
Note 1:	If the UE repo	rts in an available u	plink rep	orting ins	tance at	
	than SF#(n-4) eNB downlink	th based on CQI es , this reported wide , before SF#(n+4)	band CQ	l cannot l	be applie	d at the
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				rn OP.1 g to		
Note 3:	least one of the two SNR(s) and the respective wanted signal input					
Note 4:	level. 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)
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	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.

Parameter		Unit	Test 1 Test		st 2	
Bandwidth		MHz	10 MHz			
Transmi	ssion mode			1 (po	ort 0)	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$ ho_{\scriptscriptstyle B}$	dB		(0	
allocation	σ	dB		(C	
Uplink downlink configuration					2	
Specia	subframe guration			4	4	
	(Note 3)	dB	6	7	12	13
	. ,					
	$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-92	-91	-86	-85
1	$V_{oc}^{(j)}$	dB[mW/15kHz]	-6	98	-9	98
	tion channel			EP	PA5	
	ation and			High ((1 x 2)	
	configuration					
	ing mode				CH 1-0	
	g periodicity	ms	$N_{\rm pd} = 5$			
	l delay	ms	10 or 11			
CQI r	channel for eporting		PUSCH (Note 4)			
	Report Type			4	4	
	i-pmi-			2	3	
Configu	rationIndex				5	
	per of HARQ				1	
	missions					
	CK feedback			Multip	lexing	
Note 1:	node	l orts in an available u	unlink ron	orting inc	tonoo ot	
Note 1.		th based on CQI es				ot lator
		, this reported wide				
		before SF#(n+4).		i cannot i	be applie	uatine
Note 2:		easurement channel			ding to Ta	ahla
Note 2.		egory 2-8 with one s				
		ibed in Annex A.5.2				
		or Category 1 with o				
		2 TDD as described				
Note 3:	For each test,	, the minimum requirements shall be fulfilled for at				
		ne two SNR(s) and t	ne respe	ctive war	nted signa	ai input
Noto 4:	level.	aiona hatwaan COL	roporto o			•
Note 4:		sions between CQI report both on PUS				
		shall be transmitted				
		to multiplex with the				
	subframe SF#				0001111	upiirik
l						

Table 9.3.2.1.2-1 Fading test for single antenna (TDD)

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.

Para	neter	Unit	Tes	st 1	Tes	st 2
Band	width	MHz	10 MHz			
Transmiss	sion mode		9			
	$ ho_{\scriptscriptstyle A}$	dB		(C	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB		(C	
allocation	P_c	dB		-1	3	
	σ	dB		-	3	
SNR (1	Note 3)	dB	2	3	7	8
\hat{I}_{a}^{0}	(j) m	dB[mW/15kHz]	-96	-95	-91	-90
N	(j) oc	dB[mW/15kHz]	-9	8	-9	98
Propagatio	on channel			EP	A5	
Correlation and an				ULA Hig	h (4 x 2)	
Beamform	ning Model		As sp		Section	B.4.3
Cell-specific re				Antenna	ports 0,1	
CSI referen	nce signals		An	tenna po	rts 15,	,18
	and subframe offset				/1	
	Δ_{CSI-RS}			5,	/1	
CSI-RS reference s	signal configuration				2	
CodeBookSubset	Restriction bitmap		0x0	000 000	0 0000 0	001
Reportir	ng mode		PUCCH 1-1			
Reporting		ms		N _{pd}	= 5	
CQI delay		ms		8	3	
Physical channel for CQI/ PMI					(Note 4)	
reporting				FUSCH	(11018 4)	
PUCCH Report Type for CQI/PMI 2						
	I for RI reporting				Format 2	
PUCCH repo					3	
	gurationIndex				2	
	ïgIndex				1	
	RQ transmissions				1	
on CQI e	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.				ne		
	test, the minimum re			or at leas	st one of t	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 9.3.2.2.1-1 Fading test for FDD

	Test 1	Test 2
α[%]	20	20
γ	1.05	1.05
UE Category	≥1	≥1

 Table 9.3.2.2.1-2 Minimum requirement (FDD)

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.

	Parar	neter	Unit	Tes	st 1	Te	st 2
	Bandwidth		MHz		10	MHz	
Т	ransmiss	sion mode		9			
Uplink	downlin	k configuration		2			
Specia	subfram	ne configuration			4	4	
		$ ho_{\scriptscriptstyle A}$	dB			0	
Downlink		$ ho_{\scriptscriptstyle B}$	dB		(0	
allocati	on	P_c	dB		-	6	
		σ	dB		-	3	
	SNR (I	Note 3)	dB	1	2	7	8
	$\hat{I}_{o}^{(}$	j) r	dB[mW/15kHz]	-97	-96	-91	-90
	N	(j) oc	dB[mW/15kHz]	-9	8	-6	98
Pi	opagatio	on channel			EF	PA5	
		tenna configuration			XP Hig	h (8 x 2)	
		ing Model		As sp		Section	B.4.3
CR	S refere	nce signals			Antenna	ports 0, 1	
		nce signals		An	tenna po	orts 15,	,22
CSI-RS per		and subframe offset Δ_{CSI-RS}			5/	/ 3	
CSI-RS ret		signal configuration				2	
		Restriction bitmap		0x0000 0000 0000 0020 0000		0000	
	Reportir	na mode		0000 0001 PUCCH 1-1 (Sub-mode: 2)		le: 2)	
R		periodicity	ms	$N_{\rm pd} = 5$			
	CQI		ms	10			
Physical channel for CQI/ PMI reporting			PUSCH (Note 4)				
DUCCH	PUCCH Report Type for CQI/ PMI					. ,	
		I for RI reporting				<u>2c</u> Format 2	,
		ort type for RI					
		gurationIndex				3 3	
cqi-p	ri-Conf				805 (N	-	
Max numb		RQ transmissions			1) 000	1	
		edback mode			Multir	lexing	
		reports in an availabl	le uplink reporting ir	istance a			based
0	on CQI e	stimation at a downlir	nk SF not later than	SF#(n-4)	, this rep		
		not be applied at the e e measurement chan				1.1 with a	~~
		amic OCNG Pattern					ne
	-	test, the minimum re					the two
S	SNR(s) a	nd the respective wa	nted signal input lev	/el.			
		collisions between C					y to
	report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be			with the			
	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.			with the			
		ng interval is set to the between RI, CQI/PN					
	enorte ci	ollide, it is expected the	hat COI/PMI reports	will he d	ronned		and
		CK will be multiplexed					
		Oms during performar					
9	SF#7 of t	he previous frame is	applied in downlink				
Ó	CQI/PMI	dropping) is available	э. Э.				

Table 0 2 2 2 2 4	Eading toot for TDD
Table 9.3.2.2.2-1	Fading test for TDD

Table 9.3.2.2.2-2 N	/linimum	requirement	(TDD)
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	Test 1	Test 2
α[%]	20	20
γ	1.05	1.05
UE Category	≥1	≥1

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 α % 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.

Para	meter	Unit	Test 1	Test 2
Band	dwidth	MHz	10 MHz	10 MHz
Transmis	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
$I_{\scriptscriptstyle ot}^{(j)}$ for	RB 05	dB[mW/15kHz]	-102	-93
$I_{\mathit{ot}}^{(j)}$ for $ $	RB 641	dB[mW/15kHz]	-93	-93
$I_{\mathit{ot}}^{(j)}$ for F	RB 4249	dB[mW/15kHz]	-93	-102
Î	(j) or	dB[mW/15kHz]	-94 -94	
	er of HARQ hissions		1	
			Clause B.2.4 wi	th $ au_d=0.45\mu\mathrm{s}$,
Propagati	on channel		a=1, f	$f_D = 5 \text{ Hz}$
	g interval	ms		
Antenna configuration			1:	x 2
CQI delay		ms		8
	ng mode			CH 3-0
	and size	RB	· · · · ·	l size)
r 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)			
		nnex A.5.1.1/2.		

Table 9.3.3.1.1-1 Sub-band test for single antenna transmission (FDD)

	Test 1	Test 2
α[%]	60	60
γ	1.6	1.6
UE Category	≥1	≥1

Table 9.3.3.1.1-2 Minimum requirement (FDD)

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 α % 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.

Para	ameter	Unit	Test 1	Test 2
Bandwidth		MHz	10 MHz	10 MHz
Transmis	ssion 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
	downlink guration		2	
	subframe guration		4	
$I_{\scriptscriptstyle ot}^{(j)}$ for	r RB 05	dB[mW/15kHz]	-102	-93
$I_{\scriptscriptstyle ot}^{(j)}$ for	RB 641	dB[mW/15kHz]	-93	-93
$I_{\scriptscriptstyle ot}^{(j)}$ for	RB 4249	dB[mW/15kHz]	-93 -102	
j	$\hat{f}(j)$	dB[mW/15kHz]	-94	-94
	per of HARQ		1	
Propagat	ion channel		Clause B.2.4 with $\tau_d = 0.45 \mu\text{s}$, $a = 1, f_D = 5 \text{Hz}$	
Antenna o	configuration		1 x 5	2
Reporti	ng interval	ms	5	
	delay	ms	10 o	
Report	ing mode		PUSC	H 3-0
	and size	RB	6 (full	size)
	ACK/NACK feedback Multiplexing			exing
 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 9.3.3.1.2-1 Sub-band test for single antenna transmission (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_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the subband size.

Parameter		Unit	Test 1 Test 2			st 2
Bandwidth		MHz		10 I	MHz	
Transmission mode			1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power	$ ho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB		()	
SNR	(Note 3)	dB	9	10	14	15
	$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-89	-88	-84	-83
1	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	98	-9	98
			Clause	B.2.4 wit	h $\tau_d = 0$).45 <i>μ</i> s,
Propagation channel			$a = 1, f_D = 5 \text{ Hz}$			
Reporti	ng interval	ms	5			
CQ	l delay	ms	8			
	ing mode		PUSCH 2-0			
	per of HARQ		1			
	missions		-			
	nd size (k)	RBs		3 (full	size)	
	of preferred ands (<i>M</i>)		5			
 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.5 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. 				CQI able 9D as r at		

 Table 9.3.4.1.1-1 Subband test for single antenna transmission (FDD)

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

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.

Parameter		Unit	Tes	st 1	Tes	st 2
Bandwidth		MHz		10 MHz		
Transmi	ssion mode		1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$ ho_{\scriptscriptstyle B}$	dB		(C	
allocation	σ	dB		()	
config	downlink guration			2	2	
	subframe guration			2	1	
SNR	(Note 3)	dB	9	10	14	15
	$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-89	-88	-84	-83
Ι	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	98	-6	98
Propagat	ion channel		Clause B.2.4 with $\tau_d = 0.45 \mu \text{s}$).45 <i>μ</i> s,
			$a = 1, f_D = 5 \text{ Hz}$			
	ng interval	ms	5			
	l delay	ms	10 or 11			
	ing mode			PUSC	CH 2-0	
	per of HARQ		1			
	missions	RBs		2 /6.1		
	nd size (k) of preferred	KD5		3 (full	size)	
	ands (<i>M</i>)			ţ	5	
ACK/NAC	CK feedback			Multin	lexing	
	node			•	•	
Note 1: Note 2: Note 3:	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.5 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 9.3.4.1.2-1 Sub-band test for single antenna transmission (TDD)

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_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the subband size.

Parameter		Unit	Tes	st 1	Tes	st 2
	dwidth	MHz			MHz	
Transmis	sion mode			1 (po	ort 0)	
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power	$ ho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB		()	
SNR	(Note 3)	dB	8	9	13	14
Í	(j) or	dB[mW/15kHz]	-90	-89	-85	-84
Λ	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	98	-9	98
Propagati	on channel			B.2.4 wit a = 1, f N_P		
	periodicity	ms		N _P	= 2	
	delay	ms		8	3	
	channel for eporting			PUSCH	(Note 4)	
	Report Type					
for wide	band CQI			2	1	
	Report Type				1	
	band CQI				•	
	er of HARQ		1			
	nissions d size (<i>k</i>)	RBs	6 (full size)			
	f bandwidth	TLD3		· · · · ·		
	ts (J)		3			
	K		1			
	ConfigIndex			1		
	subframe SF# not later than cannot be app	orts in an available u of based on CQI es SF#(n-4), this repor- blied at the eNB dow	timation a rted subb vnlink bel	at a down and or wi fore SF#(llink subf deband (n+4)	CQI
	A.4-1 with one	easurement channel				
Note 3:	For each test,	in Annex A.5.1.1/2. est, the minimum requirements shall be fulfilled for at of the two SNR(s) and the respective wanted signal input				
Note 4:	To avoid collis necessary to DCI format 0 to allow period	bilisions between CQI reports and HARQ-ACK it is to report both on PUSCH instead of PUCCH. PDCCH 0 shall be transmitted in downlink SF#1, #3, #7 and #9 riodic CQI to multiplex with the HARQ-ACK on PUSCH ubframe SF#5, #7, #1 and #3.				
Note 5:	CQI reports for bandwidth para according to the with j=1.	or the short subband (having 2RBs in the last rt) are to be disregarded and data scheduling he most recent subband CQI report for bandwidth part			dth part	
		nere wideband CQI cording to the most				I

Table 9.3.4.2.1-1 Subband test for single antenna transmission (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.

Par	ameter	Unit	Те	st 1	Tes	st 2
-	ndwidth	MHz			MHz	
	ssion mode				ort 0)	
Downlink		dB)	
power	$\rho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB		()	
Uplink	downlink					
	guration			2	2	
	l subframe			4	1	
	guration	5				
	(Note 3)	dB	8	9	13	14
	$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-90	-89	-85	-84
1	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	98	-9	8
Propaga	tion channel		Clause	B.2.4 wit	th $ au_d=0$.45 μs,
				a = 1, f $N_{\rm P}$ 10 c	$_{D} = 5 \text{Hz}$	
	g periodicity	ms		N _P	= 5	
	I delay	ms		10 c	or 11	
	channel for eporting			PUSCH	(Note 4)	
PUCCH	Report Type			4	1	
	eband CQI				T	
	Report Type				1	
	ber of HARQ					
	missions		1			
	nd size (<i>k</i>)	RBs		6 (full	size)	
	of bandwidth rts (<i>J</i>)			3	3	
pa	K				1	
cqi-pmi-	ConfigIndex				3	
	CK feedback		Multiplexing			
	node			-	-	
Note 1:	subframe SF# not later than cannot be app	orts in an available u th based on CQI es SF#(n-4), this repor blied at the eNB dow	timation a ted subb vnlink bei	at a down and or wi fore SF#(ilink subfr deband (n+4).	CQI
Note 2:		easurement channel				
		e/two sided dynamic Annex A.5.2.1/2.			/ . I/Z ID	Das
Note 3:			uirements shall be fulfilled for at d the respective wanted signal input			
Note 4:	To avoid collis necessary to DCI format 0	Ilisions between CQI reports and HARQ-ACK it is o report both on PUSCH instead of PUCCH. PDCCH 0 shall be transmitted in downlink SF#3 and #8 to allow 11 to multiplex with the HARQ-ACK on PUSCH in upline F#7 and #2				CCH allow
Note 5:	CQI reports for bandwidth paraccording to t with j=1.	#7 and #2. or the short subband (having 2RBs in the last rt) are to be disregarded and data scheduling the most recent subband CQI report for bandwidth pa			dth part	
Note 6:		here wideband CQI cording to the most				

Table 9.3.4.2.2-1 Sub-band test for single antenna transmission (TDD)

	Test 1	Test 2
γ	1.15	1.15
UE Category	≥1	≥1

Table 9.3.4.2.2-2 Minimum requirement (TDD)

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%.

Par	ameter	Unit	Cell 1	Cell 2		
Bai	ndwidth	MHz	10	MHz		
	ission mode			ort 0)		
Cyclic Prefix			Normal	Normal		
	ell ID		0	1		
SINF	R (Note 8)	dB	-2	N/A		
	$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	N/A		
	tion channel		EPA5	Static (Note 7)		
	lation and		Low (1 x 2)	(1 x 2)		
	configuration					
	(Note 4)	dB	N/A	-0.41		
	ference		Note 2	N/A		
-	ment channel			-		
	ting mode		PUCCH 1-0	N/A		
	g periodicity	ms	$N_{\rm pd} = 2$	N/A		
	l delay	ms	8	N/A		
CQI	I channel for reporting		PUSCH (Note 3)	N/A		
	Report Type		4	N/A		
	qi-pmi- ırationIndex		1	N/A		
Max num	ber of HARQ		1	N/A		
trans	missions	rts in an available	-			
Note 2: Note 3: Note 4: Note 5:	 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: 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 3: Note 6: Note 7: Note 8: Note 9:	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. Both cells are time-synchronous. Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present. SINR corresponds to \hat{E}_s / N_{oc} of Cell 1 as defined in clause 8.1.1. Downlink physical channel setup in Cell 2 applies OCNG pattern OP.1 FDD as defined in Annex A.5.1.1.					

 Table 9.3.5.1.1-1 Fading test for single antenna (FDD)



γ	1.8
UE Category	≥1

9.3.5.1.2 TDD

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%.

			0.114	0.11.0
	ameter	Unit MHz	Cell 1	Cell 2
	ndwidth	IVIHZ		MHz
	ission mode < downlink		т (рс	ort 0)
	iguration		2	
	al subframe			
	iguration		4	1
	lic Prefix		Normal	Normal
	Cell ID		0	1
SINF	R (Note 8)	dB	-2	N/A
	$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	-98
		ub[iiiw/iokii2]		
	tion channel		EPA5	Static (Note 7)
	lation and		Low (1 x 2)	(1 x 2)
	configuration (Note 4)	dB	N/A	-0.41
	ference	uВ	IN/A	-0.41
-	ment channel		Note 2	N/A
	rting mode		PUCCH 1-0	N/A
	ng periodicity	ms	$N_{\rm pd} = 5$	N/A
	l delay	ms	10 or 11	N/A
Physica	I channel for		PUSCH (Note	N/A
	reporting		3)	
	Report Type		4	N/A
	qi-pmi-		3	N/A
	urationIndex		-	-
	ber of HARQ		1	N/A
	CK feedback			
	node		Multiplexing	N/A
Note 1:		orts in an available u	plink reporting ins	tance at
	subframe SF#	n based on CQI es	timation at a down	link SF not later
		, this reported wide	band CQI cannot	be applied at the
		before SF#(n+4)		
Note 2:		easurement channe		
		ibed in Annex A.5.2		
		or Category 1 with o		
		2 TDD as described		
Note 3:		sions between CQI		
		report both on PUS		
		shall be transmitted		
		o multiplex with the	HARQ-ACK on P	USCH in uplink
Note 4:	subframe SF#		antral donaity of a	ach interfering
Note 4.		e received power sp		
	cell relative to	$N_{\it oc}$ ´ is defined by	its associated DII	- value as
	specified in cl			
Note 5:		considered in which		
		ering cell. The numb		ts in both cells is
Note 6:		efering cell is fully lo time-synchronous.	aded.	
Note 7:			rference model. Ir	case for white
Note 7: Static channel is used for the interference model. In case for white Gaussian noise model Cell 2 is not present.				
Note 9:		onds to \hat{E}_s / N_{oc}		d in clause
Note 8:		Under to $\mathbf{L}_{s} / \mathbf{W}_{oc}$	or Gell i as define	u in clause
Nata O:	8.1.1.	alaal ahan - I t		
Note 9:		sical channel setup		DUNG pattern
	OF. LIDD as	defined in Annex A	.0.2.1.	

Table 9.3.5.1.2-1 Fading test for single antenna (TDD)
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Table 9.3.5.1.2-2	Minimum	requirement	(TDD)
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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%.

Parameter	Unit Cell 1 Cell 2			
Bandwidth	MHz		10 MHz	
Transmission mode Cyclic Prefix		Normal	9 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		Antenna ports	Antenna port 0	
signals		0,1		
CSI reference signals		Antenna ports 15,16	N/A	
CSI-RS periodicity and subframe offset		5/1	N/A	
CSI-RS reference		2	N/A	
signal configuration 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		Note 2	N/A	
measurement channel 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		1	N/A	
transmissions			-	
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	tive to $N_{\scriptscriptstyle oc}{}^{\prime}$ is defined by its associated DIP value as			
Note 5: Two cells are 2 is the interfe	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.				

Table 9.3.5.2.1-1 Fading test for sing	gle antenna (FDD)
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Note 8:	SINR corresponds to \widehat{E}_s/N_{oc} ´ of Cell 1 as defined in clause
Note 9:	8.1.1. Downlink physical channel setup in Cell 2 applies OCNG pattern OP.1 FDD as defined in Annex A.5.1.1.

γ	1.8
UE Category	≥1

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%.

		•	、 <i>,</i>
Parameter	Unit	Cell 1	Cell 2
Bandwidth	MHz		MHz
Transmission mode		,	9
Uplink downlink			2
configuration			
Special subframe configuration		4	4
Cyclic Prefix		Normal	Normal
Cyclic Prelix 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		Low (2 x 2)	(1 x 2)
antenna configuration DIP (Note 4)	dB	N/A	-0.41
Cell-specific reference	uВ	Antenna ports	Antenna port 0
signals		0,1	Antenna port o
CSI reference signals		Antenna ports 15,16	N/A
CSI-RS periodicity and subframe offset		5/3	N/A
CSI-RS reference		2	N/A
signal configuration		۷	IN/A
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap	Subframes / bitmap	N/A	3 / 00100000000 0000
CodeBookSubsetRestr iction bitmap		001111	N/A
Reference measurement channel		Note 2	N/A
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		PUSCH (Note	
CQI/PMI reporting		3)	N/A
PUCCH Report Type			N1/A
for CQI/PMI		2c	N/A
Physical channel for RI		PUCCH	N1/A
reporting		Format 2	N/A
PUCCH Report Type for RI		3	N/A
cqi-pmi-		3	N/A
ConfigurationIndex ri-ConfigIndex		POE (Nata O)	N/A
Max number of HARQ		805 (Note 9)	IN/A
transmissions		1	N/A
ACK/NACK feedback	<u> </u>	Multiplosier	ΝΙ/Δ
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)			
A.4-1 with one	te 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 collis necessary to DCI format 0 periodic CQI/ uplink subfran	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			

Table 9.3.5.2.2-1	Fading test	for single antenna	(TDD)
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	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 $ \widehat{E}_{s} ig / \! 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.
Note 10:	
	OP.1 TDD as defined in Annex A.5.2.1.

Table 9.3.5.2.2-2 Minimum requirement (TDD)

γ	1.8
UE Category	≥1

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 $\geq \gamma$;

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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.

		Unit		Te	st 1			Те	st 2	
Para	Parameter		TP			2	TF		TF	2
	lwidth	MHz			MHz				MHz	
Transmis	sion mode		10			0	10 10		0	
	$ ho_{\scriptscriptstyle A}$	dB			0		0			
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0		0			
allocation	P_c	dB	-3 0)	-:	3	()	
	σ	dB		-	3			-	3	
	Note 7)	dB	10	11	7	8	14	15	9	10
\hat{I}_{c}	(j) pr	dB[mW/15kHz]	-88	-87	-91	-90	-84	-85	-89	-88
Ν	•(j) oc	dB[mW/15kHz]		-6	98			-6	98	
Propagatio	on channel		EPA 5	Low	a =	th .45 μs,	EPA	5 Low	" a =	th .45 μs,
	onfiguration		4x2		2>		4)		2)	
	ning Model		As spe		Section	B.4.3	As sp		Section	B.4.3
0	between TPs	US			0 0				0	
	et between TPs ference signals	Hz	Δ		ports 0,1				0 ports 0,1	
	signal 0		Antenna 15,	ports	N/	/A	Antenn 15,	a ports	N/	/A
	, and subframe offset / Δ_{CSI-RS}		5/1		N	/A	5/		N	/A
	onfiguration		0		N	/Α	()	N	/Α
CSI-RS	signal 1		N/#	A	Antenn 15	a ports ,16	N	/A	Antenn 15	•
T _{CSI-RS}	\prime and subframe offset / $\Delta_{ m CSI-RS}$		N/#	A	5/	/1	N	/A	5/	′1
CSI-RS 1 c	onfiguration		N/A	١		5	N	/A		5
	RS 0 configuration /erCSI-RS bitmap		N/#		1 111000 00		N		1 111000 00	
I _{CSI-RS} / ZeroPow	RS 1 configuration verCSI-RS bitmap		1 / 001001 ² 0000	0000	N	/A	1 00100 ⁷ 000	110000	N	/A
	and subframe offset / Δ_{CSI-RS}		5/1		5/	/1	5/	/1	5/	′1
	onfiguration		2		2	2	2	2	2	2
T _{CSI-RS}	and subframe offset / $\Delta_{\rm CSI-RS}$		5/1		N		5/	/1	N	
	onfiguration		6		N/	/A	6	6	N	Ά
T _{CSI-RS}	and subframe offset / Δ_{CSI-RS}		N/A		5/	/1	N		5/	/1
CSI-IM 2 c	onfiguration		N/A			1	N			
	CSI-RS				RS 0				RS 0	
	CSI-IM Reporting mode				-IM 0 CH 1-1				-IM 0 CH 1-1	
	CodeBookSubsetR estriction bitmap		0x00		0 0000 0	001	0x0		0 0000 0	001
	Reporting periodicity	ms	1	$N_{\rm pd}$	= 5		N _{pd} = 5			
CSI process 0	CQI delay	ms		1	0			1	0	
	Physical channel for CQI/ PMI reporting		F		(Note 6)				(Note 6)	
	PUCCH Report Type for CQI/PMI			:	2			:	2	
	PUCCH channel		F	UCCH	Format 2			PUCCH	Format 2	

Table 9.3.6.1-1 Fading test for FDD

	for RI reporting					
	PUCCH report type for RI		;	3	:	3
	cqi-pmi- ConfigurationIndex		2	2	2	2
	ri-ConfigIndex			1	1	
	CSI-RS		CSI-	RS 1	CSI-	RS 1
	CSI-IM			IM 0	CSI-	
	Reporting mode		PUSC	CH 3-1	PUSC	
CSI process 1	CodeBookSubsetR estriction bitmap		000	001	000	001
	Reporting interval (Note 9)	ms		5	Ę	
	CQI delay	ms		0	1	
	Sub-band size	RB	6 (ful		6 (full	
	CSI-RS			RS 0	CSI-	
	CSI-IM		CSI		CSI-	
	Reporting mode		PUSC	CH 3-1	PUSCH 3-1	
CSI process 2	CodeBookSubsetR estriction bitmap		0x0000 0000 0000 0001		0x0000 0000 0000 0001	
	Reporting interval (Note 9)	ms	5		5	
	CQI delay	ms	1	0	10	
	Sub-band size	RB	6 (full size		6 (full size) (Note 8)	
	CSI-RS		CSI-		CSI-RS 1	
	CSI-IM			·IM 2	CSI-IM 2	
	Reporting mode		PUSC	CH 3-1	PUSCH 3-1	
CSI process 3	CodeBookSubsetR estriction bitmap		000	001	000	001
·	Reporting interval (Note 9)	ms	:	5	Ę	5
	CQI delay	ms	1	0	1	0
	Sub-band size	RB	6 (ful	size)	6 (full	size)
CSI process for P	DSCH scheduling			ocess 2	CSI pro	
	I ID		0	6	0	6
Quasi-co-loc	ated CSI-RS		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1
	ocated CRS		Same Cell ID as Cell 1	Same Cell ID as Cell 2	Same Cell ID as Cell 1	Same Cell ID 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 subf	rame 1 and 6		0x0000 0000 0001 0000	100000	0x0000 0000 0001 0000	100000
			0001 0000			

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.

	CSI process 0	CSI process 1	CSI process 2	CSI process 3
α[%]	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 9.3.6.1-2 Minimum requirement (FDD)

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.

Test 1 Test 2 Parameter Unit TP1 TP2 TP1 TP2 Bandwidth MHz 10 MHz 10 MHz Transmission mode 10 10 10 10 Uplink downlink configuration 2 2 2 2 Special subframe configuration 4 4 4 4 0 dB 0 ρ_A 0 Downlink power $ho_{\scriptscriptstyle B}$ dB 0 allocation P_c dB -3 0 -3 0 dB -3 σ -3 SNR (Note 7) dB 10 14 9 10 11 7 8 15 $\hat{I}_{or}^{(j)}$ dB[mW/15kHz] -88 -87 -91 -90 -84 -85 -89 -88 $N_{oc}^{(j)}$ dB[mW/15kHz] -98 -98 Clause B.2.4.1 Clause B.2.4.1 with with $\tau_{d} = 0.45 \,\mu s$, $\tau_{d} = 0.45 \,\mu s$, Propagation channel EPA 5 Low EPA 5 Low a = 1, a = 1, $f_D = 5 \,\mathrm{Hz}$ $f_D = 5 \,\mathrm{Hz}$ Antenna configuration 4x2 2x2 4x2 2x2 **Beamforming Model** As specified in Section B.4.3 As specified in Section B.4.3 Timing offset between TPs us 0 0 Frequency offset between TPs 0 Ηz 0 Cell-specific reference signals Antenna ports 0,1 Antenna ports 0,1 Antenna ports Antenna ports CSI-RS signal 0 N/A N/A 15,..., 18 15,..., 18 CSI-RS 0 periodicity and subframe offset 5/3 N/A 5/3 N/A $T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$ CSI-RS 0 configuration 0 N/A 0 N/A Antenna ports Antenna ports CSI-RS signal 1 N/A N/A 15, 16 15, 16 CSI-RS 1 periodicity and subframe offset 5/3 N/A 5/3 N/A $T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$ CSI-RS 1 configuration N/A 5 N/A 5 3/ 3/ Zero-power CSI-RS 0 configuration N/A 1110000000 N/A 1110000000 ICSI-RS / ZeroPowerCSI-RS bitmap 00000 00000 3/ 3/ Zero-power CSI-RS 1 configuration 00100110000 00100110000 N/A N/A I_{CSI-RS} / ZeroPowerCSI-RS bitmap 00000 00000 CSI-IM 0 periodicity and subframe offset 5/3 5/3 5/3 5/3 $T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$ CSI-IM 0 configuration 2 2 2 2 CSI-IM 1 periodicity and subframe offset 5/3 N/A 5/3 N/A $T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$ CSI-IM 1 configuration N/A 6 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 N/A N/A 1 1 CSI-RS CSI-RS 0 CSI-RS 0 CSI-IM CSI-IM 0 CSI-IM 0 Reporting mode PUCCH 1-1 PUCCH 1-1 CodeBookSubsetR 0x0000 0000 0000 0001 0x0000 0000 0000 0001 estriction bitmap Reporting CSI process 0 ms $N_{\rm pd} = 5$ $N_{\rm pd} = 5$ periodicity 12 CQI delay 12 ms Physical channel for CQI/ PMI PUSCH (Note 6) PUSCH (Note 6) reporting

Table 9.3.6.2-1 Fading test for TDD

2

2

PUCCH Report

	Type for CQI/PMI					
	PUCCH channel					
	for RI reporting		PUCCH	Format 2	PUCCH	Format 2
	PUCCH report					
	type for RI		3		3	3
	cqi-pmi- ConfigurationIndex		3		3	
	ri-ConfigIndex		805 (Note 10)		805 (N	ote 10)
	CSI-RS		CSI-RS 1		CSI-I	
	CSI-IM		CSI-IM 0		CSI-	
	Reporting mode		PUSC		PUSC	
	CodeBookSubsetR				000	004
CSI process 1	estriction bitmap		000	001	000	001
	Reporting interval (Note 9)	ms	Ę	5	5	5
	CQI delay	ms	1	2	1	2
	Sub-band size	RB	6 (full		6 (full	
	CSI-RS			RS 0	CSI-I	
	CSI-IM		CSI-		CSI-	IM 1
	Reporting mode		PUSC	CH 3-1	PUSC	
	CodeBookSubsetR		0,0000,000	0 0000 0001	0,0000,000	0,000,0004
CSI process 2	estriction bitmap		0x0000 000	0 0000 0001	0x0000 0000	0000 0001
	Reporting interval (Note 9)	ms	Ę	5	5	5
	CQI delay	ms	1	2	1	2
	Sub-band size	RB	6 (full size		6 (full size	
	CSI-RS		CSI-	RS 1	CSI-I	
	CSI-IM		CSI-		CSI-IM 2	
	Reporting mode		PUSCH 3-1		PUSCH 3-1	
	CodeBookSubsetR					
CSI process 3	estriction bitmap		000	001	000001	
·	Reporting interval (Note 9)	ms	Ę	5	5	
	CQI delay	ms	1	2	12	
	Sub-band size	RB	6 (full		6 (full size)	
CSI process for F	DSCH scheduling			ocess 2	CSI process 2	
	ll ID		0	6	0	6
Quasi-co-loc	ated CSI-RS		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1
Quasi-co-k	ocated CRS		Same Cell ID	Same Cell ID	Same Cell ID	Same Cell ID
Quasi-cu-id			as Cell 1	as Cell 2	as Cell 1	as Cell 2
PMI for subf	rame 4and 9		0x0000 0000 0000 0001	100000	0x0000 0000 0000 0001	100000
PMI for subf	rame 3 and 8		0x0000 0000 0001 0000	100000	0x0000 0000 0001 0000	100000
Max number of HA	ARQ transmissions		1	N/A	1	N/A
			Multiplexing	N/A	Multiplexing	N/A
		uplink reporting insta	nce at subframe S	F#n based on CO	I estimation at a	
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols	SF#(n-4), this reported allocated to PDCCH.					
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols Note 3: Reference and 9 fror	SF#(n-4), this reported s allocated to PDCCH. e measurement channe n TP1.	el RC.12 TDD accord	ling to Table A.4-1	. PDSCH transmi	ssion is scheduled	d on subframe 4
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols Note 3: Reference and 9 fror Note 4: TM10 OC	SF#(n-4), this reported s allocated to PDCCH. e measurement channe n TP1. NG is transmitted as s	el RC.12 TDD accord pecified in A.5.2.8 on	ling to Table A.4-1 subframe 3 and 8	. PDSCH transmi 3 from TP1.	ssion is scheduled	d on subframe 4
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols Note 3: Reference and 9 fror Note 4: TM10 OC Note 5: TM10 OC	SF#(n-4), this reported allocated to PDCCH. e measurement channe n TP1. NG is transmitted as s NG is transmitted as s	el RC.12 TDD accord pecified in A.5.2.8 on pecified in A.5.2.8 on	ling to Table A.4-1 subframe 3 and 8 subframe 3, 4, 8	. PDSCH transmi 3 from TP1. and 9 from TP2.		
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols Note 3: Reference and 9 fror Note 4: TM10 OC Note 5: TM10 OC Note 6: To avoid PDCCH E	SF#(n-4), this reported s allocated to PDCCH. e measurement channe n TP1. NG is transmitted as s NG is transmitted as s collisions between CQ DCI format 0 shall be tr	el RC.12 TDD accord pecified in A.5.2.8 on pecified in A.5.2.8 on /PMI reports and HA ansmitted in downlinł	ling to Table A.4-1 subframe 3 and 8 subframe 3, 4, 8 RQ-ACK it is nece	. PDSCH transmi 3 from TP1. and 9 from TP2. essary to report bo	oth on PUSCH inst	tead of PUCCH
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols Note 3: Reference and 9 fror Note 4: TM10 OC Note 5: TM10 OC Note 6: To avoid PDCCH I ACK on F Note 7: For each	SF#(n-4), this reported s allocated to PDCCH. e measurement channe n TP1. NG is transmitted as s NG is transmitted as s collisions between CQI DCI format 0 shall be tr PUSCH in uplink SF#0 test, the minimum requ	el RC.12 TDD accord pecified in A.5.2.8 on pecified in A.5.2.8 on /PMI reports and HA ansmitted in downlinł and #5.	ling to Table A.4-1 subframe 3 and 8 subframe 3, 4, 8 RQ-ACK it is nece < SF#1 and #6 to a	. PDSCH transmi 3 from TP1. and 9 from TP2. essary to report bo allow periodic CQI	oth on PUSCH inst /PMI to multiplex	tead of PUCCH with the HARQ-
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols Note 3: Reference and 9 fror Note 4: TM10 OC Note 5: TM10 OC Note 6: To avoid PDCCH I ACK on F Note 7: For each signal inp Note 8: PDCCH I	SF#(n-4), this reported s allocated to PDCCH. e measurement channer n TP1. NG is transmitted as s NG is transmitted as s collisions between CQI DCI format 0 shall be tr PUSCH in uplink SF#0 test, the minimum requ ut level. DCI format 0 with a trig	el RC.12 TDD accord pecified in A.5.2.8 on pecified in A.5.2.8 on I/PMI reports and HA ansmitted in downlink and #5. uirements shall be fult ger for aperiodic CQI	ling to Table A.4-1 subframe 3 and 8 subframe 3, 4, 8 RQ-ACK it is nece SF#1 and #6 to a filled for at least of	. PDSCH transmi 3 from TP1. and 9 from TP2. essary to report bo allow periodic CQI ne of the two SNR	oth on PUSCH inst /PMI to multiplex t(s) and the respec	tead of PUCCH with the HARQ- ctive wanted
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols Note 3: Reference and 9 fror Note 4: TM10 OC Note 5: TM10 OC Note 6: To avoid PDCCH I ACK on F Note 7: For each signal inp Note 8: PDCCH I CQI/PMI/	SF#(n-4), this reported s allocated to PDCCH. e measurement channer n TP1. NG is transmitted as s NG is transmitted as s collisions between CQ DCI format 0 shall be tr PUSCH in uplink SF#0 test, the minimum requ ut level. DCI format 0 with a trig RI to be transmitted in	el RC.12 TDD accord pecified in A.5.2.8 on pecified in A.5.2.8 on I/PMI reports and HA ansmitted in downlink and #5. uirements shall be full ger for aperiodic CQI uplink SF#0 and #5.	ling to Table A.4-1 subframe 3 and 8 subframe 3, 4, 8 RQ-ACK it is nece SF#1 and #6 to a filled for at least of shall be transmitte	. PDSCH transmi 3 from TP1. and 9 from TP2. essary to report bo allow periodic CQI ne of the two SNR ed in downlink SF	oth on PUSCH inst /PMI to multiplex t(s) and the respect #1 and #6 to allow	tead of PUCCH with the HARQ- ctive wanted v aperiodic
ACK/NACK fe Note 1: If the UE later than Note 2: 3 symbols Note 3: Reference and 9 fror Note 4: TM10 OC Note 5: TM10 OC Note 6: To avoid PDCCH I ACK on F Note 7: For each signal inp Note 8: PDCCH I CQI/PMI/ Note 9: For these	SF#(n-4), this reported s allocated to PDCCH. e measurement channer n TP1. NG is transmitted as s NG is transmitted as s collisions between CQI DCI format 0 shall be tr PUSCH in uplink SF#0 test, the minimum requ ut level. DCI format 0 with a trig	el RC.12 TDD accord pecified in A.5.2.8 on pecified in A.5.2.8 on /PMI reports and HA ansmitted in downlink and #5. uirements shall be full ger for aperiodic CQI uplink SF#0 and #5. not selected for PDS0	ling to Table A.4-1 subframe 3 and 8 subframe 3, 4, 8 RQ-ACK it is nece SF#1 and #6 to a filled for at least of shall be transmitte CH transmission,	. PDSCH transmi 3 from TP1. and 9 from TP2. essary to report bo allow periodic CQI ne of the two SNR ed in downlink SF TM10 OCNG shou	oth on PUSCH inst /PMI to multiplex t(s) and the respect #1 and #6 to allow uld be transmitted.	tead of PUCCH with the HARQ ctive wanted v aperiodic

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.

	CSI process 0	CSI process 1	CSI process 2	CSI process 3	
α[%]	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 9.3.6.2-2 Minimum requirement (TDD)

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			

9.4 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_{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 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 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 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 $t_{rnd1, rnd2}$ 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.

Para	meter	Unit	Test 1
	dwidth	MHz	10
Transmis	sion mode		6
Propagat	ion channel		EVA5
	g granularity	PRB	50
	ation and onfiguration		Low 2 x 2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3
power	$ ho_{\scriptscriptstyle B}$	dB	-3
allocation	σ	dB	0
Ν	$U_{oc}^{(j)}$	dB[mW/15kHz]	-98
Report	ing mode		PUSCH 3-1
Reporti	ng interval	ms	1
PMI dela	ay (Note 2)	ms	8
	ent channel		R. 10 FDD
	B Pattern		OP.1 FDD
	er of HARQ		4
	ncy version sequence		{0,1,2,3}
Note 1:	For random p	recoder selection, th ted in each TTL (1 m	
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 9.4.1.1.1-1 PMI test for single-layer (FDD)

Table 9.4.1.1.1-2 Minimum	requirement (FDD)
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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.

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode			6	
	downlink		4	
config	uration		1	
	subframe		4	
configuration			_	
Propagation channel			EVA5	
	granularity	PRB	50	
	tion and		Low 2 x 2	
antenna co	onfiguration		2011 2 7 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 interval		ms	1	
PMI delay (Note 2)		ms	10 or 11	
	ent channel		R.10 TDD	
	Pattern		OP.1 TDD	
	er of HARQ		4	
	nissions			
Redundancy version			{0,1,2,3}	
coding sequence			(0,1,2,0)	
ACK/NACK feedback			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 reporti			plink reporting	
instance at subrame SF#n based on PMI				
estimation at a downlink SF not later than SF#(n-			ater than SF#(n-	
4), this reported PMI cannot be applied at the			oplied at the	
eNB downlink before SF#(n+4).				

Table 9.4.1.1.2-1 PMI test for single-layer (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.

Der	matar	Unit	Test 1	
Parameter				
Bandwidth		MHz	10 6	
Transmission mode Propagation channel			EVA5	
			EVAS	
	ation and		Low 4 x 2	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-6	
power	$ ho_{\scriptscriptstyle B}$	dB	-6	
allocation	σ	dB	3	
Ι	$V_{oc}^{(j)}$	dB[mW/15kHz]	-98	
PM	delay	ms	8 or 9	
	ing mode		PUCCH 2-1 (Note 6)	
	g periodicity	ms	$N_{\rm pd} = 2$	
Physical	channel for eporting		PUSCH (Note 3)	
PUCCH I	Report Type and CQI/PMI		2	
PUCCH I	Report Type band CQI		1	
Measurement channel			R.14-1 FDD	
	Pattern		OP.1/2 FDD	
	g granularity	PRB	6 (full size)	
	of bandwidth		, , , , , , , , , , , , , , , , , , ,	
pa	rts (J)		3	
	К		1	
cqi-pmi-ConfigIndex			1	
	per of HARQ		4	
	nissions			
	ncy version		{0,1,2,3}	
	sequence			
Note 1:		recoder selection, th (2 ms granularity).	ne precoder shall be updated	
Note 2:			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/PM				
		it is necessary to report both on PUSCH instead of		
PUCCH. PDCCH DCI format 0 shall be transmitted in downlind 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 4: Reports for the short subband (having 2RBs in the last bandwid part) are to be disregarded and instead data is to be transmitted				
Note 5:	the most recently used subband for bandwidth part with j=1. Note 5: In the case where wideband PMI is reported, data is to be			
transmitted on the most recently used subband.				
Note 6: The bit field for PMI confirmation in DCI format 1B shall be map to "0" and TPMI information shall indicate the codebook index u in Table 6.3.4.2.3-2 of TS36.211 [4] according to the latest PMI report on PUCCH.				

Table 9.4.1.2.1-1 PMI test for single-layer (FDD)

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.

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode Uplink downlink			6	
	guration		1	
Special	subframe guration		4	
	ion channel		EVA5	
	ation and			
antenna c	onfiguration		Low 4 x 2	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-6	
power	$ ho_{\scriptscriptstyle B}$	dB	-6	
allocation	σ	dB	3	
Λ	$V_{oc}^{(j)}$	dB[mW/15kHz]	-98	
	delay	ms	10	
	ing mode		PUCCH 2-1 (Note 6)	
	g periodicity	ms	$N_{\rm P} = 5$	
Physical	channel for		PUSCH (Note 3)	
	eporting Report Type			
for wideba	and CQI/PMI		2	
	Report Type		1	
	band CQI			
	nent channel		R.14-1 TDD	
	Pattern		OP.1/2 TDD	
Precoding	g granularity	PRB	6 (full size)	
	of bandwidth		3	
pa	rts (J) K		1	
cai-nmi-(ConfigIndex		4	
	ber of HARQ			
	nissions		4	
	ncy version		(0, 1, 2, 2)	
coding	sequence		{0,1,2,3}	
ACK/NA	CK fedback		Multiplexing	
	ode			
Note 1:			ne precoder shall be updated in	
		e downlink transmis		
Note 2:		rts in an available uplink reporting instance at		
subrame SF#n based on PMI estimation at a (
			cannot be applied at the eNB	
Note 3:	downlink before SF#(n+4). To avoid collisions between HARQ-ACK and wideband CQI/PMI or			
Note 0.	subband CQI it is necessary to report both on PUSCH instead of			
	PUCCH. PDCCH DCI format 0 shall be transmitted in downlink			
	F#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 part) are to be disregarded and		e short subband (having 2RBs in the last bandwidth		
			stead data is to be transmitted on	
	the most recently used subband for bandwidth part with j=1.			
Note 5:	ote 5: In the case where wideband PMI is reported, data is to be			
transmitted on the most recently				
Note 6: The bit field for PMI confirmation in DCI format 1E to "0" and TPMI information shall indicate the cod in Table 6.3.4.2.3-2 of TS36.211 [4] according to t				
			4] according to the latest PIVI	
report on PUCCH.				

Table 9.4.1.2.2-1 PMI test for single-layer (TDD)

Table 9.4.1.2.2-2 Minimum	requirement ((TDD)
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	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.

		-	
	meter	Unit	Test 1
	lwidth	MHz	10
	sion mode		9
	on channel	מממ	EPA5
	granularity tion and	PRB	50 Low
	onfiguration		ULA 4 x 2
	ic reference		Antenna ports
	nals		0,1
			Antenna ports
CSI refere	nce signals		15,,18
	ning model		Annex B.4.3
CSI-RS pe	riodicity and		
	ne offset		5/ 1
I _{CSI-RS}	/ Δ _{CSI-RS}		
	reference nfiguration		6
	SubsetRestr		0x0000 0000
	bitmap		0000 FFFF
	ρ_A	dB	0
David	PA	-	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	Pc	dB	-3
	σ	dB	-3
N	N _{oc} ^(j) dB[mW/15kHz] -98		-98
	ng mode		PUSCH 3-1
Reportin	g interval	ms	5
	y (Note 2)	ms	8
	ent channel		R.44 FDD
	Pattern		OP.1 FDD
	Max number of HARQ 4		4
	transmissions		
	Redundancy version {0,1,2,3}		
Note 1:	coding sequence		
	shall be updated in each TTI (1 ms granularity).		
i	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		power per	
subcarrier at the receiver.			

Table 9.4.1.3.1-1 PMI test for single-layer (FDD)

Parameter	Test 1
γ	1.2
UE Category	≥1

Table 9.4.1.3.1-2 Minimum requirement (FDD)

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.

		will test for single	
	meter	Unit	Test 1
	dwidth	MHz	10
	sion mode		9
	downlink		1
	uration		
	subframe		4
	uration on channel		EVA5
	granularity	PRB	50
	onfiguration	TRB	8 x 2
			High, Cross
Correlatio	n modeling		polarized
Cell-specif	ic reference		Antenna ports
sig	nals		0,1
CSI refere	nce signals		Antenna ports
	-		15,,22
	ning model		Annex B.4.3
	riodicity and		
	ne offset		5/ 4
	/ <u>A_{CSI-RS}</u> reference		
	nfiguration		0
orginal oo	Ingulation		0x0000 0000
CodeBook	SubsetRestr		001F FFE0
iction	bitmap		0000 0000
			FFFF
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink		dB	0
power	$\rho_{\scriptscriptstyle B}$	-	-
allocation	Pc	dB	-6
	σ	dB	-3
N	r(j) oc	dB[mW/15kHz]	-98
	ng mode		PUSCH 3-1
	g interval	ms	5
	y (Note 2)	ms	10
	,		R.45-1 TDD
			for UE
Measurem	ent channel		Category 1,
Measurem			R.45 TDD for
			UE Category
			≥2
	Pattern		OP.1 TDD
Max number of HARQ transmissions		4	
	Redundancy version {0,1,2,3}		{0,1,2,3}
	coding sequence (0, 1, 2, 3) ACK/NACK feedback		
mode Multiplexing		Multiplexing	
Note 1: For random precoder selection, the precoder			
shall be updated in each TTI (1 ms granularity).			
Note 2:			plink 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			
shall be used as specified in B.2.3A.4			

Table 9.4.1.3.2-1 PMI test for single-layer (TDD)

Table 9.4.1.3.2-2 Minimum	requirement	(TDD)
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Parameter	Test 1
γ	3
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.

_			
	neter	Unit	Test 1
	width	MHz	10
Transmiss	sion mode		6
	on channel		EPA5
(only for re followir	granularity porting and ng PMI)	PRB	6
	tion and		Low 2 x 2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3
power	$ ho_{\scriptscriptstyle B}$	dB	-3
allocation	σ	dB	0
N	(j) oc	dB[mW/15kHz]	-98
	ng mode		PUSCH 1-2
Reporting 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}		{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 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 			
Note 3: C	eNB downlink before SF#(n+4). One/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2 shall be used.		

Table 9.4.2.1.1-1 PMI test for single-layer (FDD)

Table 9.4.2.1.1-2 Minimum requirement (FDD)

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.

r		1	
Parar	neter	Unit	Test 1
Band		MHz	10
Transmiss			6
	lownlink		1
configu			
Special s			4
configu			FDAG
Propagatio			EPA5
	granularity	000	0
(only for re	porting and	PRB	6
followin			
Correlat			Low 2 x 2
antenna co	niiguration		
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3
power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3
anocation	σ	dB	0
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
Reportir	ng mode		PUSCH 1-2
Reporting interval		ms	1
PMI delay		ms	10 or 11
			R.11-3 TDD
			for UE
Measurement channel			Category 1
Measurenne			R.11 TDD for
			UE Category
			≥2
	OCNG Pattern OP.1/2 TD		OP.1/2 TDD
	er of HARQ		4
transm			
	cy version		{0,1,2,3}
coding s	equence		
	ACK/NACK feedback Multiplexing		Multiplexing
		recoder selection, th	ne precoders
shall be updated in each available downlink			
t	transmission instance.		
Note 2: It	ote 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		oplied 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		.1/2 shall be	
used.			

Table 9.4.2.1.2-1 PMI test for single-layer (TDD)

Table 9.4.2.1.2-2 Minimum re	equirement (TDD)
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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.

Para	ameter	Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode			6	
Propagat	ion channel		EVA5	
	ation and configuration		Low 4 x 2	
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-6	
power	$ ho_{\scriptscriptstyle B}$	dB	-6	
allocation	σ	dB	3	
1	$V_{oc}^{(j)}$	dB[mW/15kHz]	-98	
PM	delay	ms	8	
Reporting mode			PUSCH 2-2	
Reporti	ng 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 (<i>M</i>)			5	
Max number of HARQ transmissions			4	
Redundancy version			{0,1,2,3}	
coding sequence				
		recoder selection, the precoder shall be updated in		
		ns granularity)		
		orts in an available uplink reporting instance at		
		n based on PMI estimation at a downlink SF not later		
), this reported PMI cannot be applied at the eNB		
	downlink befo	re SF#(n+4)		

Table 9.4.2.2.1-1 PMI test for single-layer (FDD)

Table 9.4.2.2.1-2 Minimum	requirement	(FDD)
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	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.

Para	meter	Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Uplink o	downlink		1
	uration		I
	subframe uration		4
	on channel		EVA5
	tion and		
	onfiguration		Low 4 x 2
Downlink	ρ_A	dB	-6
power	$ ho_{\scriptscriptstyle B}$	dB	-6
allocation	σ	dB	3
N	oc	dB[mW/15kHz]	-98
PMI	delay	ms	10
Reporti	ng mode		PUSCH 2-2
Reportin	g interval	ms	1
	ent channel		R.14-2 TDD
	Pattern		OP.1/2 TDD
	d size (<i>k</i>)	RBs	3 (full size)
Number of preferred subbands (<i>M</i>)			5
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback			Multiplexing
mode mode/precision 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 9.4.2.2.2-1 PMI test for single-layer (TDD)

Table 9.4.2.2.2-2 Minimum	requirement	(TDD)
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	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.

	meter	Unit	Test 1	
	dwidth	MHz	10	
Transmission mode			9	
	on channel		EVA5	
	granularity	ססס	0	
	eporting and ng PMI)	PRB	6	
	ation and		Low	
	onfiguration		ULA 4 x 2	
	ic reference		Antenna ports	
	Inals		0,1	
CSI refere	ence signals		Antenna ports 15,,18	
Beamforr	ning model		Annex B.4.3	
	riodicity and			
	ne offset		5/ 1	
T _{CSI-RS}	/ Δ_{CSI-RS}			
	reference		8	
signal co	nfiguration		-	
	SubsetRestr		0x0000 0000	
Iction	bitmap		0000 FFFF	
	$ ho_{\scriptscriptstyle A}$	dB	0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0	
allocation	Pc	dB	-3	
	σ	dB	-3	
Ν	$U_{oc}^{(j)}$	dB[mW/15kHz]	-98	
	ng mode		PUSCH 1-2	
	ng interval	ms	5	
PMI	delay	ms	8	
Measurem	ent channel		R.45-1 FDD for UE Category 1,	
Modouron			R.45 FDD for UE Category ≥2	
OCNG	Pattern		OP.1 FDD	
	er of HARQ			
transn	nissions		4	
	ncy version		(0 1 2 2)	
coding sequence			{0,1,2,3}	
		recoder selection, th		
		ted in each TTI (1 m		
		orts in an available u Ibrame SF#n based		
		a downlink SF not later than SF#(n- ed PMI cannot be applied at the		
		before SF#(n+4).		
		d dynamic OCNG Pa	attern OP.1/2	
		ibed in Annex A.5.1		
used.				
	to have the sa	= 0 dB, PDSCH_RB ame PDSCH and OC		
subcarrier at the receiver.				

Table 9.4.2.3.1-1 PMI test for single-layer (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.

Boro	notor	Unit	Test 1
Band	neter width	MHz	10
Transmiss		WII 12	9
	lownlink		1
configuration			I
Special s			4
configu Propagatio			EVA5
	granularity		LVAJ
(only for re		PRB	6
followir	ig PMľ)		
Antenna co	onfiguration		8 x 2
Correlation	n modeling		High, Cross polarized
	c reference		Antenna ports
sigr	nals		0,1
CSI referen	nce signals		Antenna ports 15,,22
Beamform			Annex B.4.3
	iodicity and le offset		5/ 4
	le offset ⊄∆csi-rs		J/ 4
	eference		
signal cor	figuration		4
			0x0000 0000
CodeBookS			001F FFE0
iction I	biimap		0000 0000 FFFF
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink	$ ho_{\scriptscriptstyle B}$	dB	0
power allocation	Pc	db	-6
anocation	σ	dB	-3
λ			
N		dB[mW/15kHz]	-98
Reportir			PUSCH 1-2
Reporting		ms	5 (Note 4)
PMI delay		ms	8 R.45-1 TDD
Measureme	ent channel		for UE Category 1, R.45 TDD for UE Category
			≥2
OCNG			OP.1 TDD
	er of HARQ		4
transm			
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback			Multiplexing
	de for random n	recoder selection th	
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			
Note 3: C	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.		
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			ink SF#4 and #9

Table 9.4.2.3.2-1 PMI test for single-layer (TDD)

	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

- 9.4.3 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 singlelayer 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, 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.

Parameter		Unit	Test 1	Test 2	Test 3		
Bandwidth		MHz	10				
PDSCH transmission mode			4				
ρ_{Λ}		dB	-3				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3				
anocation	σ	dB		0			
Propagation condit antenna configur				2 x 2 EPA5			
CodeBookSubsetRe			0000	11 for fixed RI = 1			
bitmap	50110011			00 for fixed $RI = 2$			
•			010011	for UE reported			
Antenna correla	ation		Low	Low	High		
RI configuration	on		Fixed RI=2 and	Fixed RI=1	Fixed RI=1		
SNR		dB	follow RI	and follow RI 20	and follow RI 20		
-			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 transmission			1				
Reporting mo			PUCCH 1-1 (Note 4)				
Physical channel for			PUCCH Format 2				
reporting							
PUCCH Report Ty CQI/PMI	•		2				
Physical channel reporting	for RI		PUSCH (Note 3)				
PUCCH Report Typ	e for RI		3				
Reporting period		ms	N _{pd} = 5				
PMI and CQI de		ms	8				
cqi-pmi-Configurati		1110	6				
ri-Configuration			1 (Note 5)				
		ailable uplink repor	ting instance at subfra		on PMI and		
			ot later than SF#(n-4),				
			NB downlink before S				
Note 2: Reference me	easuremen	t channel RC.2 FDE	according to Table A	.4-1 with one sid	ed dynamic		
		FDD as described ir					
			d HARQ-ACK it is neo				
			format 0 shall be tran				
	#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 						
			recooling information b when applying CQI and		switching Pl		
			ne subframe delay in a				
	MI reports.		ne subirame delay In a		i to align with		
	ivit reports.						

Table 9.5.1.1-1 RI Test (FDD)
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Table 9.5.1.1-2 Minimu	Im requirement (FDD)
------------------------	----------------------

	Test 1	Test 2	Test 3
<i>)</i> 1	N/A	1.05	0.9
1/2	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

- The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when a) transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when b) 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.

Parameter		Unit	Test 1	Test 2	Test 3	
Bandwidth		MHz	10			
PDSCH transmission mode			4			
	$ ho_{\scriptscriptstyle A}$	dB	-3			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB		-3		
	σ	dB		0		
Uplink downlink cor	figuration			2		
Special subfra configuratio				4		
Propagation cond antenna configu				2 x 2 EPA5		
CodeBookSubsetRestriction bitmap			000011 for fixed RI = 1 010000 for fixed RI = 2 010011 for UE reported RI			
Antenna corre	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 transmissio			1			
Reporting mo	ode		PUS	SCH 3-1 (Note 3)		
Reporting inte	erval	ms		5		
PMI and CQI	delay	ms	10 or 11			
ACK/NACK feedba				Bundling		
CQI estim	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 COI and PMI are used and sub-band COI is discarded 						

Table 9.5.1.2-1 RI Test (TDD)

Note 3: Reported wideband CQI and PMI are used and sub-band CQI is discarded.

	Test 1	Test 2	Test 3
<i>y</i> 1	N/A	1.05	0.9
1/2	1	N/A	N/A
UE Category	≥2	≥2	≥2

Minimum requirement (CSI Reference Symbols) 9.5.2

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.

Parameter		Unit	Test 1	Test 2	Test 3	
Bandwidth		MHz		10		
PDSCH transmission mode				9		
ρ_A		dB	0			
Downlink	nower		dB	0		
allocati		$\rho_{\scriptscriptstyle B}$	-		-	
		Pc	dB dB		0	
Propagatio	on condit	σ ion and	uБ		0	
	a configur				2 x 2 EPA5	
Cell-specific				A	ntenna ports 0	
	orming M				ified in Section B.	.4.3
	erence sig				enna ports 15, 16	-
	periodicit					
	rame offs				5/1	
T _{CSI-}	$_{\rm RS}$ / $\Delta_{\rm CSI-F}$	RS				
	erence si				6	
con	figuratior	1				
CodeBook	SubsetRe	striction			11 for fixed $RI = 1$	
	bitmap				00 for fixed $RI = 2$	
Antonn	na correla	tion		Low	for UE reported	High
Anteni		llion		Fixed RI=2 and	Fixed RI=1	Fixed RI=1
RI co	onfiguratio	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 ı	number c			1		
	smission					
	orting mo			PUCCH 1-1		
Physical cha	annel for eporting	CQI/PIVII		PUSCH (Note 3)		
PUCCH I		ine for				
	QI/PMI			2		
Physical	channel	for RI		PUCCH Format 2		
	eporting			10		
PUCCH R					3	
	ng period		ms		$N_{\rm pd} = 5$	
	nd CQI de		ms		8	
cqi-pmi-Co					6 1 (Noto 4)	
	figuratior) A available unlink rai	l porting instance at sub	1 (Note 4)	ad on DMI and
				ot later than SF#(n-4),		
				NB downlink before S		ii ana
			FDD as described in			
				orts and HARQ-ACK		
				format 0 shall be tran		
		periodic C	QI/ PMI to multiple>	with the HARQ-ACK	on PUSCH in up	link SF#0 and
#!						
re	ports are		ied at the TE with o	when applying CQI and ne subframe delay in a		

Table 9.5.2.1-1 RI Test (FDD)

	Test 1	Test 2	Test 3
<i>)</i> 1	N/A	1.05	0.9
<i>γ</i> 2	1	N/A	N/A
UE Category	≥2	≥2	≥2

 Table 9.5.2.1-2 Minimum requirement (FDD)

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.

Parameter		Unit	Test 1	Test 2	Test 3	
Bandwidth		MHz		10		
PDSCH transmission mode				9		
$ ho_{\scriptscriptstyle A}$		dB	0			
Downlink power $\rho_{\scriptscriptstyle B}$		dB	0			
allocatio	n	Pc	dB	0		
		σ	dB		0	
Uplink down	link conf	-	48		1	
	al subfra					
	iguratior				4	
Propagatio						
antenna					2 x 2 EPA5	
Cell-specific				Ar	ntenna ports 0	
CSI refe				Ante	nna ports 15, 16	
Beamfo				As speci	fied in Section B	.4.3
CSI refe	rence si	gnal			Λ	
conf	iguratior	ı ı			4	
CSI-RS p	eriodicit	y and				
	ame offs				5/4	
T _{CSI-R}	$_{\rm LS}$ / $\Delta_{\rm CSI-F}$	RS				
CodeBookS	ubsotRe	striction			11 for fixed RI = '	
	itmap	SINCION			00 for fixed $RI = 2$	
	•			010011	for UE reported	
Antenna	a correla	ition		Low	Low	High
RI co	ofiguratio	n		Fixed RI=2 and	Fixed RI=1	Fixed RI=1
	RI configuration			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 n				1		
	mission					
	ting mo			PUCCH 1-1		
Physical cha		CQI/ PMI		PUSCH (Note 3)		
	porting	fa = 0.01/				
	PMI				2	
Physical		for RI		PU	CCH Format 2	
	porting					
Reportir			ms		$N_{\rm pd} = 5$	
	d CQI de		ms		10 Dura all'an ar	
ACK/NACK					Bundling	
cqi-pmi-Co ri Conf	iguratior				41	
				porting instance at sub		
	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).					
						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					t is necessary to	report both on
	avoid o					
					smitted in downli	nk SF#4 and
PL	JSCH in:	stead of PL	JCCH. PDCCH DCI	format 0 shall be tran with the HARQ-ACK of		

Table 9.5.2.2-1 RI Test (TDD)

Table 9.5.2.2-2 Minimum requirement	(חחד)	
Table 9.5.2.2-2 Minimum requirement	(יטטי)	

	Test 1	Test 2	Test 3
<i>)</i> /1	N/A	1.05	0.9
1/2	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.

Parameter		Unit		est 1	Tes	
			Cell 1	Cell 2	Cell 1	Cell 2
Bandwidth PDSCH transmissio	n modo	MHz	3	10 Note 10	1	0 Note 10
FDSCH transmissic		dB	3	-3		
Downlink power	ρ_A	-		-	-3	
allocation	$ ho_{\scriptscriptstyle B}$	dB		-3	-:	
Propagation condit	σ ion and	dB		0	(
antenna configur	ation			2 EPA5	2 x 2	EPA5
CodeBookSubsetRestriction bitmap			01 for fixed RI = 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	ation			_ow	Lc	W
RI configuration	on		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 ^(j) _{oc2}	dBmW/15kH z	-98 (Note 4)	N/A	-98 (Note 4)	N/A
	$N_{oc3}^{(j)}$		-98 (Note 5)	N/A	-94.8 (Note 5)	N/A
$\hat{I}^{(j)}_{or}$	$\hat{I}_{or}^{(j)}$		-98	-110	-78	-92
Subframe Configu	uration		Non- MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN
Cell Id	0 "		0	1	0	1
Time Offset betwee		μs	N/A	ronous cells) 10000000 10000000 10000000 10000000 1000000	2.5 (synchro N/A	10000000 10000000 10000000 10000000 1000000
RLM/RRM Measur Subframe Pattern (10000000 10000000 10000000 10000000 1000000	N/A	10000000 10000000 10000000 10000000 1000000	N/A
CSI Subframe Sets (Note 8)	C _{CSI,0}		10000000 1000000 1000000 1000000 1000000	N/A	10000000 10000000 10000000 10000000 1000000	N/A
Number of control Symbols	OFDM		3	3	3	3
Maximum number c	of HARQ			4		
transmission	S			1	1	
Reporting mo			PUC	CH 1-0	PUCC	H 1-0
Physical channel f reporting			PUCCH	l Format 2	PUCCH	Format 2
PUCCH Report Type	e for CQI			4	2	<u> </u>

Table	9.5.3	.1-1 RI	Test	(FDD)
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Physical	ysical channel for RI reporting		PUCCH Format 2 PUCCH Form		Format 2	
PUCC	H Report Type for RI		3		3	
Re	porting periodicity	ms	Npd	= 10	N _{pd} =	= 10
cqi-pn	ni-ConfigurationIndex		1	1	1	1
ri-	ConfigurationInd			5	Į.	5
cqi-pm	ni-ConfigurationIndex2		1	0	1	0
ri-0	ConfigurationInd2			2		2
	Cyclic prefix		Normal	Normal	Normal	Normal
Note 1:	If the UE reports in an av					
	a downlink subframe not downlink before SF#(n+4		n-4), this repor	ted wideband (CQI cannot be app	blied at the eNB
Note 2:	Reference measurement				ble A.4-1 with one	sided dynamic
	OCNG Pattern OP.1 FD					
Note 3:	This noise is applied in C	•	#1, #2, #3, #5,	#6, #8, #9, #10	,#12, #13 of a sub	oframe
	overlapping with the agg					
Note 4:	This noise is applied in C ABS.)FDM symbols #	#0, #4, #7, #11	of a subframe	overlapping with t	he aggressor
Note 5:	This noise is applied in a	II OFDM symbo	Is of a subfram	e overlapping	with aggressor no	n-ABS
Note 6:	ABS pattern as defined i					
	transmitted in the serving					subframe of
	aggressor cell and the su					
Note 7:	Time-domain measurem					
Note 8:				ent resource re	estriction pattern for	or CSI
	measurements defined in					
Note 9:	· · · · · · · · · · · · · · · · · · ·					ell 1 and Cell 2
Nete 10	is the same.		0 in a canalana			
Note 10:	Downlink physical chann defined in Annex A.5.1.5		2 in accordanc	e with Annex C		NG pattern as

Table 9.5.3.1-2 Minimum requirement (FDD)

	Test 1	Test 2
<i>γ</i> 1	0.9	1.05
UE Category	≥2	≥2

9.5.3.2 TDD

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.

Parameter		Unit	Tes		Tes	
			Cell 1	Cell 2	Cell 1	Cell 2
Bandwidth	n modo	MHz	1 3	-	1(
PDSCH transmissic Uplink downlink conf			3	Note 11	3	Note 11
Special subfra					-	
configuration			4		4	
	$ ho_{\scriptscriptstyle A}$	dB	-3	3	-3	3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-:	3	-3	8
allocation	σ	dB	C)	0	
Propagation condit	ion and		2 x 2 l		2 x 2 E	
antenna configur	ation			EFAD	2 X 2 E	FAS
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
$N_{oc}^{(j)}$	$N_{oc2}^{(j)}$	dB[mW/15k Hz]	-98 (Note 5)	N/A	-98 (Note 5)	N/A
	$N_{oc3}^{(j)}$		-98 (Note 6)	N/A	-94.8 (Note 6)	N/A
$\hat{I}^{(j)}_{or}$		dB[mW/15k Hz]	-98	-110	-78	-92
Subframe Configu	Iration		Non- MBSFN	Non- MBSFN	Non-MBSFN	Non-MBSFN
Cell Id			0	1 hronouo	0	1
Time Offset betwee	en Cells	μs	2.5 (synchronous cells)		2.5 (synchronous cells)	
ABS Pattern (No	te 7)		N/A	0000000 001 0000000 001	N/A	0000000001 00000000001
RLM/RRM Measu 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	
Number of control Symbols	OFDM		3	3	3	3
Maximum number o	f HARQ		1		1	
transmission						
Reporting mo			PUCC	H 1-0	PUCC	H 1-0
Physical channel for and RI reporting			PUCCH I	Format 2	PUCCH	Format 2
PUCCH Report Type			4	Ļ	4	
FUCCIT Report Type for CQI		•	·		4	

Table 9.5.3.2-1 RI Test (TDD)

	channel for C _{CSI,1} CQI nd RI reporting		PUSCH (Note 3)		PUSCH (Note 3)	
	Report Type for RI		3	3	3	
	orting periodicity	ms	N _{pd} =	= 10	N _{pd} =	= 10
ACK/NA	CK feedback mode		Multip	lexing	Multip	lexing
	-ConfigurationIndex		8		8	
	ConfigurationInd		5		40	
	ConfigurationIndex2		ç		ç	
	onfigurationInd2		((-
	Cyclic prefix		Normal	Normal	Normal	Normal
Note 1:	If the UE reports in an estimation at a downli					
	be applied at the eNB					
Note 2:	Reference measurem	ent channel in	Cell 1 RC.2	TDD accordir	ng to Table A.4-1	with one sided
	dynamic OCNG Patte					
Note 3:	To avoid collisions be					
	PUSCH instead of PU					
Nista 4.	allow periodic RI/CQI					
Note 4:	This noise is applied i overlapping with the a		OIS #1, #2, #3	3, #5, #6, #8,	#9, #10,#12, #13	or a subframe
Note 5:	This noise is applied i		ols #0 #4 #7	7 #11 of a su	uhframe overlanni	ng with the
Note J.	aggressor ABS.	II OI DIVI Syllib	013 #0, #4, #1	, #1101230		ng with the
Note 6:	This noise is applied i	n all OFDM sy	mbols of a su	bframe over	apping with aggre	essor non-ABS
Note 7:	ABS pattern as define					
	PDCCH/PCFICH are	transmitted in t	the serving co	ell subframe	when the subfram	e is overlapped
	with the ABS subfram	e of aggressor	cell and the	subframe is a	available in the de	efinition of the
	reference channel.					
Note 8:	Time-domain measure	ement resource	e restriction p	attern for PC	Cell measurements	s as defined in
	[7].					
Note 9:	As configured accordi		domain meas	surement res	ource restriction p	battern for CSI
Note 10:	measurements defined in [7]. Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell 1					orte in Cell 1
11010 10.	and Cell 2 is the same		ayyressor c			
Note 11:	Downlink physical cha		Cell 2 in acco	rdance with	Annex C.3.3 appl	vina OCNG
	pattern as defined in A					, , , , , , , , , , , , , , , , , , , ,

Table 9.5.3.2-2 Minimum requirement (TDD)

	Test 1	Test 2
<i>γ</i> 1	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.

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
	$ 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 configur			2×2 EPA5 (Note 2)	2×2 EPA5 (Note 2)	2×2 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
\widehat{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 Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	Time Offset between Cells		N/A	3	-1
Frequency shift betwe	Frequency shift between Cells		N/A	300	-100
Cell Id			0	126	1
ABS pattern (No	te 6)		N/A	10000000 10000000 10000000 10000000 1000000	10000000 10000000 10000000 10000000 1000000
RLM/RRM Measur Subframe Pattern (10000000 10000000 10000000 10000000 1000000	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 symbols	OFDM		3	Note 9	Note 9
Maximum number o			1	N/A	N/A
transmission: Reporting mod			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	I reporting		4 PUCCH Format 2	N/A N/A	N/A N/A
PUCCH Report Typ			3	N/A	N/A
Reporting period		ms	N _{pd} = 10	N/A	N/A

Table 9.5.4.1-1: RI Test (FDD)

cqi-pm	ni-ConfigurationIndex		11	N/A	N/A	
ri-	ri-ConfigurationInd		5	N/A	N/A	
cqi-pmi	i-ConfigurationIndex2		10	N/A	N/A	
ri-C	ConfigurationInd2		2	N/A	N/A	
	Cyclic prefix		Normal	Normal	Normal	
Note 1:	Downlink physical chann	nel setup in Cell	2 in accordance with	n Annex C.3.3 app	lying OCNG	
	pattern OP.5 FDD as de					
Note 2:	The propagation condition					
Note 3:	This noise is applied in 0		#1, #2, #3, #5, #6, #8	3, #9, #10,#12, #1	3 of a subframe	
	overlapping with the agg					
Note 4:	This noise is applied in (OFDM symbols	#0, #4, #7, #11 of a s	subframe overlapp	ping with the	
	aggressor ABS.					
Note 5:	This noise is applied in a					
Note 6:	ABS pattern as defined i					
	PDCCH/PCFICH are tra					
	overlapped with the ABS definition of the reference		ggressor cell and the	subframe is available	able in the	
Note 7:			atriation pattorn for D		to on defined in	
Note 7.	Time-domain measurem [7]	ient resource re	Striction pattern for P	Cell measuremen	its as defined in	
Note 8:	As configured according	to the time-don	nain measurement re	source restriction	nattern for CSI	
Note 0.	measurements defined i		nam measurement re			
Note 9:	The number of control C		s not available for AB	S and is 3 for the	subframe	
11010 01	indicated by "0" of ABS				oublicatio	
Note 10:			eporting instance at s	subframe SF#n ba	ased on CQI	
	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 canno					
	be applied at the eNB downlink before SF#($n+4$).					
Note 11:	Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 with one sided					
	dynamic OCNG Pattern					
Note 12:	The number of the CRS	ports in Cell1, 0	Cell2 and Cell 3 is the	e same.		
Note 13:	SIB-1 will not be transmi	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
\widehat{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
71	N/A	1.05	0.9
1/2	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 $\geq \gamma_{1;}$
- 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 9.5.4.2-1, 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.

Parameter		Unit	Cell 1	Cell 2	Cell 3
Bandwidth		MHz	10	10	10
PDSCH transmission	n mode		3	As defined in	As defined in
Uplink downlink confi	auration		1	Note 1 1	Note 1 1
Special subframe cont			4	4	4
opedial submarile com	ρ_A	dB	-3	-3	-3
Downlink power		dB	-3	-3	-3
allocation	$ ho_{\scriptscriptstyle B}$	-	-		
Dropogation conditi	σ	dB	0 2x2 EPA5 (Note	N/A 2×2 EPA5	N/A 2×2 EPA5
Propagation condition antenna configuration			2×2 EPA5 (Note 2)	(Note 2)	(Note 2)
CodeBookSubsetRe bitmap	striction		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 9.5.4.2-2 for each test	12	10
$\hat{I}_{or}^{(j)}$		dB[mW/15k Hz]	Reference Value in Table 9.5.4.2-2 for each test	-86	-88
Subframe Configu	Subframe Configuration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift betwe	en Cells	Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (Not	te 6)		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Measure Subframe Pattern (1			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 of transmissions			1	N/A	N/A
Reporting mod			PUCCH 1-0	N/A	N/A
Physical channel for C and RI reportin	C _{CSI,0} CQI		PUCCH format 2	N/A	N/A
Physical channel for C	C _{CSI,1} CQI		PUSCH (Note	N/A	N/A
and RI reporting PUCCH Report Type for CQI			<u> </u>	N/A	N/A
	PUCCH Report Type for RI		3	N/A	N/A
Reporting period		ms	N _{pd} = 10	N/A	N/A
ACK/NACK feedbac		_	Multiplexing	N/A	N/A
cqi-pmi-Configuratio			8	N/A	N/A
ri-Configuration			5	N/A	N/A
cqi-pmi-Configuration			9	N/A	N/A
			0	N/A	N/A
ri-Configuration1	naz		0	IN/A	IN/A

Table 9.5.4.2-1: RI Test (TDD)

dense with Anney C.O.D. samplying OCNC
dance with Annex C.3.3 applying OCNG
cell 3 are statistically independent.
#5, #6, #8, #9, #10,#12, #13 of a subframe
#11 of a subframe overlapping with the
frame overlapping with aggressor non-ABS
SIB1/paging and its associated
I subframe when the subframe is
ell and the subframe is available in the
ttern for PCell measurements as defined in
urement resource restriction pattern for CSI
diement resource restriction pattern for CO
ble for ABC and is 2 for the subfrome
able for ABS and is 3 for the subframe
stance at subframe SF#n based on CQI
F#(n-4), this reported wideband CQI cannot
DD according to Table A.4-1 with one sided
Annex A.5.2.1.
Cell 3 is the same.
this test.
ARQ-ACK it is necessary to report them on
shall be transmitted in downlink SF#4 and
ARQ-ACK on PUSCH in uplink subframe

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
<i>)</i> /1	N/A	1.05	0.9
1/2	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 and the corresponding requirements shall be fulfilled. For UE supports multiple CSI processes, CSI processes 0 and 1 are configured for Test 2 and the corresponding requirements shall be fulfilled.

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	st 1	Te	st 2
Para	ameter	Unit	TP1	TP2	TP1	TP2
Bandwidth		MHz	10 MHz		10 MHz	
Transmission mode)		10	10	10	10
	$ ho_{\scriptscriptstyle A}$	dB	(0	(0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	(D	(C
allocation	P_c	dB	0	0	0	0
	σ	dB		0	-	<u> </u>
SNR		dB	0	0	20	20
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-98	-98	-78	-78
$\frac{N_{or}^{(j)}}{N_{oc}^{(j)}}$		dB[mW/15kHz]	-9	98	-9	98
Propagation channel	el		EPA 5 Low	EPA 5 Low	EPA 5 Low	EPA 5 High
Antenna configurati			2x2	2x2	2x2	2x2
Beamforming Mode				Section B.4.3		Section B.4.3
Timing offset betwe		US		C		C
Frequency offset be		Hz		0		0
Cell-specific referen	nce signals			a ports 0		a ports 0
CSI-RS signal 0			Antenna ports 15,16	N/A	Antenna ports 15,16	N/A
CSI-RS 0 periodicit $T_{CSI-RS} / \Delta_{CSI-RS}$	y and subframe offset		5/1	N/A	5/1	N/A
CSI-RS 0 configura	ition		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 and subframe offset $T_{CSI-RS} / \Delta_{CSI-RS}$			N/A	5/1	N/A	5/1
CSI-RS 1 configuration			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 1 configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap			1 / 00110000000 00000	N/A	1 / 00110000000 00000	N/A
CSI-IM 0 periodicity T _{CSI-RS} / Δ _{CSI-RS}	and subframe offset		5/1	N/A	5/1	N/A
CSI-IM 0 configurat	tion		2	N/A	2	N/A
	and subframe offset		N/A	5/1	N/A	5/1
CSI-IM 1 configurat	tion		N/A	6	N/A	6
RI configuration			Fixed RI=2 and follow RI	N/A	Fixed RI=1 and follow RI	N/A
Physical channel fo	or CQI/PMI reporting		PUSCH (Note 6)	N/A	PUSCH (Note 6)	PUSCH (Note 6)
PUCCH Report Typ	be for CQI/PMI		2	N/A	2	2
Physical channel fo	or RI reporting		PUCCH Format 2	N/A	PUCCH Format 2	PUCCH Format 2
PUCCH Report Typ	be for RI		3	N/A	3	3
	CSI-RS		CSI-RS 0	N/A	CSI-RS 0	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 (Note 7)	Reporting periodicity	ms	$N_{\rm pd}=5$	N/A	$N_{\rm pd}=5$	N/A
(NOLE 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)	Reporting mode		N/A	N/A	N/A	PUCCH 1-1
(Reporting periodicity	ms	N/A	N/A	N/A	$N_{\rm pd}=5$

	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 proce	ess 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 as Cell 1	Same Cell ID as Cell 2	Same Cell ID as Cell 1	Same Cell ID 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 s	ubframe 1 and 6		100000	100000	100000	N/A
Max num	ber 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.

Table 9.5.5.1-2 Minimum requirement (FDD)

	Test 1	Test 2
<i>γ</i> 1	N/A	1.0
<i>7</i> 2	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		11.5	Te	st 1	Test 2	
Par	ameter	Unit	TP1	TP2	TP1	TP2
Bandwidth		MHz		MHz		MHz
Transmission mode	e		10	10	10	10
	$ ho_{\scriptscriptstyle A}$	dB	(D	(0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	(0	(0
allocation	P_c	dB	0	0	0	0
	σ	dB	_	0	-	0
Uplink downlink co	_	uD	2	2	2	2
Special subframe of			4	4	4	4
SNR	Johnigaration	dB	0	0	20	20
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-98	-78	-78
						_
$N_{oc}^{(j)}$		dB[mW/15kHz]		98		98
Propagation chann			EPA 5 Low	EPA 5 Low	EPA 5 Low	EPA 5 High
Antenna configurat			2x2	2x2	2x2	2x2
Beamforming Mode				Section B.4.3		n Section B.4.3
Timing offset betwee Frequency offset b		us Hz		0 0		0
Cell-specific refere		ΠZ		a ports 0		a ports 0
	1100 SIYIIAIS		Antenna ports		Antenna ports	
CSI-RS signal 0			15,16	N/A	15,16	N/A
CSI-RS 0 periodicit $T_{CSI-RS} / \Delta_{CSI-RS}$	ty and subframe offset		5/3	N/A	5/3	N/A
CSI-RS 0 configura	ation		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 and subframe offset $T_{CSI-RS} / \Delta_{CSI-RS}$			N/A	5/3	N/A	5/3
CSI-RS 1 configura	ation		N/A	3	N/A	3
Zero-power CSI-RS 0 configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap			N/A	3 / 10000010000 00000	N/A	3 / 10000010000 00000
Zero-power CSI-R I _{CSI-RS} / ZeroPower	S 1 configuration CSI-RS bitmap		3 / 00110000000 00000	N/A	3 / 00110000000 00000	N/A
CSI-IM 0 periodicity T _{CSI-RS} / A _{CSI-RS}	y and subframe offset		5/3	N/A	5/3	N/A
CSI-IM 0 configura	tion		2	N/A	2	N/A
CSI-IM 1 periodicity	y and subframe offset		N/A	5/3	N/A	5/3
$\frac{T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}}{CSL \text{ IM 1 coefficience}}$	tion		N/A	6	N/A	6
CSI-IM 1 configura			Fixed RI=2	-	Fixed RI=1	
RI configuration			and follow RI	N/A	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 (Note 6, 7)	Reporting mode		PUSCH 3-1	N/A	PUSCH 3-1	N/A
	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)	Reporting mode		N/A	N/A	N/A	PUSCH 3-1
· · · · · · · · /	Reporting Interval	ms	N/A	N/A	N/A	5
001	CQI delay	ms	N/A	N/A	N/A	11
CSI process for PE	DSCH scheduling		· · · · ·	ocess 0		ocess 0
Cell ID			0	6		6
Quasi-co-located C	57-16		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1
Quasi-co-located C	CRS		Same Cell ID as Cell 1	Same Cell ID as Cell 2	Same Cell ID as Cell 1	Same Cell IE as Cell 2
PMI for subframe 4	1 and 9		010000 for fixed RI = 2 010011 for UE	100000	000011 for fixed RI = 1 010011 for UE	N/A

		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 later than SF#(n-4), this reported					downlink SF not
Note 2: 3 symbols allocated to PDCCH					
Note 3: Reference measurement chann and 9 from TP1.	e 3: Reference measurement channel RC.13 TDD according to Table A.4-1. PDSCH transmission is scheduled on subframe 4				
Note 4: TM10 OCNG as specified in A.	5.2.8 is transmitted on	subframe 3 and 8	3 from TP1.		
Note 5: TM10 OCNG as specified in A. 2.	te 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 2.				
Note 6: Reported wideband CQI and PI	6: Reported wideband CQI and PMI are used and sub-band CQI is discarded.				
Note 7: If UE supports multiple CSI pro	cesses, CSI process () is configured as	RI-reference CSI	process' for CSI	process 1.

Table 9.5.5.2-2 Minimum requirement (TDD)

	Test 1	Test 2
<i>)</i> 1	N/A	1.0
<i>j</i> 2	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 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 $CQI_{Pcell}-wideband\ CQI_{Scell} \geq 2$

for more than 90% of the time.

Parameter		Unit	Pcell	Scell	
PDSCH transmissio	PDSCH transmission mode			1	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0	
allocation	$ ho_{\scriptscriptstyle B}$	dB		0	
Propagation condit antenna configur			AWG	N (1 x 2)	
SNR		dB	10	4	
$\hat{I}^{(j)}_{or}$	$\hat{I}_{or}^{(j)}$		-88	-94	
$N_{oc}^{(j)}$	$N_{oc}^{(j)}$		-98	-98	
Physical channel f reporting	or CQI		PUCCH	Format 2	
PUCCH Report	Туре			4	
Reporting period	dicity	ms	$N_{\rm pd} = 10$		
cqi-pmi-ConfigurationIndex			16 [shift of 5 ms relating to Pcell]		
			DSCH for user data is sche as described in Annex A.5		

Table 9.6.1.1-1: Parameters for PUCCH 1-0 static test on multiple cells (FDD)

Table 9.6.1.1-2: PUCCH 1-0 static test (FDD)

Test number		Bandwidth combination	CA capability			
1 10MHz for both cells		10MHz for both cells	CL_A-A			
2		20MHz for both cells	CL_C			
Note 1:	Note 1: The applicability of requirements for different CA configurations and					
	bandwidth combination sets is defined in 9.1.1.2.					

9.6.1.2 TDD

The following requirements apply to UE Category ≥ 3 . 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 $CQI_{Pcell}-wideband\ CQI_{Scell} \geq 2$

for more than 90% of the time.

Parameter		Unit	Pcell	Scell
PDSCH transmission	PDSCH transmission mode			1
Uplink downlink cont	figuration			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	10	4
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-88	-94
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98
Physical channel f reporting	or CQI		PUCCH Format 2	
PUCCH Report	Туре			4
Reporting periodicity		ms	Np	_{bd} = 10
cqi-pmi-ConfigurationIndex			8	13 [shift of 5 ms relative to Pcell]
			DSCH for user data is sch as described in Annex A.	neduled for the UE with one 5.2.1.

Table 9.6.1.2-1: PUCCH 1-0 static test on multiple cells (TDD)

Table 9.6.1.2-2: PUCCH 1-0 static test (TDD)

Test number		Bandwidth combination	CA capability		
1	1 20MHz for both cells		1 20MHz for both cells CL_C, CL_A-A		CL_C, CL_A-A
Note 1:	Note 1: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 9.1.1.2.				

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).

Parameter	Unit	Value			
Number of HARQ processes	Processes	None			
Subcarrier spacing	kHz	15 kHz			
Allocated subframes per Radio Frame (Note 1)		6 subframes			
Number of OFDM symbols for PDCCH		2			
Cyclic Prefix		Extended			
Note1: For FDD mode, up to 6 subframes (#1/2/3/6/7/8) are available for MBMS, 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.

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 10.1.1-1: Test Parameters for Testing

Table 10.1.1-2: Minimum performance

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference value		ation Reference value	MBMS
number		Channel	Pattern	condition	Matrix and antenna	BLER (%)	SNR(dB)	UE Category	
1	10 MHz	R.37 FDD	OP.4 FDD				4.1	≥1	
2	10 MHz	R.38 FDD	OP.4 FDD	MBSFN			11.0	≥1	
3	10 MHz	R.39 FDD	OP.4 FDD	channel model (Table	1x2 low	1	20.1	≥2	
	5.0MHz	R.39-1 FDD	OP.4 FDD	B.2.6-1)			20.5	1	
4	1.4 MHz	R.40 FDD	OP.4 FDD]			6.6	≥1	

10.2 TDD (Fixed Reference Channel)

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).

Pa	rameter	Unit	Value		
	er of HARQ ocesses	Processes	None		
Subcar	bcarrier 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.					

Table 10.2-1: Common Test Parameters (TDD)

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.

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 10.2.1-1: Test Parameters for Testing

Table 10.2.1-2: Minimum pe	erformance
----------------------------	------------

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Referen	ce value	MBMS
number		Channel	Pattern	condition	Matrix and antenna	BLER (%)	SNR(dB)	UE Category
1	10 MHz	R.37 TDD	OP.4 TDD				3.4	≥1
2	10 MHz	R.38 TDD	OP.4 TDD	MBSFN channel model (Table	1x2 low	1	11.1	≥1
3a	10 MHz	R.39 TDD	OP.4 TDD				20.1	≥2
3b	5MHz	R.39-1 TDD	OP.4 TDD	B.2.6-1)			20.5	1
4	1.4 MHz	R.40 TDD	OP.4 TDD				5.8	≥1

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_{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,

 $\min |R - (A + 24*(N_{CB} + 1)) / N_{ch}|, where N_{CB} = \begin{cases} 0, if C = 1\\ C, if C > 1 \end{cases}$ 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.

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, Ful	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, Par	rtial RB allocation,	QPSK							
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	
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 Por	Table A.2.2.2.1-1	16 O M	20	QPSK	1/6	96	≥ 1	
FDD, Fai	Table A.2.2.2.2-1		1.4 - 20	16QAM	3/4	1	> 1	
			1.4 - 20			1	≥1	
FDD	Table A.2.2.2.2-1 Table A.2.2.2.2-1		1.4 - 20	16QAM	3/4	2	≥ 1	
FDD	Table A.2.2.2.2-1			16QAM	3/4	3	≥1	
FDD			1.4 - 20	16QAM	3/4	4	≥ 1	
FDD	Table A.2.2.2.2-1		1.4 - 20 3 - 20	16QAM	3/4	5 6	≥1	
FDD	Table A.2.2.2.2-1			16QAM	3/4		≥1	
FDD	Table A.2.2.2.2-1		3 - 20	16QAM	3/4	8	≥1	
FDD	Table A.2.2.2.2-1		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.2.2.2.1		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.2.2.2.2-1		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.2.2.2.2-1		20	16QAM	1/2	81	≥ 2	
FDD	Table A.2.2.2.2-1		20	16QAM	2/5	90	≥ 2	
FDD Sur	Table A.2.2.2.2-1		20	16QAM	2/5	96	≥ 2	
	stained data rate	D 4 4 500		ODOK	0.01	40		
FDD	Table A.2.2.3-1	R.1-1 FDD		QPSK	0.31	40	≥ 1	
FDD	Table A.2.2.3-1	R.1-2 FDD		QPSK	0.31	40	≥1	
FDD	Table A.2.2.3-1	R.1-3 FDD		QPSK	0.31	90	≥2	
FDD	Table A.2.2.3-1	R.1-3A FDI		QPSK	0.31	40	≥1	
	Table A.2.2.3-1	R.1-4 FDD	20	QPSK	0.31	90	≥ 2	
	I RB allocation, QP	JN	4.4	000	1/0	6		
TDD	Table A.2.3.1.1-1		1.4	QPSK	1/3	6 15	≥1 >1	
TDD	Table A.2.3.1.1-1		3	QPSK	1/3	15 25	≥1 >1	
TDD TDD	Table A.2.3.1.1-1 Table A.2.3.1.1-1		5 10	QPSK	1/3	25 50	≥1 ≥1	
עעי	1 auto A.Z.J. 1. 1-1		10	QPSK	1/3	50	≤	

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, Fu	II RB allocation, 16-	QAM					<u> </u>		
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, Pa	rtial RB allocation,	QPSK							1
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, Pa	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	

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TDDTable A.2.3.2.2-15 - 2016QAM1/320 ≥ 1 TDDTable A.2.3.2.2-15 - 2016QAM1/324 ≥ 1 TDDTable A.2.3.2.2-110 - 2016QAM1/325 ≥ 1 TDDTable A.2.3.2.2-110 - 2016QAM1/327 ≥ 1 TDDTable A.2.3.2.2-110 - 2016QAM3/430 ≥ 2 TDDTable A.2.3.2.2-110 - 2016QAM3/432 ≥ 2 TDDTable A.2.3.2.2-110 - 2016QAM3/436 ≥ 2 TDDTable A.2.3.2.2-110 - 2016QAM3/440 ≥ 2 TDDTable A.2.3.2.2-110 - 2016QAM3/448 ≥ 2 TDDTable A.2.3.2.2-110 - 2016QAM3/448 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM3/450 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM3/454 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM2/360 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM1/272 ≥ 2 TDDTable A.2.3.2.2-12016QAM1/272 ≥ 2 </td <td>TDD</td> <td>Table A.2.3.2.2-1</td> <td></td> <td>5 - 20</td> <td>16QAM</td> <td>1/2</td> <td>16</td> <td>≥ 1</td> <td></td>	TDD	Table A.2.3.2.2-1		5 - 20	16QAM	1/2	16	≥ 1	
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TDDTable A.2.3.2.2-115 - 2016QAM $3/4$ 50 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $3/4$ 54 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $2/3$ 60 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $2/3$ 64 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $1/2$ 72 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $1/2$ 72 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 75 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 80 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 80 ≥ 2 TDDTable A.2.3.2.2-12016QAM $2/5$ 90 ≥ 2 TDDTable A.2.3.2.2-12016QAM $2/5$ 90 ≥ 2	TDD	Table A.2.3.2.2-1		10 - 20	16QAM	3/4	45	≥ 2	
TDDTable A.2.3.2.2-115 - 2016QAM $3/4$ 54 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $2/3$ 60 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $2/3$ 64 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $1/2$ 72 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 75 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 80 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 81 ≥ 2 TDDTable A.2.3.2.2-12016QAM $2/5$ 90 ≥ 2 TDDTable A.2.3.2.2-12016QAM $2/5$ 90 ≥ 2	TDD	Table A.2.3.2.2-1		10 - 20	16QAM	3/4	48	≥ 2	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	TDD	Table A.2.3.2.2-1		15 - 20	16QAM	3/4	50	≥ 2	
TDDTable A.2.3.2.2-115 - 2016QAM $2/3$ 64 ≥ 2 TDDTable A.2.3.2.2-115 - 2016QAM $1/2$ 72 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 75 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 80 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 80 ≥ 2 TDDTable A.2.3.2.2-12016QAM $1/2$ 81 ≥ 2 TDDTable A.2.3.2.2-12016QAM $2/5$ 90 ≥ 2	TDD	Table A.2.3.2.2-1		15 - 20	16QAM	3/4	54	≥ 2	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	TDD	Table A.2.3.2.2-1		15 - 20	16QAM	2/3	60	≥ 2	
TDDTable A.2.3.2.2-12016QAM1/275 ≥ 2 TDDTable A.2.3.2.2-12016QAM1/280 ≥ 2 TDDTable A.2.3.2.2-12016QAM1/281 ≥ 2 TDDTable A.2.3.2.2-12016QAM2/590 ≥ 2	TDD	Table A.2.3.2.2-1		15 - 20	16QAM	2/3	64	≥ 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 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		15 - 20	16QAM	1/2	72	≥ 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	1/2	75	≥ 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	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 96 ≥ 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, Sustained data rate	TDD, Su	stained data rate						 	
TDD Table A.2.3.3-1 R.1-1 TDD 10 QPSK 0.43 40 ≥ 1	TDD	Table A.2.3.3-1	R.1-1 TDD	10	QPSK	0.43	40	≥ 1	
TDD Table A.2.3.3-1 R.1-2 TDD 10 QPSK 0.61 40 ≥ 2	TDD		R.1-2 TDD	10		0.61	40	≥ 2	
TDD Table A.2.3.3-1 R.1-3 TDD 20 QPSK 0.49 90 ≥ 2	TDD	Table A.2.3.3-1	R.1-3 TDD	20	QPSK	0.49	90	≥ 2	
TDD Table A.2.3.3-1 R.1-3B TDD 15 QPSK 0.42 60 ≥ 2	TDD	Table A.2.3.3-1	R.1-3B TDD	15	QPSK	0.42	60	≥ 2	
TDD Table A.2.3.3-1 R.1-4 TDD 20 QPSK 0.49 90 ≥ 2	TDD	Table A.2.3.3-1	R.1-4 TDD	20	QPSK	0.49	90	≥ 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 QPSK QPSK									
Target Coding rate 1/3 1/3 1/3 1/5 1/7									
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)								

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 present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)										

A.2.2.1.3 64-QAM

[FFS]

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

Paramet er	Ch BW	Allocate d RBs	DFT- OFDM Symbols per Sub- Frame	Mod'n	Target Coding rate	Payload size	Transpo rt block CRC	Number of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame	Total symbols per Sub- Frame	UE Categor y
Unit	MHz					Bits	Bits		Bits		
	1.4 - 20	1	12	QPSK	1/3	72	24	1	288	144	≥1
	1.4 - 20	2	12	QPSK	1/3	176	24	1	576	288	≥1
	1.4 - 20	3	12	QPSK	1/3	256	24	1	864	432	≥1
	1.4 - 20	4	12	QPSK	1/3	392	24	1	1152	576	≥1
	1.4 - 20	5	12	QPSK	1/3	424	24	1	1440	720	≥1
	3-20	6	12	QPSK	1/3	600	24	1	1728	864	≥1
	3-20	8	12	QPSK	1/3	808	24	1	2304	1152	≥1
	3-20	9	12	QPSK	1/3	776	24	1	2592	1296	≥1
	3-20	10	12	QPSK	1/3	872	24	1	2880	1440	≥1
	3-20	12	12	QPSK	1/3	1224	24	1	3456	1728	≥1
	5-20	15	12	QPSK	1/3	1320	24	1	4320	2160	≥1
	5-20	16	12	QPSK	1/3	1384	24	1	4608	2304	≥1
	5-20	18	12	QPSK	1/3	1864	24	1	5184	2592	≥1
	5-20	20	12	QPSK	1/3	1736	24	1	5760	2880	≥1
	5-20	24	12	QPSK	1/3	2472	24	1	6912	3456	≥1
	10-20	25	12	QPSK	1/3	2216	24	1	7200	3600	≥1
	10-20	27	12	QPSK	1/3	2792	24	1	7776	3888	≥1
	10-20	30	12	QPSK	1/3	2664	24	1	8640	4320	≥ 1
	10-20	32	12	QPSK	1/3	2792	24	1	9216	4608	≥1
	10-20	36	12	QPSK	1/3	3752	24	1	10368	5184	≥ 1
	10-20	40	12	QPSK	1/3	4136	24	1	11520	5760	≥1
	10-20	45	12	QPSK	1/3	4008	24	1	12960	6480	≥1
	10-20	48	12	QPSK	1/3	4264	24	1	13824	6912	≥ 1
	15 - 20	50	12	QPSK	1/3	5160	24	1	14400	7200	≥ 1
	15 - 20	54	12	QPSK	1/3	4776	24	1	15552	7776	≥1
	15 - 20	60	12	QPSK	1/4	4264	24	1	17280	8640	≥ 1
	15 - 20	64	12	QPSK	1/4	4584	24	1	18432	9216	≥ 1
	15 - 20	72	12	QPSK	1/4	5160	24	1	20736	10368	≥1
	20	75	12	QPSK	1/5	4392	24	1	21600	10800	≥1
	20	80	12	QPSK	1/5	4776	24	1	23040	11520	≥1
	20	81	12	QPSK	1/5	4776	24	1	23328	11664	≥1
	20	90	12	QPSK	1/6	4008	24	1	25920	12960	≥1
	20	96	12	QPSK	1/6	4264	24	1	27648	13824	≥1

Table A.2.2.2.1-1 Reference Channels for QPSK with partial RB allocation

A.2.2.2.2 16-QAM

Paramet er	Ch BW	Allocate d RBs	DFT- OFDM Symbols per Sub- Frame	Mod'n	Target Coding rate	Payload size	Transpo rt block CRC	Number of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame	Total symbols per Sub- Frame	UE Catego y
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

Table A.2.2.2.2-1 Reference Channels for 16-QAM with partial RB allocation

A.2.2.2.3 64-QAM

[FFS]

A.2.2.3 Reference measurement channels for sustained downlink data rate provided by lower layers

Unit			Va	lue		
	R.1-1	R.1-2	R.1-3	R.1-3A	R.1-4	FFS
	FDD	FDD	FDD	FDD	FDD	
MHz	10	10	20	10	20	
	40	40	90	40	90	
	(Note 2)	(Note 2)	(Note 3)	(Note 2)	(Note 3)	
	10	10	10	10	10	
	12	12	12	12	12	
	QPSK	QPSK	QPSK	QPSK	QPSK	
	0.31	0.31	0.31	0.31	0.31	
Bits	3496	3496	7992	3496	7992	
	1	1	2	1	2	
	5760	5760	12960	5760	12960	
	11520	11520	25920	11520	25920	
Mbps	3.496	3.496	7.992	3.496	7.992	
	≥ 1	≥ 1	≥2	≥ 1	≥2	
esent, an	additional	CRC seque	nce of $L = 2$	4 Bits is atta	ached to ea	ch Code
	MHz Bits Mbps	R.1-1 FDD MHz 10 40 (Note 2) 10 12 QPSK 0.31 Bits 3496 1 5760 11520 Mbps Mbps 3.496 ≥ 1 resent, an additional (R.1-1 FDD R.1-2 FDD MHz 10 10 40 40 40 (Note 2) (Note 2) (Note 2) 10 10 10 12 12 12 QPSK QPSK QPSK 0.31 0.31 0.31 Bits 3496 3496 1 1 1 5760 5760 11520 Mbps 3.496 3.496 ≥ 1 ≥ 1 ≥ 1	R.1-1 R.1-2 R.1-3 FDD FDD FDD MHz 10 10 20 40 40 90 (Note 2) (Note 2) (Note 3) 10 10 10 10 12 12 12 12 QPSK QPSK QPSK QPSK 0.31 0.31 0.31 0.31 Bits 3496 3496 7992 1 1 2 5760 5760 12960 11520 11520 25920 Mbps 3.496 3.496 7.992 ≥ 1 ≥ 1 ≥ 2 resent, an additional CRC sequence of L = 2 ≥ 1 ≥ 2	R.1-1 FDDR.1-2 FDDR.1-3 FDDR.1-3A FDDMHz1010201040409040(Note 2)(Note 2)(Note 3)(Note 2)1010101012121212QPSKQPSKQPSKQPSK0.310.310.310.31Bits349634967992349611215760576012960576011520115202592011520Mbps3.4963.4967.9923.496 ≥ 1 ≥ 1 ≥ 2 ≥ 1 resent, an additional CRC sequence of L = 24 Bits is attract	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$

Table A.2.2.3-1: Uplink Reference Channels for sustained data-rate test (FDD)

Note 3: RB-s 5-94 allocated with PUSCH.

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			
Jplink-Downlink Configuration (Note 2) 1 <th1< th=""> 1</th1<>										
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 to each Code Block (otherwise		n addition	al CRC s	equence	of L = 24	Bits is a	ttached			
Note 2: As per Table 4.2-2 in TS 36.21	1 [4]									

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			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		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 Code Block (otherwise L = 0 Block) Note 2: As per Table 4.2-2 in TS 36.2 ²	Bit)	an additiona	al CRC seq	uence of L	. = 24 Bits i	s attached	to each

A.2.3.1.3 64-QAM

[FFS]

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

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 12	QPSK QPSK	1/3 1/3	424 600	24 24	1	1440 1728	720 864	≥1
	3-20 3-20	8	1	12	QPSK	1/3	808	24	1	2304	1152	≥ 1 ≥ 1
	3-20	9	1	12	QPSK	1/3	776	24	1	2592	1296	≥1 ≥1
	3-20	10	1	12	QPSK	1/3	872	24	1	2392	1290	≥1
	3-20	10	1	12	QPSK	1/3	1224	24	1	3456	1728	≥1
	5-20	15	1	12	QPSK	1/3	1320	24	1	4320	2160	≥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 48	1	12 12	QPSK QPSK	1/3 1/3	4008	24 24	1	12960	6480 6912	≥ 1 ≥ 1
	10-20 15 - 20	48 50	1	12	QPSK QPSK	1/3	4264 5160	24	1	13824 14400	7200	≥1
	15 - 20	54	1	12	QPSK	1/3	4776	24	1	15552	7200	≥1
	15 - 20	60	1	12	QPSK	1/3	4264	24	1	17280	8640	≥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

Table A.2.3.2.1-1 Reference Channels for QPSK with partial RB allocation

A.2.3.2.2 16-QAM

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 48	1	12 12	16QAM	3/4	19080	24 24	4	25920	6480	≥2
	10-20 15 - 20	48 50	1	12	16QAM 16QAM	3/4 3/4	20616 21384	24		27648 28800	6912 7200	≥2
	15 - 20	50	1	12	16QAM 16QAM	3/4	21384	24	4	28800	7200	≥2 ≥2
	15 - 20	54 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	10308	≥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
	20	96	1	12	16QAM	2/5	22152	24	4	55296	13824	≥2
Note 1: Note 2:	If more t	han one Co	de Block is p n TS 36.211	resent, an a								

Table A.2.3.2.2-1 Reference Channels for 16QAM with partial RB allocation

A.2.3.2.3 64-QAM

[FFS]

A.2.3.3 Reference measurement channels for sustained downlink data rate provided by lower layers

Parameter	Unit			Value		
Reference Channel		R.1-1	R.1-2	R.1-3	R.1-3B	R.1-4
		TDD	TDD	TDD	TDD	TDD
Channel Bandwidth	MHz	10	10	20	15	20
Uplink-Downlink Configuration (Note 2)		5	5	5	1	1
Allocated Resource Blocks		40	40	90	60	90
		(Note 3)	(Note 3)	(Note 5)	(Note 4)	(Note 5)
Allocated Sub-Frames per Radio-Frame		1	1	1	1	1
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Coding Rate						
For Sub-Frame 2		0.43	0.61	0.49	0.42	0.49
For Sub-Frame 3,7,8		n/a	n/a	n/a	0.42	0.49
Information Bit Payload per Sub-Frame	Bits					
For Sub-Frame 2		4968	6968	12576	7224	12576
For Sub-Frame 3,7,8		0	0	0	7224	12576
Number of Code Blocks per Sub-Frame						
(Note 1)						
For Sub-Frame 2		1	2	3	2	3
For Sub-Frame 3,7,8		0	0	0	2	3
Modulation Symbols per Sub-Frame						
For Sub-Frame 2		5760	5760	12960	8640	10240
For Sub-Frame 3,7,8		0	0	0	8640	10240
Binary Channel Bits per Sub-Frame						
For Sub-Frame 2		11520	11520	25920	17280	25920
For Sub-Frame 3,7,8		n/a	n/a	n/a	17280	25920
Max Throughput over 1 Radio-Frame	Mbps	0.4968	0.6968	1.2576	2.8896	5.0304
UE Category		≥ 1	≥ 2	≥2	≥ 2	≥ 2
Note 1: If more than one Code Block is p	resent, an	additional C	CRC sequer	nce of $L = 2$	4 Bits is atta	ached to
each Code Block (otherwise L =	0 Bit)					
Note 2: As per Table 4.2-2 in TS 36.211						
Note 3: RB-s 5-44 allocated with PUSCH						
Note 4: RB-s 7-66 allocated with PUSCH						
Note 5: RB-s 5-94 allocated with PUSCH	l.					

Table A.2.3.3-1: Uplink Reference Channels for sustained data-rate test (TDD)

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_{RB}

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,

$$\min |R - (A + 24*(N_{CB} + 1))/N_{ch}|, where N_{CB} = \begin{cases} 0, if C = 1\\ C, if C > 1 \end{cases}$$
 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.

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	
	eiver requirements		T		1	1	-		
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	
FDD, Rece	eiver requirements,	Maximum inp	out level	for UE Ca	tegorie	s 3-5	-	-	
FDD	Table A.3.2-3		1.4	64QAM	3/4	6		-	
FDD	Table A.3.2-3		3	64QAM	3/4	15		-	
FDD	Table A.3.2-3		5	64QAM	3/4	25		-	
FDD	Table A.3.2-3		10	64QAM	3/4	50		-	
FDD	Table A.3.2-3		15	64QAM	3/4	75		-	
FDD	Table A.3.2-3		20	64QAM	3/4	100		-	
FDD, Rece	eiver requirements,	Maximum inp	out level	for UE Ca	tegorie	s 1			
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	1	1	tegorie	s 2			ſ
FDD	Table A.3.2-3b		1.4	64QAM	3/4	6		-	
FDD	Table A.3.2-3b		3	64QAM	3/4	15		-	
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		-	
FDD	Table A.3.2-3b		20	64QAM	3/4	83		-	
TDD, Rece	eiver requirements,	Maximum inp		for UE Ca	tegorie	s 3-5	1		
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		-	
	eiver requirements,	Maximum inp	1	1	_	1			
TDD	Table A.3.2-4a		1.4	64QAM	3/4	6		-	
TDD	Table A.3.2-4a		3	64QAM	3/4	15		-	

Table A.3.1.1-1: Overview of DL reference measurement channels

тор			F	640414	2/4	10			
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	N	20	64QAM	3/4	17		-	
	eiver requirements,			1		1			
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	ingle enterne	20	64QAM	3/4	83		-	
	CH Performance, S	-	[1				
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.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	
	CH Performance, S		-				B (Cha	r	edge)
FDD	Table A.3.3.1-4	R.0 FDD	3 10 /	16QAM	1/2	1		≥ 1	
FDD	Table A.3.3.1-4	R.1 FDD	20	16QAM	1/2	1		≥ 1	
FDD, PDS	CH Performance, S	ingle-antenna	transm	ission (CR	S), Sin	gle PR	B (MB	SFN C	onfiguration)
FDD	Table A.3.3.1-5	R.29 FDD	10	16QAM	1/2	1		≥ 1	
FDD, PDS	CH Performance: C	arrier aggrega	ation wit	th power i	mbalan	се			
FDD	Table A.3.3.1-7	R.49 FDD	20	64QAM	0.84- 0.87	100		≥5	
FDD, PDS	CH Performance, N	lulti-antenna t	ransmis	sion (CRS		antenr	a port	s	
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.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	Table A.3.3.2.1-1	R.35 FDD	10	64QAM	1/2	50		≥ 2	
FDD	Table A.3.3.2.1-1	R.35-1 FDD	20	64QAM	0.39	100		4	
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	
	I		-		I	1		-	1

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	
	CH Performance, N		-		6). Four		na port		
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, PDS	CH Performance (U	E specific RS) Two ar	ntenna por	rts (CSI	-RS)			
FDD	Table A.3.3.3.1-1	R.51 FDD	10	16QAM	1/2	50		≥ 2	
FDD, PDS	CH Performance (U	E specific RS) Two ar	ntenna por	rts (CSI	-RS, no	on Qua	asi Co-	located)
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	
FDD, PDS	CH Performance (U	E specific RS) Four a	ntenna po	rts (CS	I-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	
TDD, PDS	CH Performance, S	ingle-antenna	transm	ission (CR	(S)				
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.3.4.1-2	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	
	CH Performance, S	-		1	1	ī I	B (Cha	1	dge)
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, PDS	CH Performance, S	ingle-antenna	transm	ission (CR	S), Sin	gle PR	B (MBS	SFN C	onfiguration)
TDD	Table A.3.4.1-5	R.29 TDD	10	16QAM	1/2	1		≥ 1	
TDD, PDS	CH Performance: C	arrier aggrega	ation wit	h power in		се			
TDD	Table A.3.4.1-7	R.49 TDD	20	64QAM	0.81- 087	100		≥ 5	
	CH Performance, N	lulti-antenna t	ransmis	sion (CRS	i). Two	antenn	a port	s	

TDD			10	ODOK	4/0	50			
TDD	Table A.3.4.2.1-1	R.10 TDD	10	QPSK	1/3	50		≥ 1	
TDD	Table A.3.4.2.1-1	R.11 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.1-1	R.11-1 TDD	10	16QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.1-1	R.11-2 TDD	5	16QAM	1/2	25		≥ 1	
TDD	Table A.3.4.2.1-1	R.11-3 TDD	10	16QAM	1/2	40		≥ 1	
TDD	Table A.3.4.2.1-1	R.11-4 TDD	10	QPSK	1/2	50		≥ 1	
TDD	Table A.3.4.2.1-1	R.30 TDD	20	16QAM	1/2	100		≥ 2	
TDD	Table A.3.4.2.1-1	R.30-1 TDD	20	16QAM	1/2	100		≥ 2	
TDD	Table A.3.4.2.1-1	R.30-2 TDD	20	16QAM	1/2	100		3	
TDD	Table A.3.4.2.1-1	R.35 TDD	10	64QAM	1/2	50		≥ 2	
TDD	Table A.3.4.2.1-1	R.35-1 TDD	20	64QAM	0.39	100		4	
TDD	Table A.3.4.2.1-2	R.35-2 TDD	10	64QAM	0.47	50		≥ 2	
TDD	Table A.3.4.2.1-2	R.46 TDD	10	QPSK		50		≥ 1	
TDD	Table A.3.4.2.1-2	R.47 TDD	10	16QAM		50		≥ 1	
	CH Performance, N			-	-	1	na por		
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	
	CH Performance, 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	
	CH Performance, T		orts (DR	-		1		-	Γ
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	
	CH Performance (U					· ·			
TDD	Table A.3.4.3.3-1	R.51 TDD	10	16QAM	1/2	50		≥ 2	
	CH Performance (U	•		-	-	1	on Qua		located)
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	
	CH Performance (U	•		-		,			
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, PDS	CH Performance (U	E specific RS) Eight a	intenna po	orts (CS	SI-RS)			
TDD TDD	Table A.3.4.3.5-1 Table A.3.4.3.5-2	R.50 TDD R.45 TDD	10 10	QPSK 16QAM	1/3 1/2	50 50		≥ 1 ≥ 2	

TDD	Table A.3.4.3.5-2	R.45-1 TDD	10	16QAM	1/2	39	≥ 1	
	CH / PCFICH Perfo		10	TOQAIN	1/2	39	2 1	
FDD, FDC	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				
	CH / PCFICH Perfo		•					
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 / TDD	, PHICH Performar	nce						
FDD / TDD	Table A.3.6-1	R.18	10	PHICH				
FDD /	Table A.3.6-1	R.19	10	PHICH				
TDD FDD /								
TDD	Table A.3.6-1	R.20	5	PHICH				
FDD / TDD	Table A.3.6-1	R.24	10	PHICH				
FDD / TDD	, 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/			
	H Performance				1020			
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, PMCI	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	
	ained data rate (CR	,						
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- 0.64		≥ 2	
FDD	Table A.3.9.1-1	R.31-3 FDD	20	64QAM	0.59- 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	
		R.31-4B FDD	15	64QAM	0.85-		≥ 4	
FDD	Table A.3.9.1-1	K.31-40 FDD			0.88			
FDD FDD	Table A.3.9.1-1 Table A.3.9.1-1	R.31-4B FDD	15	64QAM	0.88 0.85- 0.91		 ≥ 3	

TDD	Table A.3.9.2-1	R.31-1 TDD	10	64QAM	0.40 0.59-		≥ 1	
TDD	Table A.3.9.2-1	R.31-2 TDD	10	64QAM	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	
FDD, Sust	ained data rate tes	t with EPDCCI	H sched	uling (CRS	•			
FDD	Table A.3.9.3-1	R.31E-1 FDD	10	64QAM	0.40- 0.41		≥ 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 FDD	10	64QAM	0.85- 0.92		≥ 2	
FDD	Table A.3.9.3-1	R.31E-4 FDD	20	64QAM	0.87- 0.91		≥ 3	
FDD	Table A.3.9.1-1	R.31E-4B FDD	15	64QAM	0.87- 0.90		≥ 4	
TDD, Sust	ained data rate tes	t with EPDCC	H sched	uling (CRS	5)			
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 TDD	10	64QAM	0.59- 0.65		≥2	
TDD	Table A.3.9.4-1	R.31E-3 TDD	20	64QAM	0.59- 0.63		≥ 2	
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, ePD	CCH 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 R	leference Channel	for Receiver Re	quirements	(FDD)
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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						
Note 1: 2 symbols allocated to PDCCH for						bols allo	cated to						
PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz													
Note 2: Reference signal, Synchronization													
Note 3: If more than one Code Block is pro		tional CR	C seque	nce of L =	= 24 Bits	is attache	ed to						
each Code Block (otherwise L = 0	Bit)				each Code Block (otherwise L = 0 Bit)								

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	L	≥1	≥1	≥1	≥ 1	≥1	≥ 1			
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.3.2-2 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			
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 for 5 MHz and 3 MHz. 4 symbols a Note 2: Reference signal, Synchronization	allocated to PI	DCCH for 1	.4 MHz.		-	llocated to	PDCCH			

Table A.3.2-3 Fixed Reference Channel for Maximum input level for UE Categories 3-8 (FDD)

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.3.2-3a Fixed Reference Channel for Maximum input level for UE Category 1 (FDD)

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			
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										

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).

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			
for 5 MHz and 3 MHz. 4 symbols a	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.3.2-3b Fixed Reference Channel for Maximum input level for UE Category 2 (FDD)

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).

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	
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								
3 symbols allocated to PDCCH fo					OCCH for 1	.4 MHz. Fo	r special	
subframe (1&6), only 2 OFDM syr								
Note 2: For 1.4MHz, no data shall be sche	eduled on spe	cial subfrar	nes(1&6) to	o avoid pro	blems with	insufficien	t 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 pr	esent, an addi	tional CRC	sequence	of $L = 24 E$	Bits is attac	ched to eac	h Code	
Block (otherwise $L = 0$ Bit).	41							
Note 5: As per Table 4.2-2 in TS 36.211 [4	¥].							

Table A.3.2-4 Fixed Reference Channel for Maximum input level for UE Categories 3-8 (TDD)

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	
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								
3 symbols allocated to PDCCH for					OCCH for 1	.4 MHz. Fo	r special	
subframe (1&6), only 2 OFDM syn								
Note 2: For 1.4MHz, no data shall be sche	duled on spe	cial subfrar	nes(1&6) to	o avoid pro	blems with	insufficien	t 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								
	esent, an addi	tional CRC	sequence	of $L = 24 E$	Bits is attac	ned to eac	n Code	
Block (otherwise $L = 0$ Bit).	11							
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)

Channel bandwidth MHz 1.4 3 5 10 15 20 Allocated resource blocks 6 15 25 50 75 83 Subcarriers per resource block 12 10 15 20 Miduality Miduality Miduality 14 13 11 <td< th=""><th>Parameter</th><th>Unit</th><th></th><th></th><th>Va</th><th>lue</th><th></th><th></th></td<>	Parameter	Unit			Va	lue		
Allocated resource blocks 6 15 25 50 75 83 Subcarriers per resource block 12 13 13 13 13 13 13 13 13 14 14 12 365 16 35 1024 12 12 12 12			1.4	3			15	20
Subcarriers per resource block 12 13 1 <th1< td=""><td>Allocated resource blocks</td><td></td><td>6</td><td></td><td></td><td>50</td><td></td><td>83</td></th1<>	Allocated resource blocks		6			50		83
Uplink-Downlink Configuration (Note 5) 1	Subcarriers per resource block		12			12		12
Allocated subframes per Radio Frame 2 3+2 Modulation 64QAM 64QAM 64QAM 64QAM 64QAM 64QAM 64QAM 64QAM 64QAM 3/4			1	1	1	1	1	1
Target Coding Rate 3/4			2	3+2	3+2	3+2	3+2	3+2
Number of HARQ Processes Processes 7 <	Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Maximum number of HARQ transmissions 1	Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Maximum number of HARQ transmissions 1	Number of HARQ Processes	Processes	7	7	7	7	7	7
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 6968 11448 23688 35160 39232 Tor Sub-Frame 0 Bits N/A 6968 12576 30576 45352 51024 Transport block CRC Bits 24 2	Maximum number of HARQ transmissions		1	1	1	1	1	1
For Sub-Frames 1,6 Bits N/A 6968 11448 23688 35160 39232 For Sub-Frame 5 Bits N/A Dists 24	Information Bit Payload per Sub-Frame							
For Sub-Frame 5 Bits N/A 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	For Sub-Frames 4,9	Bits	2984	8504	14112	30576	46888	51024
For Sub-Frame 0 Bits N/A 6968 12576 30576 45352 51024 Transport block CRC Bits 24	For Sub-Frames 1,6	Bits	N/A	6968	11448	23688	35160	39232
Transport block CRCBits24242424242424Number of Code Blocks per Sub-Frame (Note 4)I23589For Sub-Frames 1,6N/A23577For Sub-Frame 5N/AN/AV/AN/AN/AN/AFor Sub-Frame 0N/A23589Binary Channel Bits per Sub-FrameN/A1134018900414006210068724For Sub-Frames 1,6N/AN/A982816668337685086856340For Sub-Frame 5BitsM/A982816668337685086856340For Sub-Frame 5BitsN/A925216380393126601266636Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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.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).	For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
Number of Code Blocks per Sub-Frame (Note 4)123589For Sub-Frames 1,6N/A23577For Sub-Frame 5N/AV/AN/AN/AN/AN/AN/AFor Sub-Frame 0N/A23589Binary Channel Bits per Sub-FrameN/A23589For Sub-Frames 4,9Bits41041134018900414006210068724For Sub-Frames 1,6N/A982816668337685086856340For Sub-Frames 1,6N/A982816668337685086856340For Sub-Frame 5BitsN/A925216380393126001266636Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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).	For Sub-Frame 0	Bits	N/A	6968	12576	30576	45352	51024
(Note 4)123589For Sub-Frames 1,6N/A23577For Sub-Frame 5N/AN/AN/AN/AN/AN/AFor Sub-Frame 0N/AN/AN/AN/AN/AFor Sub-Frame 0N/A23589Binary Channel Bits per Sub-FrameN/A23589For Sub-Frames 4,9Bits41041134018900414006210068724For Sub-Frames 1,6N/A982816668337685086856340For Sub-Frame 5BitsN/AN/AN/AN/AN/AFor Sub-Frame 0BitsN/A925216380393126001266636Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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).	Transport block CRC	Bits	24	24	24	24	24	24
For Sub-Frames 4,9123589For Sub-Frames 1,6N/A23577For Sub-Frame 5N/AN/AN/AN/AN/AN/AN/AFor Sub-Frame 0N/A23589Binary Channel Bits per Sub-FrameN/A1134018900414006210068724For Sub-Frames 4,9Bits41041134018900414006210068724For Sub-Frames 1,6N/A982816668337685086856340For Sub-Frame 5BitsN/A925216380393126001266636Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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.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).	Number of Code Blocks per Sub-Frame							
For Sub-Frames 1,6N/A23577For Sub-Frame 5N/AN/AN/AN/AN/AN/AN/AN/AFor Sub-Frame 0N/A23589Binary Channel Bits per Sub-FrameN/A23589For Sub-Frames 4,9Bits41041134018900414006210068724For Sub-Frames 1,6N/A982816668337685086856340For Sub-Frame 5BitsN/A925216380393126001266636Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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).								
For Sub-Frame 5N/AN/AN/AN/AN/AN/AN/AFor Sub-Frame 0N/A23589Binary Channel Bits per Sub-Frame </td <td>For Sub-Frames 4,9</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>9</td>	For Sub-Frames 4,9							9
For Sub-Frame 0N/A23589Binary Channel Bits per Sub-Frame <td>For Sub-Frames 1,6</td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td>7</td> <td>•</td>	For Sub-Frames 1,6				-		7	•
Binary Channel Bits per Sub-Frame 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 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).	For Sub-Frame 5			N/A	N/A	N/A	N/A	N/A
For Sub-Frames 4,9Bits41041134018900414006210068724For Sub-Frames 1,6N/A982816668337685086856340For Sub-Frame 5BitsN/AN/AN/AN/AN/AN/AFor Sub-Frame 0BitsN/A925216380393126001266636Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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 			N/A	2	3	5	8	9
For Sub-Frames 1,6N/A982816668337685086856340For Sub-Frame 5BitsN/AN/AN/AN/AN/AN/AFor Sub-Frame 0BitsN/A925216380393126001266636Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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).								
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).		Bits	-				62100	
For Sub-Frame 0BitsN/A925216380393126001266636Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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.For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient 								
Max. Throughput averaged over 1 framekbps596.83791.26369.6139102094523154Note 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 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]. 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). 		Bits						
 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). 								
 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 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). 						OCCH for 1	.4 MHz. Fo	r special
 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 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). 		eaulea on spe	cial subtra	mes(1&6) t	o avoid pro	polems with	n insufficier	π
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).								
Block (otherwise $L = 0$ Bit).							had to can	h Codo
				sequence	01 L = 24 E	ons is allac		
	Note 5: As per Table 4.2-2 in TS 36.211 [4	11						

Table A.3.2-4b Fixed Reference Channel for Maximum input level for UE Category 2 (TDD)

A.3.3 Reference measurement channels for PDSCH performance requirements (FDD)

A.3.3.1 Single-antenna transmission (Common Reference Symbols)

Parameter	Unit			Va	lue				
Reference channel		R.4	R.42		R.2				
		FDD	FDD		FDD				
Channel bandwidth	MHz	1.4	20		10				
Allocated resource blocks (Note 4)		6	100		50				
Allocated subframes per Radio Frame		9	9		9				
Modulation		QPSK	QPSK		QPSK				
Target Coding Rate		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		4392				
For Sub-Frame 5	Bits	N/A	N/A		N/A				
For Sub-Frame 0	Bits	152	8760		4392				
Number of Code Blocks									
(Notes 3 and 4)									
For Sub-Frames 1,2,3,4,6,7,8,9		1	2		1				
For Sub-Frame 5		N/A	N/A		N/A				
For Sub-Frame 0		1	2		1				
Binary Channel Bits (Note 4)									
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368	27600		13800				
For Sub-Frame 5	Bits	N/A	N/A		N/A				
For Sub-Frame 0	Bits	528	26760		12960				
Max. Throughput averaged over 1 frame	Mbps	0.342	7.884		3.953				
(Note 4)									
UE Category		≥ 1	≥ 1		≥1				
Note 1: 2 symbols allocated to PDCCH for						nbols allo	cated		
to PDCCH for 5 MHz and 3 MHz;									
Note 2: Reference signal, synchronization									
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									
Note 4: Given per component carrier per c	odeword.								

Table A.3.3.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Unit			V	alue		
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 to PDCCH for 5 MHz and 3 MHz;	4 symbols all	ocated to	PDCC	CH for 1.4 N	/Hz.		ocated
Note 2: Reference signal, synchronization Note 3: If more than one Code Block is preach Code Block (otherwise L = 0)	resent, an add						ed to

Table A.3.3.1-2: Fixed Reference Ch	nannel 16QAM R=1/2
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Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4

MHz	1.4	R.5 FDD	R.6	R.7	R.8	R.9 FDD
MHz	1.4	FDD			1.10	1.3100
MHz	1/		FDD	FDD	FDD	
	1.7	3	5	10	15	20
		15	25	50	75	100
		9	9	9	9	9
	64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
	3/4	3/4	3/4	3/4	3/4	3/4
Bits		8504	14112	30576	46888	61664
Bits		N/A	N/A	N/A	N/A	N/A
Bits		6456	12576	28336	45352	61664
		2	3	5	8	11
		N/A	N/A	N/A	N/A	N/A
		2	3	5	8	11
Bits		11340	18900	41400	62100	82800
Bits		N/A	N/A	N/A	N/A	N/A
Bits		8820	16380	38880	59580	80280
Mbps		7.449	12.547	27.294	42.046	55.498
		≥ 1	≥2	≥ 2	≥ 2	≥ 3
20 MHz, 1	5 MHz and	10 MHz ch	annel BW;	3 symbols	allocated t	o PDCCH
esent, an ac	ditional CR	C sequence	e of L = 24	Bits is atta	ached to ea	ich Code
	Bits Bits Bits Bits Bits Bits Bits Bits	64QAM 3/4 Bits Bits Bits Bits Bits Sits Bits Comparison Sits Bits Mbps Comparison Signals and PBCH alloc	15964QAM $3/4$ $3/4$ $3/4$ BitsBitsN/ABits64562221Bits11340BitsBits11340BitsBits11340Bits11340Bits11340Bits120Mbps7.449212020MHz, 15MHz and 10MHz challocated to PDCCH for 1.4MHz.signals and PBCH allocated as p	15 25 9 9 64QAM 64QAM 3/4 3/4 3/4 3/4 Bits 8504 Bits N/A N/A N/A Bits 6456 12576 2 3 2 3 1 2 2 3 1 11340 18900 181s 11340 18900 Bits 11340 181s 16380 Mbps 7.449 12.547 2 1 20 1 20 12.547 21 2 20 MHz, 15 MHz and 10 MHz channel BW; allocated to PDCCH for 1.4 MHz. signals and PBCH allocated as per TS 36.2	15 25 50 9 9 9 9 64QAM 64QAM 64QAM 64QAM 3/4 3/4 3/4 3/4 Bits 8504 14112 30576 Bits N/A N/A N/A Bits 6456 12576 28336 2 3 5 5 1 2 3 5 2 3 5 5 1 1340 18900 41400 Bits 11340 18900 41400 Bits 11340 18900 41400 Bits 11340 18900 41400 Bits 12547 27.294 2 1 2 2 20 Mbps 7.449 12.547 27.294 21 2 2 2 20 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 1.4 MHz. signals and PBCH allocated as per TS 36.211 [4]. 4].	15 25 50 75 9 9 9 9 9 9 64QAM 64QAM 64QAM 64QAM 64QAM 64QAM 3/4 3/4 3/4 3/4 3/4 3/4 3/4 Bits 8504 14112 30576 46888 88 Bits N/A N/A N/A N/A N/A Bits 6456 12576 28336 45352 2 3 5 8 8 M/A N/A N/A N/A N/A 2 3 5 8 8 9 9 9 9 9 9 2 3 5 8 8 8 11340 18900 41400 62100 62100 Bits 11340 18900 41400 62100 Bits 8820 16380 38880 59580 Mbps 7.449 12.547 27.294 42.046 21 22 22

Block (otherwise L = 0 Bit).

Parameter	Unit			Va	lue			
Reference channel			R.6-1	R.7-1	R.8-1	R.9-1	R.9-2	
			FDD	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			64QAM	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		10296	10296	10296	10296	51024	
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 4)								
For Sub-Frames 1,2,3,4,6,7,8,9			2	2	2	2	9	
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 1,2,3,4,6,7,8,9	Bits		13608	14076	14076	14076	68724	
For Sub-Frame 5	Bits		N/A	N/A	N/A	N/A	N/A	
For Sub-Frame 0	Bits		11088	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, synchronizatio	n signals and	PBCH al			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								

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).

Parameter	Unit	Value							
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				
 ote 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. ote 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]. ote 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). 									

	Parameter	Unit	Value
Referenc	e channel		R.29 FDD
			(MBSFN)
Channel	bandwidth	MHz	10
Allocated	resource blocks		1
MBSFN (Configuration		TBD
Allocated	subframes per Radio Frame		3
Modulatio	n		16QAM
Target Co	oding Rate		1/2
	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	of Code Blocks per Sub-Frame		
(Note 3)			
	-Frames 4,9		1
For Sub	-Frame 5		N/A
For Sub	-Frame 0		1
For Sub	-Frame 1,2,3,6,7,8		0 (MBSFN)
Binary Ch	nannel Bits Per Sub-Frame		
For Sub	-Frames 4,9	Bits	552
For Sub	-Frame 5	Bits	N/A
For Sub	-Frame 0	Bits	552
For Sub	-Frame 1,2,3,6,7,8	Bits	0 (MBSFN)
Max. Thre	oughput averaged over 1 frame	kbps	76.8
UE Categ			≥ 1
Note 1:	2 symbols allocated to PDCCH.		
Note 2:	Reference signal, synchronizatio	on signals a	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
	Block (otherwise $L = 0$ Bit).		

Table A.3.3.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

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 2: Reference signal, synchronization signals and PBCH anotated as per 15 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: PCell Fixed Reference Channel for CA demodulation with power imbalance

Parameter	Unit	Value					
Reference channel			R.49 FDD				
Channel bandwidth		MHz	20				
Allocated resource blocks			100				
Allocated subframes per Radio Fra	ame		9				
Modulation			64QAM				
Coding Rate							
For Sub-Frame 1,2,3,4,6,7,8,9,			0.84				
For Sub-Frame 5			N/A				
For Sub-Frame 0			0.87				
Information Bit Payload							
For Sub-Frames 0,1,2,3,4,6,7,8,9	9	Bits	63776				
For Sub-Frame 5		Bits	N/A				
Number of Code Blocks per Sub-F (Note 3)	rame						
For Sub-Frames 0,1,2,3,4,6,7,8,9	9	Code Blocks	11				
For Sub-Frame 5		Code Blocks	N/A				
Binary Channel Bits Per Sub-Fram	ne						
For Sub-Frames 1,2,3,4,6,7,8,9		Bits	75600				
For Sub-Frame 5		Bits	N/A				
For Sub-Frame 0		Bits	73080				
Max. Throughput averaged over 1	frame	Mbps	57.398				
UE Category			≥5				
 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 							
	24 Bits is a						

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
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Parameter	Unit						Val	ue					
Reference		R.10	R.11	R.11-1	R.11-	R.11-	R.11-	R.30	R.30-	R.35-	R.35	R.35-	R.35-3
channel		FDD	FDD	FDD	2	3	4	FDD	1	1	FDD	2	FDD
					FDD	FDD Note 5	FDD		FDD	FDD		FDD	
Channel bandwidth	MHz	10	10	10	5	10	10	20	15	20	10	15	10
Allocated		50	50	50	25	40	50	100	75	100	50	75	50
resource blocks (Note 4)													
Allocated subframes per Radio Frame		9	9	9	9	9	9	9	8	8	9	8	8
Modulation		QPSK	16QAM	16QAM	16QA M	16QA M	QPS K	16QA M	16QA M	64QA M	64QAM	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	1029 6	6968	2545 6	1908 0	3057 6	19848	2292 0	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	1029 6	6968	2545 6	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 0	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	1200 0	2112 0	1320 0	5280 0	3960 0	7920 0	39600	5940 0	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	1036 8	1948 8	1238 4	5116 8	N/A	N/A	37152	N/A	N/A
Max. Throughput averaged over 1 frame (Note	Mbps	3.953	11.664	10.368	5.086	9.266	6.271	22.91 0	15.26 4	24.46 1	17.712	18.33 6	12.211
4)													
UE Category	l Jols alloc	≥1 ated to P	≥ 2 DCCH for	≥2 20 MHz 1	≥1 5 MHzan	≥ 1 d 10 MH	≥1 z channe	≥ 2 ≥ BW: 3 •	≥2 symbols a	4 allocated	≥ 2 to PDCCH	≥ 2	≥ 2 Iz and 3
MHz; 4 Note 2: Refere Note 3: If more													
Note 4: Given per component carrier per codeword.													

Note 5: For R.11-3 resource blocks of RB6–RB45 are allocated.

Parameter	Unit	nit Value								
Reference channel		R.46	R.47	R.35-4						
		FDD	FDD	FDD						
Channel bandwidth	MHz	10	10	10						
Allocated resource blocks (Note 4)		50	50	50						
Allocated subframes per Radio Frame		9	9	9						
Modulation		QPSK	16QAM	64QAM						
Target Coding Rate				0.47						
Information Bit Payload (Note 4)										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	5160	8760	18336						
For Sub-Frame 5	Bits	N/A	N/A	N/A						
For Sub-Frame 0	Bits	5160	8760	16416						
Number of Code Blocks										
(Notes 3 and 4)										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1	2	3						
For Sub-Frame 5	Bits	N/A	N/A	N/A						
For Sub-Frame 0	Bits	1	2	3						
Binary Channel Bits (Note 4)										
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	13200	26400	39600						
For Sub-Frame 5	Bits	N/A	N/A	N/A						
For Sub-Frame 0	Bits	12384	24768	37152						
Max. Throughput averaged over 1	Mbps	4.644	7.884	16.310						
frame (Note 4)										
UE Category		≥ 1	≥ 1	≥2						
Note 1: 2 symbols allocated to PDCCI	H for 20 M	Hz, 15 M⊢	Iz and 10 N	IHz channe	I BW; 3	symbols	allocated	to PDCCH	l for 5 MHz	
and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz										
Note 2: Reference signal, synchroniza										
	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 p	per codewo	ord.								

Table A.3.3.2.1-2: Fixed Reference Channel two antenna ports
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A.3.3.2.2 Four antenna ports

Parameter	Unit				Value			
Reference channel		R.12	R.13	R.14	R.14-1	R.14-2	R.14-3	R.36
		FDD	FDD	FDD	FDD	FDD	FDD	FDD
Channel bandwidth	MHz	1.4	10	10	10	10	20	10
Allocated resource blocks (Note 4)		6	50	50	6	3	100	50
Allocated subframes per Radio Frame		9	9	9	8	8	9	9
Modulation		QPSK	QPSK	16QAM	16QAM	16QAM	16QAM	64QAM
Target Coding Rate		1/3	1/3	1/2	1/2	1/2	1/2	1/2
Information Bit Payload (Note 4)								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	4392	12960	1544	744	[25456]	18336
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	n/a	N/A
For Sub-Frame 0	Bits	152	3624	11448	N/A	N/A	[22920]	18336
Number of Code Blocks								
(Notes 3 and 4)								
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	3	1	1	5	3
For Sub-Frame 5		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
Binary Channel Bits (Note 4)								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1248	12800	25600	3072	1536	51200	38400
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	n/a	N/A
For Sub-Frame 0	Bits	480	12032	24064	N/A	N/A	49664	36096
Max. Throughput averaged over 1	Mbps	0.342	3.876	11.513	1.235	0.595	[22.656]	16.502
frame (Note 4)								
UE Category		≥ 1	≥ 1	≥ 2	≥1	≥ 1	≥2	≥2
Note 1: 2 symbols allocated to PDCC	H for 20 I	MHz, 15 M	Hz and 10 I	MHz chann	el BW; 3 sy	mbols allo	cated to PD	CCH for
5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.								
Note 2: Reference signal, synchroniz								
Note 3: If more than one Code Block	is presen	t, an additi	onal CRC s	equence of	L = 24 Bits	s is attache	d to each C	ode
Block (otherwise $L = 0$ Bit).								
Note 4: Given per component carrier per codeword.								

Table A.3.3.2.2-1: Fixed Reference Channel four antenna ports

Note 4: Given per component carrier per codeword.

A.3.3.3 Reference Measurement Channel for UE-Specific Reference Symbols

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.

	Parameter	Unit	Value						
Referenc	e channel	Unit	R.51 FDD						
	bandwidth	MHz	10						
	resource blocks		50 (Note 3)						
	subframes per Radio Frame		9						
Modulatio	•		16QAM						
	oding Rate		1/2						
	on Bit Payload								
	-Frames 1,4,6,9	Bits	11448						
	-Frames 2,3,7,8	Bits	11448						
	-Frame 5	Bits	N/A						
	-Frame 0	Bits	9528						
	of Code Blocks (Note 4)	2.10							
	-Frames 1,4,6,9	Code	2						
		blocks							
For Sub	-Frames 2,3,7,8	Code	2						
		blocks							
For Sub	-Frame 5	Bits	N/A						
For Sub	-Frame 0	Bits	2						
Binary Cl	nannel 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						
	-Frame 0	Bits	19680						
Max. Thr	oughput averaged over 1	Mbps	10.1112						
frame									
UE Categ			≥2						
Note 1:	2 symbols allocated to PDCCH								
Note 2:	Reference signal, synchroniza		s and PBCH						
Nets 0	allocated as per TS 36.211 [4]								
Note 3:	50 resource blocks are allocat								
	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								
11010 4.	CRC sequence of $L = 24$ Bits i								
	Block (otherwise $L = 0$ Bit).								
DIOCK (OTHERWISE L = 0 DII).									

Table A.3.3.3.1-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

The reference measurement channels in Table A.3.3.3.1-2 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.

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 16Q					
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 PDCCI							
Note 2: Reference signal, synchroniza							
Note 3: 50 resource blocks are allocat			7, 8, 9 and 41 resource	ce blocks (RB0–			
RB20 and RB30–RB49) are a			.				
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.3.3.3.1-2: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports with ZP CSI-RS and NZP CSI-RS

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.

Parameter	Unit		Value				
Reference channel		R.43 FDD	R.50 FDD	R.48 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		QPSK	64QAM	QPSK			
Target Coding Rate		1/3	1/2				
Information Bit Payload							
For Sub-Frames 1,4,6,9	Bits	3624	18336	6200			
For Sub-Frames 2,3,7,8	Bits	3624	16416	6200			
For Sub-Frame 5	Bits	N/A	N/A	N/A			
For Sub-Frame 0	Bits	2984	14688	4968			
Number of Code Blocks (Note 4)							
For Sub-Frames 1,4,6,9	Code	1	3	2			
	blocks						
For Sub-Frames 2,3,7,8	Code	1	3	2			
	blocks						
For Sub-Frame 5	Bits	N/A	N/A	N/A			
For Sub-Frame 0	Bits	1	3	1			
Binary Channel Bits							
For Sub-Frames 1,4,6,9	Bits	12000	36000	12000			
For Sub-Frames 2,7		11600	34800	11600			
For Sub-Frames 3,8		11600	34800	12000			
For Sub-Frame 5	Bits	N/A	N/A	N/A			
For Sub-Frame 0	Bits	9840	29520	9840			
Max. Throughput averaged over 1	Mbps	3.1976	15.3696	5.4568			
frame							
UE Category		≥ 1	≥2	≥ 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: For R.31-1 and R.34-1, 50 res							
6, 7, 8, 9 and 41 resource bloc	ks (RB0–I	RB20 and RB3	80–RB49) are a	allocated in			
sub-frame 0.				() 04			
Note 4: If more than one Code Block is present, an additional CRC sequence of $L = 24$							
Bits is attached to each Code	BIOCK (Oth	erwise L = 0 B	it).				

Table A.3.3.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

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.

Parameter	Unit		Value	
Reference channel		R.44	R.45	R.45-1
		FDD	FDD	FDD
Channel bandwidth	MHz	10	10	10
Allocated resource blocks		50 ³	50^{3}	39
Allocated subframes per Radio Frame		10	10	10
Modulation		QPSK	16QAM	16QAM
Target Coding Rate		1/3	1/2	1/2
Information Bit Payload				
For Sub-Frames (Non CSI-RS subframe)	Bits	3624	11448	8760
For Sub-Frames (CSI-RS subframe)	Bits	3624	11448	8760
For Sub-Frames (ZeroPowerCSI-RS	Bits	N/A	N/A	N/A
subframe)				
For Sub-Frame 5	Bits	N/A	N/A	N/A
For Sub-Frame 0	Bits	2984	9528	8760
Number of Code Blocks per Sub-Frame				
(Note 4)				
For Sub-Frames (Non CSI-RS subframe)		1	2	2
For Sub-Frames (CSI-RS subframe)		1	2	2
For Sub-Frames (ZeroPowerCSI-RS	Bits	N/A	N/A	N/A
subframe)				
For Sub-Frame 5		N/A	N/A	N/A
For Sub-Frame 0		1	2	2
Binary Channel Bits Per Sub-Frame				
For Sub-Frames (Non CSI-RS subframe)	Bits	12000	24000	18720
For Sub-Frames (CSI-RS subframe)	Bits	11600	23200	18096
For Sub-Frames (ZeroPowerCSI-RS	Bits	N/A	N/A	N/A
subframe)				
For Sub-Frame 5	Bits	N/A	N/A	N/A
For Sub-Frame 0	Bits	9840	19680	18720
Max. Throughput averaged over 1 frame	Mbps	3.1976	10.1112	7.884
UE Category		≥ 1	≥ 2	≥ 1
Note 1: 2 symbols allocated to PDCCH for	20 MHz, 15 MH	Iz and 10 MHz	channel BW	/; 3
symbols allocated to PDCCH for 5	MHz and 3 MH	lz; 4 symbols a	llocated to P	DCCH
for 1.4 MHz		-		
Note 2: Reference signal, synchronization				
Note 3: For R. 44 and R.45, 50 resource b				
and 41 resource blocks (RB0–RB2				
Note 4: If more than one Code Block is pre			ence of $L = 2$	24 Bits is
attached to each Code Block (othe	erwise L = 0 Bit)			

Table A.3.3.3.2-2: Fixed Reference Channel for four antenna ports (CSI-RS)

A.3.4 Reference measurement channels for PDSCH performance requirements (TDD)

A.3.4.1 Single-antenna transmission (Common Reference Symbols)

ParameterUnitValueReference channelR.4R.42TDDTDDTDDTDDChannel bandwidthMHz1.420Allocated resource blocks (Note 6)6100Uplink-Downlink Configuration (Note 4)11Allocated subframes per Radio Frame (D+S)33+2ModulationQPSKQPSKTarget Coding Rate1/31/3Information Bit Payload (Note 6)For Sub-Frames 4,9Bits4088760For Sub-Frames 1,6BitsN/A7736For Sub-Frame 5BitsN/AN/AFor Sub-Frame 6)Number of Code Blocks(Notes 5 and 6)For Sub-Frames 1,6N/A2For Sub-Frames 4,912For Sub-Frames 5N/AN/AFor Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frame 5N/AN/AFor Sub-Frame 5N/AN/AFor Sub-Frame 5N/AN/AFor Sub-Frame 5N/A2For Sub-Frame 5N/A2For Sub-Frame 5N/A2For Sub-Frame 5N/A2For Sub-Frame 5N/A2For Sub-Frame 5N/A2For Sub-Frame 6For Sub-Frames 4,912Binary Channel Bits (Note 6)- </th <th>R.2 TDD 10</th>	R.2 TDD 10					
TDDTDDChannel bandwidthMHz1.420Allocated resource blocks (Note 6)6100Uplink-Downlink Configuration (Note 4)11Allocated subframes per Radio Frame (D+S)33+2ModulationQPSKQPSKTarget Coding Rate1/31/3Information Bit Payload (Note 6)For Sub-Frames 4,9Bits4088760For Sub-Frames 1,6BitsN/A7736For Sub-Frame 5BitsN/AN/AFor Sub-Frame 6)Number of Code Blocks(Notes 5 and 6)For Sub-Frames 1,6N/A2For Sub-Frames 1,6For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frame 5N/AN/AFor Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frame 5N/AN/AFor Sub-Frame 012Binary Channel Bits (Note 6)For Sub-Frames 4,9Bits1368For Sub-Frames 4,912	TDD					
Allocated resource blocks (Note 6)6100Uplink-Downlink Configuration (Note 4)11Allocated subframes per Radio Frame (D+S)33+2ModulationQPSKQPSKTarget Coding Rate1/31/3Information Bit Payload (Note 6)11For Sub-Frames 4,9Bits4088760For Sub-Frames 1,6BitsN/A7736For Sub-Frame 5BitsN/AN/AFor Sub-Frame 6)Bits2088760Number of Code Blocks121For Sub-Frames 1,6N/A21For Sub-Frames 1,6N/A21For Sub-Frames 4,9121For Sub-Frame 5N/AN/A1For Sub-Frame 0121Binary Channel Bits (Note 6)12For Sub-Frames 4,9Bits136827600						
Allocated resource blocks (Note 6)6100Uplink-Downlink Configuration (Note 4)11Allocated subframes per Radio Frame (D+S)33+2ModulationQPSKQPSKTarget Coding Rate1/31/3Information Bit Payload (Note 6)11For Sub-Frames 4,9Bits4088760For Sub-Frames 1,6BitsN/A7736For Sub-Frame 5BitsN/AN/AFor Sub-Frame 6)Bits2088760Number of Code Blocks121For Sub-Frames 1,6N/A21For Sub-Frames 1,6N/A21For Sub-Frames 4,9121For Sub-Frame 5N/AN/A1For Sub-Frame 0121Binary Channel Bits (Note 6)12For Sub-Frames 4,9Bits136827600						
Uplink-Downlink Configuration (Note 4)11Allocated subframes per Radio Frame (D+S)33+2ModulationQPSKQPSKTarget Coding Rate1/31/3Information Bit Payload (Note 6)For Sub-Frames 4,9Bits4088760For Sub-Frames 1,6BitsN/A7736For Sub-Frame 5BitsN/AN/AFor Sub-Frame 6Bits2088760Number of Code Blocks(Notes 5 and 6)12For Sub-Frame 5N/AN/AFor Sub-Frames 1,6N/A2For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frames 4,912For Sub-Frame 5N/AN/AFor Sub-Frame 612Binary Channel Bits (Note 6)12For Sub-Frames 4,9Bits1368For Sub-Frames 4,9Bits1368	50					
Allocated subframes per Radio Frame (D+S)33+2ModulationQPSKQPSKTarget Coding Rate1/31/3Information Bit Payload (Note 6)For Sub-Frames 4,9Bits4088760For Sub-Frames 1,6BitsN/A7736For Sub-Frame 5BitsN/AN/AFor Sub-Frame 0Bits2088760Number of Code Blocks(Notes 5 and 6)12For Sub-Frame 5N/AN/AFor Sub-Frames 1,6N/A2For Sub-Frames 1,6N/A2For Sub-Frames 4,912For Sub-Frame 5N/AN/AFor Sub-Frames 4,912For Sub-Frame 5N/AN/AFor Sub-Frame 5N/AN/AFor Sub-Frame 512Binary Channel Bits (Note 6)12For Sub-Frames 4,9Bits1368For Sub-Frames 4,9Bits	1					
ModulationQPSKQPSKTarget Coding Rate1/31/3Information Bit Payload (Note 6)1/31/3For Sub-Frames 4,9Bits4088760For Sub-Frames 1,6BitsN/A7736For Sub-Frame 5BitsN/AN/AFor Sub-Frame 0Bits2088760Number of Code BlocksImage: Code BlocksImage: Code BlocksImage: Code Blocks(Notes 5 and 6)Image: Code BlocksImage: Code BlocksImage: Code BlocksFor Sub-Frames 1,6N/A2Image: Code BlocksFor Sub-Frames 1,6N/A12For Sub-Frame 5N/AN/AImage: Code BlocksFor Sub-Frames 1,6Image: Code BlocksImage: Code BlocksFor Sub-Frame 0Image: Code BlocksImage: Code BlocksFor Sub-Frames 4,9Image: Code BlocksImage: Code BlocksFor S	3+2					
Target Coding Rate 1/3 1/3 Information Bit Payload (Note 6)	QPSK					
Information Bit Payload (Note 6)Image: Constraint of the systemFor Sub-Frames 4,9Bits4088760For Sub-Frames 1,6BitsN/A7736For Sub-Frame 5BitsN/AN/AFor Sub-Frame 0Bits2088760Number of Code BlocksImage: Constraint of the systemImage: Constraint of the systemImage: Constraint of the system(Notes 5 and 6)Image: Constraint of the systemImage: Constraint of the systemImage: Constraint of the systemFor Sub-Frames 4,9Image: Constraint of the systemImage: Constraint of the systemImage: Constraint of the systemFor Sub-Frames 1,6N/A2Image: Constraint of the systemImage: Constraint of the systemFor Sub-Frame 5N/AN/A2For Sub-Frame 0Image: Constraint of the systemImage: Constraint of the systemBinary Channel Bits (Note 6)Image: Constraint of the systemImage: Constraint of the systemFor Sub-Frames 4,9Bits136827600	1/3					
For Sub-Frames 4,9 Bits 408 8760 For Sub-Frames 1,6 Bits N/A 7736 For Sub-Frame 5 Bits N/A N/A For Sub-Frame 0 Bits 208 8760 Number of Code Blocks Image: Code Blocks Image: Code Blocks Image: Code Blocks (Notes 5 and 6) Image: Code Blocks Image: Code Blocks<						
For Sub-Frame 5BitsN/AN/AFor Sub-Frame 0Bits2088760Number of Code Blocks (Notes 5 and 6)12For Sub-Frames 4,912For Sub-Frames 1,6N/A2For Sub-Frame 5N/AN/AFor Sub-Frame 012Binary Channel Bits (Note 6)12For Sub-Frames 4,9Bits136827600	4392					
For Sub-Frame 0 Bits 208 8760 Number of Code Blocks	3240					
For Sub-Frame 0Bits2088760Number of Code Blocks (Notes 5 and 6)12For Sub-Frames 4,912For Sub-Frames 1,6N/A2For Sub-Frame 5N/AN/AFor Sub-Frame 012Binary Channel Bits (Note 6)12For Sub-Frames 4,9Bits1368	N/A					
(Notes 5 and 6) 1 2 For Sub-Frames 4,9 1 2 For Sub-Frames 1,6 N/A 2 For Sub-Frame 5 N/A N/A For Sub-Frame 0 1 2 Binary Channel Bits (Note 6)	4392					
For Sub-Frames 4,9 1 2 For Sub-Frames 1,6 N/A 2 For Sub-Frame 5 N/A N/A For Sub-Frame 0 1 2 Binary Channel Bits (Note 6)						
For Sub-Frames 1,6 N/A 2 For Sub-Frame 5 N/A N/A For Sub-Frame 0 1 2 Binary Channel Bits (Note 6)						
For Sub-Frame 5 N/A N/A For Sub-Frame 0 1 2 Binary Channel Bits (Note 6)	1					
For Sub-Frame 0 1 2 Binary Channel Bits (Note 6) For Sub-Frames 4,9 Bits 1368 27600	1					
Binary Channel Bits (Note 6)EndFor Sub-Frames 4,9Bits136827600	N/A					
For Sub-Frames 4,9 Bits 1368 27600	1					
For Sub-Frames 1.6 Bits N/A 22656	13800					
	11256					
For Sub-Frame 5 Bits N/A N/A	N/A					
For Sub-Frame 0 Bits 672 26904	13104					
Max. Throughput averaged over 1 frameMbps0.1024.175(Note 6)	1.966					
UE Category ≥1 ≥1	≥1					
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel						
symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated						
PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are alloc						
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 perform	ance at					
	the test point.					
	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 Bits is attached to each Code Block (otherwise L = 0 Bit).	L = 24					
Note 6: Given per component carrier per codeword.						

Table A.3.4.1-1: Fixed Reference Channel QPSK R=1/3

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 2							
PDCCH for 5 MHz and 3 MHz; 4 sy		ocated to F	PDCCH fo	r 1.4 MHz. F	or subfram	ne 1&6, on	ly 2
OFDM symbols are allocated to PD							
Note 2: Reference signal, synchronization s		d PBCH a	llocated as	s 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 pres Code Block (otherwise L = 0 Bit).	ent, an ac	dditional C	RC seque	ence of $L = 2$	24 Bits is at	tached to	each
Code block (otherwise $L = 0$ BIt).							

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 all	ocated to I	PDCCH for	1.4 MHz. F	or subfram	e 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 pres Block (otherwise L = 0 Bit).	ent, an ad	ditional CR	C sequenc	e of L = 24	Bits is attac	ched to eac	ch Code

Table A.3.4.1-3: Fixed R	Reference Channel	64QAM R=3/4
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Parameter	Unit		Value				
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 2	20 MHz, 15	MHz and '	10 MHz cha	annel BW; 3	3 symbols a	allocated to	PDCCH
for 5 MHz and 3 MHz; 4 symbols all	ocated to F	DCCH for	1.4 MHz. F	For subfram	e 1&6, only	/ 2 OFDM \$	symbols
are allocated to PDCCH.							
Note 2: Reference signal, synchronization s	ignals and	PBCH allo	cated as pe	er TS 36.21	1 [4]		

Table A.3.4.1-3a: Fixed Reference Channel 64QAM R=3/4

Note 3: Note 4:

Localized allocation started from RB #0 is applied. As per Table 4.2-2 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 5:

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 2	0 MHz, 15	MHz and	10 MHz cha	annel BW;	3 symbols a	llocated	to
PDCCH for 5 MHz and 3 MHz; 4 syr		ated to PI	DCCH for 1.4	4 MHz. Fo	or subframe 1	l&6, only	2
OFDM symbols are allocated to PD							
Note 2: Reference signal, synchronization s	ignals and	PBCH allo	ocated as pe	er TS 36.2	11 [4]		
Note 3: As per Table 4.2-2 in TS 36.211 [4].							
Note 4: If more than one Code Block is pres	ent, an ado	ditional CF	RC sequence	e of L = 24	Bits is attac	hed to e	ach
Code Block (otherwise $L = 0$ Bit).							

Table A.3.4.1-4: Fixed Reference Channel Single PRB

	Parameter	Unit	Value
Referenc	e channel		R.29 TDD
			(MBSFN)
Channel	bandwidth	MHz	10
Allocated	resource blocks		1
MBSFN (Configuration		[TBD]
Uplink-Do	ownlink Configuration (Note 3)		1
	subframes per Radio Frame (D+S)		1+2
Modulatio	วท		16QAM
Target Co	oding Rate		1/2
Information	on 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	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 Cl	nannel 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. Thr	oughput averaged over 1 frame	kbps	67.2
UE Categ			≥ 1
Note 1:	2 symbols allocated to PDCCH.		
Note 2:		ignals 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 pres		
	sequence of $L = 24$ Bits is attached	to each Co	de Block (otherwise
L	L = 0 Bit).		

Table A.3.4.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

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		
Note 1: 2 symbols allocated to PDCCH for							
to PDCCH for 5 MHz and 3 MHz; 4			PDCCH	for 1.4 M	Hz. For su	ubframe	1&6,
only 2 OFDM symbols are allocated							
Note 2: For BW=1.4 MHz, the information b					et to zero (no scheo	duling)
to avoid problems with insufficient F							
Note 3: Reference signal, synchronization s		PBCH allo	cated as	per TS 3	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 pre-		itional CR	C seque	nce of L	= 24 Bits i	s attache	ed to
each Code Block (otherwise L = 0 E	Bit).						

Table A.3.4.1-6: Fixed Reference Channel QPSK R=1/10

Parameter	Unit	Value						
Reference channel		R.49 TDD						
Channel bandwidth	MHz	20						
Allocated resource blocks		100						
Uplink-Downlink Configuration (Note 1)		1						
Allocated subframes per Radio Frame		3+2						
(D+S)		•··=						
Modulation		64QAM						
Number of OFDM symbols for PDCCH								
per component carrier								
For Sub-Frames 0,4,5,9	OFDM	3						
, ,-,-	symbols	-						
For Sub-Frames 1,6	OFDM	2						
,	symbols							
Target Coding Rate								
For Sub-Frames 4,9		0.84						
For Sub-Frames 1,6		0.81						
For Sub-Frames 5		N/A						
For Sub-Frames 0		0.87						
Information Bit Payload								
For Sub-Frames 0, 4, 9	Bits	63776						
For Sub-Frame 1,6	Bits	55056						
For Sub-Frame 5	Bits	N/A						
Number of Code Blocks per Sub-Frame								
(Note 2)								
For Sub-Frames 0, 4, 9	Code	11						
	Blocks							
For Sub-Frame 1,6	Code	9						
	Blocks							
For Sub-Frame 5	Code	N/A						
	Blocks							
Binary Channel Bits Per Sub-Frame								
For Sub-Frames 4,9	Bits	75600						
For Sub-Frame 1,6	Bits	67968						
For Sub-Frame 5	Bits	N/A						
For Sub-Frame 0	Bits	73512						
Max. Throughput averaged over 1 frame	Mbps	30.144						
UE Category		≥5						
Note 1: Reference signal, synchronizatio	n signals an	d PBC						
	allocated as per TS 36.211 [4].							
Note 2: If more than one Code Block is p	resent, an a	dditional						
CRC sequence of $L = 24$ Bits is a	attached to e	each Code						
Block (otherwise $L = 0$ Bit).								

Table A.3.4.1-7: PCell Fixed Reference Channel for CA demodulation with power imbalance

A.3.4.2 Multi-antenna transmission (Common Reference Signals)

A.3.4.2.1 Two antenna ports

Parameter	Unit						Value				
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	

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; 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.

Parameter	Unit	Value							
Reference channel		R.46 TDD	R.47 TDD	R.35-2					
				TDD					
Channel bandwidth	MHz	10	10	10					
Allocated resource		50	50	50					
blocks (Note 5)									
Uplink-Downlink		1	1	1					
Configuration (Note									
3)									
Allocated subframes		3+2	3+2	2+2					
per Radio Frame									
(D+S)									
Modulation		QPSK	16QAM	64QAM					
Target Coding Rate				0.47					
Information Bit									
Payload (Note 5)									
For Sub-Frames 4,9	Bits	5160	8760	18336					
For Sub-Frames 1,6	51	3880	7480	14688					
For Sub-Frame 5	Bits	N/A	N/A	N/A					
For Sub-Frame 0	Bits	5160	8760	N/A					
Number of Code									
Blocks									
(Notes 4 and 5)		4	0						
For Sub-Frames 4,9		1	2	3					
For Sub-Frames 1,6		1	2	3					
For Sub-Frame 5		N/A	N/A	N/A					
For Sub-Frame 0		1	2	N/A					
Binary Channel Bits									
(Note 5) For Sub-Frames 4,9	Bits	13200	26400	39600					
For Sub-Frames 1,6	DIIS	10656	20400	39600					
For Sub-Frame 5	Bits	N/A	N/A	N/A					
For Sub-Frame 0	Bits	12528	25056	N/A					
Max. Throughput	Mbps	2.324	4.124	6.604					
averaged over 1	iviops	2.324	4.124	0.004					
frame (Note 5)									
UE Category		≥ 1	≥ 1	≥2					
Note 1: 2 symbols a	llocated to	PDCCH for 2			l Iz channel	BW/· 3 symb	ols allocated		
		nd 3 MHz; 4 s							
		are allocated							
		hronization sig		CH allocated	as per TS	36,211 [4].			
		S 36.211 [4].				· · · · · · · · · · · · · · · · · · ·			
		Block is prese	ent, an additio	nal CRC sec	uence of L	= 24 Bits is	attached to		
		rwise L = 0 Bi							

Table A.3.4.2.1-2: Fixed Reference Channel two antenna ports

Note 5: Given per component carrier per codeword

A.3.4.2.2 Four antenna ports

Parameter	Unit	Value								
Reference channel		R.12	R.13	R.14	R.14-1	R.14-2	R.43	R.36		
		TDD	TDD	TDD	TDD	TDD	TDD	TDD		
Channel bandwidth	MHz	1.4	10	10	10	10	20	10		
Allocated resource blocks (Note 6)		6	50	50	6	3	100	50		
Uplink-Downlink Configuration (Note		1	1	1	1	1	1	1		
4)										
Allocated subframes per Radio		3	3+2	2+2	2	2	2+2	2+2		
Frame (D+S)										
Modulation		QPSK	QPSK	16QAM	16QAM	16QAM	16QAM	64QAM		
Target Coding Rate		1/3	1/3	1/2	1/2	1/2	1/2	1/2		
Information Bit Payload (Note 6)										
For Sub-Frames 4,9	Bits	408	4392	12960	1544	744	25456	18336		
For Sub-Frames 1,6	Bits	N/A	3240	9528	N/A	N/A	21384	15840		
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	4392	N/A	N/A	N/A	N/A	N/A		
Number of Code Blocks										
(Notes 5 and 6)										
For Sub-Frames 4,9		1	1	3	1	1	5	3		
For Sub-Frames 1,6		N/A	1	2	N/A	N/A	4	3		
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0		1	1	N/A	N/A	N/A	N/A	N/A		
Binary Channel Bits (Note 6)										
For Sub-Frames 4,9	Bits	1248	12800	25600	3072	1536	51200	38400		
For Sub-Frames 1,6		N/A	10256	20512	N/A	N/A	41312	30768		
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
For Sub-Frame 0	Bits	624	12176	N/A	N/A	N/A	N/A	N/A		
Max. Throughput averaged over 1	Mbps	0.102	1.966	4.498	0.309	0.149	9.368	6.835		
frame (Note 6)										
UE Category		≥1	≥ 1	≥2	≥1	≥1	≥2	≥2		
Note 1: 2 symbols allocated to PDC										
MHz and 3 MHz; 4 symbols	allocated	to PDCCH to	or 1.4 MHz. H	or subfram	ne 1&6, onl	y 2 OFDM s	symbols are	;		
allocated to PDCCH.							\			
Note 2: For BW=1.4 MHz, the inform					et to zero (i	no schedulir	ng) to avoid			
problems with insufficient P					00 044 [4]					
Note 3: Reference signal, synchron		hals and PB	-H allocated	as per TS	36.211 [4].					
Note 4: As per Table 4.2-2 in TS 36					04 Dite :		a a a a b C	la Diaak		
Note 5: If more than one Code Bloc (otherwise L = 0 Bit).	k is preser	ii, an additio	nai UKU seq	uence of L	= 24 BIIS I	s attached to				
Note 6: Given per component carrie										

Table A.3.4.2.2-1: Fixed Reference Channel four antenna ports

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.

Parameter	Unit	Value							
Reference channel		R.25 TDD	R.26 TDD	R.26-1 TDD	R.27 TDD	R.27-1 TDD	R.28 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 a	pplied.							

Table A.3.4.3.1-1: Fixed Referen	ice Channel for DRS
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Two antenna ports (Cell Specific) A.3.4.3.2

The reference measurement channels in Table A.3.4.3.2-1 apply for verifying demodulation performance for CDMmultiplexed UE specific reference symbols with two cell-specific antenna ports.

Reference channel		R.31	R.32	R.32-1	R.33	R.33-1	R.34	
		TDD	TDD	TDD	TDD	TDD	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)		0.501/						
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	D'/	40000	0.4000	40000	00000	10000		
For Sub-Frames 4,9	Bits	12000	24000	10800	36000	12960	36000	
For Sub-Frames 1,6	6.4	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						DCCH for 1	.4 MHZ.	
For subframe 1						TO 00 04	41	
Note 2: Reference sign Note 3: as per Table 4.			gnais and	PDUH allo	caleo as pe	9 15 30.21	I [4].	
Note 3: as per l'able 4. Note 4: For R.31, R.32			cource ble	oko oro oli	poptod in a	ub framas 4	0 and 41	
resource block								
DwPTS portion								
frames 4,9 and								
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).								
					sequence	e or L = 24 E	5115 15	

Table A.3.4.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS

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 CDMmultiplexed 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

	Parameter	Unit	Value
Referenc	e channel		R.51 TDD
	bandwidth	MHz	10
	I resource blocks		50 (Note 5)
	ownlink Configuration (Note 3)		1
Allocated	I subframes per Radio Frame		3+2
(D+S)			
Modulatio	on		16QAM
Target Co	oding Rate		1/2
Information	on Bit Payload		
For Sub	-Frames 4,9 (non CSI-RS	Bits	11448
subframe			
For Sub	-Frame 4,9	Bits	11448
	-Frames 1,6	Bits	7736
For Sub	-Frame 5	Bits	N/A
	-Frame 0	Bits	9528
Number of	of Code Blocks		
(Note 4)			
For Sub	-Frames 4, 9 (non CSI-RS	Code	2
subframe	e)	blocks	
For Sub	-Frames 4,9	Code	2
		blocks	
For Sub	-Frames 1,6	Code	2
		blocks	
	-Frame 5		N/A
For Sub	o-Frame 0	Code	2
		blocks	
Binary Cl	hannel Bits		
	-Frames 4, 9 (non CSI-RS	Bits	24000
subframe			
	-Frames 4,9		22800
	-Frames 1,6		15744
	-Frame 5	Bits	N/A
	-Frame 0	Bits	19680
	oughput averaged over 1	Mbps	4.7896
frame			
UE Cate	gory		≥ 2
Note 1:	2 symbols allocated to PDCCH		
Note 2:	Reference signal, synchroniza allocated as per TS 36.211 [4]	ition signal	s and PBCH
Note 3:	as per Table 4.2-2 in TS 36.21	1 [/]	
Note 3.	If more than one Code Block is	n 141. E present	an additional
11010 4.	CRC sequence of $L = 24$ Bits i	is attacher	to each Code
	Block (otherwise $L = 0$ Bit).		
Note 5:	50 resource blocks are allocat	ed in sub-f	frames 4.9 and
11010 0.	41 resource blocks (RB0–RB2		
	allocated in sub-frame 0 and th	he DwPTS	portion of
	sub-frames 1,6.	•	
L			

The reference measurement channels in Table A.3.4.3.3-2 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.

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 (D+S)		3+2	3+2	3+2
Modulation		64QAM	64QAM	16QAM
Target Coding Rate		1/2	1/2	1/2
Information Bit Payload		1/2	172	1/2
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 blocks	3	3	2
For Sub-Frames 1,6	Code blocks	2	2	2
For Sub-Frame 5		n/a	n/a	n/a
For Sub-Frame 0	Code blocks	3	3	2
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 frame	Mbps	7.1184	7.1184	4.7896
UE Category		≥2	≥2	≥2
Note 1:2 symbols allocated to PDCCINote 2:Reference signal, synchronizaNote 3:as per Table 4.2-2 in TS 36.2	ation signal 11 [4].	s and PBCH allo		
Note 4:If more than one Code Block i attached to each Code Block iNote 5:50 resource blocks are allocate and RB30–RB49) are allocate 6.	(otherwise ed in sub-f	L = 0 Bit). rames 4, 9 and 4	41 resource bloc	ks (RB0–RB20

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

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 CDMmultiplexed UE specific reference symbols with two cell-specific antenna ports and four CSI-RS antenna ports.

	Parameter	Unit	Valu	Ie					
Reference	e channel		R.44 TDD	R.48					
				TDD					
Channel	bandwidth	MHz	10	10					
	resource blocks		50 (Note 4)	50 (Note					
				4)					
Uplink-Do	ownlink Configuration		1	1					
(Note 3)	3.								
	I subframes per Radio		3+2	3+2					
Frame (D									
Modulatio	on		64QAM	QPSK					
Target Co	oding Rate		1/2						
	on Bit Payload								
For Sub	-Frames 4,9 (non CSI-RS	Bits	18336	N/A					
subframe									
For Sub	-Frames 4,9 (CSI-RS	Bits	16416	6200					
subframe									
For Sub	-Frames 1,6		11832	4264					
For Sub	-Frame 5	Bits	N/A	N/A					
For Sub	-Frame 0	Bits	14688	4968					
Number of	of Code Blocks per Sub-								
Frame									
(Note 5)									
For Sub	-Frames 4,9 (non CSI-RS		3	2					
subframe									
For Sub-	-Frames 4,9 (CSI-RS		3	2					
subframe									
	-Frames 1,6		2	1					
For Sub	-Frame 5		N/A	N/A					
	o-Frame 0		3	1					
	hannel Bits Per Sub-								
Frame									
	-Frames 4,9 (non CSI-RS	Bits	36000	12000					
subframe									
	Frames 4,9 (CSI-RS	Bits	33600	11600					
subframe	/								
	-Frames 1,6		23616	7872					
	-Frame 5	Bits	N/A	N/A					
	-Frame 0	Bits	29520	9840					
	oughput averaged over 1	Mbps	7.1184	2.5896					
frame									
UE Cateo			≥ 2	≥ 1					
Note 1:	2 symbols allocated to PD								
Note 2:	Reference signal, synchro		gnals and PBC	H					
Note 0.	allocated as per TS 36.211 [4].								
Note 3: Note 4:	as per Table 4.2-2 in TS 3 50 resource blocks are allo	0.∠11[4]. acatodin a	ub frames 4.0	and 11					
NOIE 4.	resource blocks (RB0–RB								
	in sub-frame 0 and the Dw								
Note 5:	If more than one Code Blo								
NOLE D.	sequence of L = 24 Bits is								
	(otherwise $L = 0$ Bit).	ลแลงกอนไ	o caun coue D	IUUK					

Table A.3.4.3.4-1: Fixed Reference Channel for CDM-multiplexed DM RS with four CSI-RS antenna ports

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 CDMmultiplexed UE specific reference symbols with two cell-specific antenna ports and eight CSI-RS antenna ports.

	Parameter	Unit	Value				
Referenc	e channel	01110	R.50 TDD				
	bandwidth	MHz	10				
	resource blocks	101112	50 (Note 4)				
	wnlink Configuration (Note		1				
3)							
	subframes per Radio		3+2				
Frame (D			012				
Modulatio			QPSK				
	oding Rate		1/3				
	on Bit Payload		1/5				
	-Frames 4,9 (non CSI-RS	Bits	3624				
subframe		Dita	5024				
	Frames 4,9 (CSI-RS	Bits	3624				
subframe		Dita	5024				
	-Frames 1,6		2664				
	-Frame 5	Bits	N/A				
	-Frame 0	Bits	2984				
	of Code Blocks per Sub-	Dita	2304				
Frame	of Code Blocks per Sub-						
(Note 5)							
	-Frames 4,9 (non CSI-RS		1				
subframe							
For Sub-	Frames 4,9 (CSI-RS		1				
subframe							
	-Frames 1,6		1				
	-Frame 5		N/A				
	-Frame 0		1				
	nannel Bits Per Sub-Frame		•				
For Sub	-Frames 4,9 (non CSI-RS	Bits	12000				
subframe		2.110					
	- Frames 4,9 (CSI-RS	Bits	10400				
subframe							
	-Frames 1,6		7872				
	-Frame 5	Bits	N/A				
	-Frame 0	Bits	9840				
	oughput averaged over 1	Mbps	1.556				
frame							
UE Categ	lory	İ	≥ 1				
	2 symbols allocated to PDC	CH.					
Note 2:			als and PBCH				
-	allocated as per TS 36.211		-				
Note 3:	as per Table 4.2-2 in TS 36.						
Note 4:	50 resource blocks are alloc	ated in sub					
	41 resource blocks (RB0-R						
	allocated in sub-frame 0 and						
frames 1,6.							
Note 5:	If more than one Code Bloc	k is present	t, an additional				
CRC sequence of L = 24 Bits is attached to each Code							
	Block (otherwise $L = 0$ Bit).						

Table A.3.4.3.5-1: Fixed Reference Channel for CDM-multiplexed DM RS with eight CSI-RS antenna ports

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.

	Parameter	Unit	Val						
Reference	e channel		R.45	R.45-1					
			TDD	TDD					
	bandwidth	MHz	10	10					
	I resource blocks		50 ⁴	39					
Uplink-De	ownlink Configuration (Note 3)		1	1					
Allocated	I subframes per Radio Frame		4+2	4+2					
(D+S)									
Allocated	I subframes per Radio Frame		10	10					
Modulatio	on		16QAM	16QAM					
Target Co	oding Rate		1/2	1/2					
Informati	on Bit Payload								
	-Frames 4 and 9	Bits	N/A	N/A					
(Non CS	SI-RS subframe)								
	p-Frames 4 and 9	Bits	11448	8760					
(CSI-RS	S subframe)								
	Frames 1,6	Bits	7736	7480					
	-Frame 5	Bits	N/A	N/A					
	p-Frame 0	Bits	9528	8760					
	of Code Blocks per Sub-Frame								
(Note 5)									
	-Frames 4 and 9		N/A	N/A					
	SI-RS subframe)								
· · · ·	Frames 4 and 9		2	2					
	S subframe)		-	-					
	Frames 1,6		2	2					
	-Frame 5		 N/A	N/A					
	p-Frame 0		2	2					
	hannel Bits Per Sub-Frame		_	_					
	-Frames 4 and 9	Bits	N/A	N/A					
	SI-RS subframe)	Dito	1.177	1.0// (
	p-Frames 4 and 9	Bits	22400	17472					
	S subframe)	Dito	22400	11 712					
	Frames 1,6	Bits	15744	14976					
	p-Frame 5	Bits	N/A	N/A					
	p-Frame 0	Bits	19680	18720					
	oughput averaged over 1 frame	Mbps	4.7896	4.1240					
UE Cate		IVIDPS	4.7890 ≥ 2	4.1240 ≥1					
Note 1:	2 symbols allocated to PDCCH fo								
Note 1.	BW; 3 symbols allocated to PDCCH to								
	allocated to PDCCH for 1.4 MHz. symbols are allocated to PDCCH.								
Note 2:	Reference signal, synchronization			as nor TS					
Note 2.	36.211 [4].	i siynais anu Pi		asperio					
Note 3:	As per Table 4.2-2 in TS 36.211	41							
Note 3.	for For R. 45, 50 resource blocks		sub-frames 4	9 and 41					
11018 4.	resource blocks (RB0–RB20 and								
				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									
Note 5:	L = 24 Bits is attached to each Co								
Note 6				<i>.</i>					
Note 6: Localized allocation started from RB #0 is applied.									

Table A.3.4.3.5-2: Fixed Reference Channel for eight antenna ports (CSI-RS)

A.3.5 Reference measurement channels for PDCCH/PCFICH performance requirements

A.3.5.1 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

Table A.3.5.1-1: Reference Channel FDD

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

Pa	rameter	Unit		Value	;	
Reference cha	nnel		R.18	R.19	R.20	R.24
Number of tran	smitter antennas		1	2	4	1
Channel bandv	vidth	MHz	10	10	5	10
User roles (Not	e 1)		W I1 I2	W I1 I2	W I1 I2	W I1
Resource alloc	ation (Note 2)		(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	-4 0 -3	-4 0 -3	+3 0
Payload (Note	4)		ARR	ARR	ARR	A R
Note 2: The Note 3: The	vanted user, I1=interf resource allocation p power offsets (per us ive to the first interfer	er user is g er) repres	given as (N_group_	PHICH, N_seq_PH		l per PHICH

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

Parameter			Р	МСН			
	Unit			Va	lue		
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 Frame (Note 1)		6			6		
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 Subframe (Note 3)		1			1		
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 su 36.331.	bframes (#	#1/2/3/6/7/8) ar	e avail	able fo	r MBMS, in lin	e with	TS
Note 2: 2 OFDM symbols are rese 36.211.	erved for P	DCCH; and ref	erence	signa	l allocated as	per TS	
Note 3: If more than one Code Blo attached to each Code Blo		•	al CRO	C sequ	ence of L = 24	4 Bits is	\$

Table A.3.8.1-1: Fixed Reference Channel QPSK R=1/3

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 36.331.	/2/3/6/7/	8) are	availal	ole for	MBMS, in lin	e with	TS	
Note 2: 2 OFDM symbols are reserved for PD 36.211.	e 2: 2 OFDM symbols are reserved for PDCCH; and reference signal allocated as per TS							
Note 3: If more than one Code Block is preser attached to each Code Block (otherwise)			CRC	seque	nce of L = 24	Bits is		

Table A.3.8.1-2: Fixed Reference Channel 16QAM R=1/2

Table A.3.8.1-3: Fixed Reference Channel 64QAM R=2/3

Parameter	РМСН								
	Unit			Va	alue				
Reference channel				R.39-1	R.39 FDD				
				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		11		1					
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,Note 2:2 OFDM symbols are reserved for PDCCHNote 3:If more than one Code Block is present, arCode Block (otherwise L = 0 Bit).	l; and refere	ence sig	nal all	ocated as p	er TS 36.211.		ach		

A.3.8.2 TDD

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, Up	link-Downlink	Config	uratior	n 5 is propose	d, up to	o 5
subframes (#3/4/7/8/9) are availa							
Note 2: 2 OFDM symbols are reserved fo							
Note 3: If more than one Code Block is p		n additional C	RC sec	quence	e of $L = 24$ Bits	s is atta	ached
to each Code Block (otherwise L	= 0 Bit).						

Table A.3.8.2-1: Fixed Reference Channel QPSK R=1/3

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 Table A.3.8.2-2: Fixed Reference Channel 16QAM R=1/2

Parameter		РМСН						
	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-l	Downlin	nk Con	figura	tion 5 is prop	osed, ı	up to	
5 subframes (#3/4/7/8/9) are available								
Note 2: 2 OFDM symbols are reserved for PD								
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).

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		
Note 1:For TDD mode, in line with TS subframes (#3/4/7/8/9) are ava 2 OFDM symbols are reserved Note 3:Note 3:If more than one Code Block is attached to each Code Block (ailable for for PDC s present	r MBMS CH; re , an ad	S. ferenc ditiona	ce signal allocat	ed as per TS 3	36.211	

Table A.3.8.2-3: Fixed Reference Channel 64QAM R=2/3

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)

Parameter	Unit				Va	lue			
Reference channel		R.31-1	R.31-2	R.31-3	R.31-3A	R.31-3C	R.31-4	R.31-4B	R.31-5
		FDD	FDD	FDD	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		10	10	10	10	10	10	10	10
Frame									
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 PDC	CH for al		22	22	<u> </u>	23	20	≤ 4	20
Note 2: Reference signal, synchro				ootod oo r	or TO 26 2	14 [4]			
Note 3: If more than one Code Blo							chad ta aa	ch Code Bl	ock
(otherwise $L = 0$ Bit).		sent, an au		C Sequen	UE 01 L - 24				UCK
Note 4: Resource blocks $n_{PRB} = 0$.	2 are allo	nested for 9	SIR transm	iesions in a	sub-frame 5	for all hand	dwidths		
Note 5: Resource blocks $n_{PRB} = 6$.									
Note 6: Resource blocks $n_{PRB} = 3$							blocks n⊳	RB = 0.49 ir	n sub-
frames 0,1,2,3,4,6,7,8,9.							2.0010 HF		
Note 7: Resource blocks $n_{PRB} = 4$	99 are a	llocated fo	r the user o	data in sub	-frame 5. a	nd resource	blocks n⊳	_{вв} = 099 ir	n sub-
frames 0,1,2,3,4,6,7,8,9.							· · · · · · · · · · · ·		
Note 8: Given per component carrier per codeword.									
Note 9: Resource blocks nPRB = 474 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 074 in sub-							ce blocks r	PRB = 07	4 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.

A.3.9.2 TDD

Parameter	Unit	Value						
Reference channel		R.31-1	R.31-2	R.31-3	R.31-3A	R.31-4		
		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 3)		5	5	5	1	1		
Number of HARQ Processes per	Proces	15	15	15	7	7		
component carrier	ses				-			
Allocated subframes per Radio Frame		8+1	8+1	8+1	4	4		
(D+S)		_	_	-				
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM		
Target Coding Rate								
For Sub-Frames 4,9		0.40	0.59	0.59	0.87	0.88		
For Sub-Frames 3,7,8		0.40	0.59	0.59	N/A	N/A		
For Sub-Frames 1		N/A	N/A	N/A	N/A	N/A		
For Sub-Frames 5		0.40	0.64	0.62	0.88	0.87		
For Sub-Frames 6		0.40	0.60	0.60	N/A	N/A		
For Sub-Frames 0		0.40	0.62	0.61	0.90	0.90		
Information Bit Payload								
For Sub-Frames 4,9	Bits	10296	25456	51024	51024	75376		
For Sub-Frames 3,7,8	Bits	10296	25456	51024	0	0		
For Sub-Frame 1	Bits	0	0	0	0	0		
For Sub-Frame 5	Bits	10296	25456	51024	51024	71112		
For Sub-Frame 6	Bits	10296	25456	51024	0	0		
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								
For Sub-Frames 4,9	Bits	26100	43200	86400	58752	86400		
For Sub-Frames 3,7,8	Bits	26100	43200	86400	0	0		
For Sub-Frame 1	Bits	0	0	0	0	0		
For Sub-Frame 5	Bits	26100	40176	82512	58320	82512		
For Sub-Frame 6	Bits	26100	42768	85968	N/A	N/A		
For Sub-Frame 0	Bits	26100	41184	84384	56736	84384		
Number of layers		1	2	2	2	2		
Max. Throughput averaged over 1 frame	Mbps	8.237	20.365	40.819	20.409	29.724		
(Note 10)								
UE Category		≥ 1	≥ 2	≥2	≥2	≥ 3		
Note 1: 1 symbol allocated to PDCCH for	r all tests.				ı			
Note 2: Reference signal, synchronization		and PBCH	allocated a	s per TS 3	6.211 [4].			
Note 3: As per Table 4.2-2 in TS 36.211 [4].								
Note 4: If more than one Code Block is p	present, an	additional	CRC sequ	ence of L =	= 24 Bits is a	ittached		
to each Code Block (otherwise L	. = 0 Bit).							
Note 5: Resource blocks n _{PRB} = 02 are allocated for SIB transmissions in sub-frame 5 for all								
bandwidths.								
Note 6: Resource blocks n _{PRB} = 614,30	49 are al	located for	the user da	ata in all su	bframes.			

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.3.9.3 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-4B
		1 FDD	2 FDD	3 FDD	3A FDD	3C FDD	4 FDD	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 Frame		10	10	10	10	10	10	10
Modulation		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								
(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)								
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)	DIIS	20100	40752	03902	40752	50504	03902	02302
(subframes with EPDCCH USS								
monitoring)								
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		1	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
frame (Note 8)		10.200	20.400	01.027	00.072	01.024	1.000	01.020
UE Categories	1	≥ 1	≥2	≥2	≥2	≥ 3	≥ 3	≥ 4
Note 1: 1 symbol allocated to PDCCH	for all t	octo					•	

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-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	0	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 3)		5	5	5	1	1
Number of HARQ Processes per component carrier	Processes	15	15	15	7	7
Allocated subframes per Radio Frame (D+S)		8+1	8+1	8+1	4	4
Coding Rate (subframes with PDCCH USS monitoring)						
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
For Sub-Frames 1		N/A	N/A	N/A	N/A	N/A
For Sub-Frames 5		0.3972	0.6372	0.6213	0.8790	0.8656
For Sub-Frames 6		0.3972	0.5986	0.5963	N/A	N/A
For Sub-Frames 0		0.3972	0.6216	0.6075	0.9036	0.8972
Coding Rate (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						
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 Bits	10296 10296	25456 25456	51024	51024 N/A	71112 N/A
For Sub-Frame 6 For Sub-Frame 0	Bits	10296	25456	51024 51024	51024	75376
Number of Code Blocks per Sub-	DILS	10290	20400	51024	51024	75576
Frame (Note 4)						40
For Sub-Frames 4,9		2	5	9	9	13
For Sub-Frames 3,7,8			5	9	N/A	N/A
For Sub-Frame 1		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 5 For Sub-Frame 6	Dito	2	5 5	9 9	9 N/A	12 N/A
For Sub-Frame 0	Bits	2	5	9	9	13
Binary Channel Bits per Sub-Frame (subframes with PDCCH USS monitoring)		2	5	3	3	13
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	Bits	26100	40176	82512	58320	82512
For Sub-Frame 6	Bits	26100	42768	85968	N/A	N/A
For Sub-Frame 0 Binary Channel Bits per Sub-Frame (subframes with EPDCCH USS	Bits	26100	41184	84384	56736	84384
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	of layers		1	2	2	2	2		
Max. Thro	oughput averaged over 1	Mbps	8.237	20.365	40.819	20.409	29.724		
frame (No	ote 10)	-							
UE Categ	jory		≥1	≥2	≥2	≥ 2	≥ 3		
Note 1:	1 symbol allocated to PDCC	H for all tests							
Note 2:	Reference signal, synchroni	zation signals	and PBCH al	located as pe	r TS 36.211 [4].			
Note 3:									
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} = 02	are allocated	I for SIB transi	missions in su	b-frame 5 for a	all bandwidths.			
Note 6:	Resource blocks n _{PRB} = 61	4,3049 are a	allocated for th	ne user data in	all subframes	5.			
Note 7:	Resource blocks n _{PRB} = 34	9 are allocate	ed for the user	data in sub-fra	ame 5, and re	source blocks r	$n_{PRB} = 049$		
	in sub-frames 0,3,4,6,7,8,9.								
Note 8:	Resource blocks n _{PRB} = 49	9 are allocate	ed for the user	data in sub-fra	ame 5, and re	source blocks r	$n_{PRB} = 099$		
	in sub-frames 0,3,4,6,7,8,9.								
Note 9:	Resource blocks n _{PRB} = 47	1 are allocate	d for the user	data in all sub	o-frames				
Note10:	Given per component carrie	r per codewoi	rd.						

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
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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

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.1 TDD	TDD	10	50	Note 3		MCS.1	10	1		
RC.3 FDD	FDD	10	6	-		MCS.10	8	1		
RC.3 TDD	TDD	10	6	Note 3		MCS.10	10	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		
2 CRS Ports	Γ	Γ		I	T	[]		I		
RC.2 FDD	FDD	10	50	-		MCS.2	8	1		
RC.2 TDD	TDD	10	50	Note 3		MCS.2	10	1		
RC.6 FDD	FDD	10	15	-		MCS.16	8	1	Note 6	
RC.6 TDD	TDD	10	15	Note 3		MCS.16	10	1	Note 6	
1 CRS Port + CSI-RS										
RC.8 FDD	FDD	10	6		Non CSI-RS	MCS.11	8	1		
KC.0 FDD	FUU	10	0	-	2 CSI-RS	MCS.12	0	1		
RC.8 TDD	TDD	10	6	Note 3	Non CSI-RS	MCS.11	10	1		
110.0 100	100	10	0		2 CSI-RS	MCS.12	10			
RC.9 FDD	FDD	10	50	-	Non CSI-RS	MCS.3	8	1		
		_			2 CSI-RS	MCS.4	-			
RC.9 TDD	TDD	10	50	Note 3	Non CSI-RS	MCS.3	10	1		
					2 CSI-RS	MCS.4				
2 CRS Port	+ CSI-RS	[Non					
RC.7 FDD	FDD	10	50	-	CSI-RS	MCS.5	8	1		
					4 CSI-RS	MCS.7				
RC.7 TDD	TDD	10	50	Note 3	Non CSI-RS	MCS.5	10	1		
					8 CSI-RS	MCS.8				
RC.11 FDD	FDD	10	50	_	Non CSI-RS	MCS.5	8	1		
					2 CSI-RS	MCS.6				
RC.11 TDD	TDD	10	50	Note 3	Non CSI-RS	MCS.5	10	1		
					2 CSI-RS	MCS.6				
1 CRS Port	+ CSI-RS	+ CSI-IM								
RC.13 FDD	FDD	10	50		Non CSI- RS/IM	MCS.3	Q	1		
		10	50		CSI- RS/IM	N/A	8			
RC.13 TDD	TDD	10	50	Note 3	Non CSI- RS/IM	MCS.3	10	1		
NO.13 100	עטי	10	50	11016 3	CSI- RS/IM	N/A	10			
2 CRS Port	+ CSI-RS	+ CSI-IM								
					Non CSI-RS	MCS.5				
RC.10 FDD	FDD	10	50	-	4 CSI- RS, 1 CSI	MCS.8	8	1		

Table A.4-1: CSI reference measurement channels

					process				
					Non CSI-RS	MCS.5			
RC.10 TDD	TDD	10	50	Note 3	8 CSI- RS, 1 CSI process	MCS.9	10	1	
	RC.12 FDD FDD 10 6	10	6		Non CSI- RS/IM	MCS.13	8	1	
KG. 12 FDD		0	0 -	CSI- RS/IM	N/A	0	1		
RC.12 TDD	TDD	10 6	6	Noto 3	Non CSI- RS/IM	MCS.13	10	1	
KG.12 TDD	TUU	10	0	6 Note 3	CSI- RS/IM	N/A	10		
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.									

IDD 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.

For TDD when UL-DL configuration 2 is used only subframes 3, 4, 8, and 9 are allocated to avoid Note 5: PBCH and synchronization signal overhead. Centered within the Transmission Bandwidth Configuration (Figure 5.6-1). Only subframes 2, 3, 4, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.

Note 6:

Note 7:

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.4-4: 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.4-6a: Void Table A.4-6b: Void

Table A.4-6: 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 Coding Rate			OOR	0.0762	0.1172	0.1885	0.3008	0.4385	0.5879	0.3691	0.4785	0.6016	0.4551	0.5537	0.6504	0.7539	0.8525	0.9258	Notes
Modulation			OOR QPSK 16QAM 64QAM																
MCS Scheme	PRB	Available RE-s	Imcs																
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	2	4	6	8	11	13	15	18	20	22	24	26	27	
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	
Note 1: Note 2: Note 3:	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.																		

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).

Relative power level $\gamma_{_{PRB}}$ [dB]						
Subframe						
	0 5 1-4,6-9					
		Allocation		Data		
First u	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 QPS	K modulated. The parameter $\gamma_{_{Pl}}$	$_{_{R\!B}}$ is used to scale the power of PI	DSCH.		
Note 2:	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 ${\gamma}_{_{PRB}}$ 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.					

Table A.5.1.1-1: OP.1 FDD: One sided dynamic OCNG FDD Pattern

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 $N_{_{RB}}-1$.

	R					
	0	5	1-4,6-9			
		Allocation		PDSCH Data		
0 – (First	t allocated PRB-1)	0 – (First allocated PRB-1)	0 – (First allocated PRB-1)	1 Doorn Data		
	and	and	and			
(Last all	located PRB+1) –	(Last allocated PRB+1) –	(Last allocated PRB+1) –			
	$(N_{RB} - 1)$	$(N_{RB} - 1)$	$(N_{RB} - 1)$			
	0	0	0	Note 1		
Note 1:		ource blocks are assigned to a nitted over the OCNG PDSCH				
	modulated. The pa	rameter $\gamma_{\scriptscriptstyle PRB}$ is used to scale t	he power of PDSCH.			
Note 2:	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 $\gamma_{_{PRB}}$ 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.					

Table A.5.1.2-1: OP.2 FDD: Two sided dynamic OCNG FDD Pattern

A.5.1.3 OCNG FDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Allocation		Relative power level $\gamma_{_{PRB}}$ [dB]					
		Subframe				PDSCH Data	PMCH Data
n_{P}	RB	0	5	4, 9	1 – 3, 6 – 8	Data	Data
1 – 49		0	0 (Allocation: all empty PRB-s)	0	N/A	Note 1	N/A
0 —	0 – 49 N/A N/A N/A 0				N/A	Note 2	
Note 1: Note 2: 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: 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					hall be be γ_{PRB} is e data in my es shall e slot. The hsmitted to e 2. The in the test.	
N/A:	Not App	enna transmiss licable	ion modes are	specified in se		3FF 13 30	.213.

Table A.5.1.3-1: OP.3 FDD: OCNG FDD Pattern 3

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.

		Relative power level $\gamma_{_{PRB}}$ [dB] Subframe			PDSCH Data	PMCH Data
Alloca						
$n_{P_{e}}$	RB	0, 4, 9	5	1 – 3, 6 – 8	Data	Data
First unallocated PRB – Last unallocated PRB		0	0 (Allocation: all empty PRB-s)	N/A	Note 1	N/A
First unallocated PRB – Last unallocated PRB		N/A	N/A	N/A	N/A	Note 2
Note 1:				ssigned to an arbitrary numb ansmitted over the OCNG P		
		•		ich is QPSK modulated. The		
Note 2:	used to scale the power of PDSCH. 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					
	paramet	er $\gamma_{\scriptscriptstyle PRB}$ is used	to scale the po	ower of PMCH.		
Note 3:	the virtu transmit	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 App	licable				

Table A.5.1.4-1: OP.4 FDD: One sided dynamic OCNG FDD Pattern for MBMS transmission

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).

Relative power level $\gamma_{\scriptscriptstyle PRB}$ [dB]						
Subframe						
0 5 1-4,6-9						
		Allocation		Data		
First u	unallocated PRB	First unallocated PRB	First unallocated PRB			
Last u	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	M modulated. The parameter γ	$_{PRB}$ is used to scale the power of F	PDSCH.		
Note 2:	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 3 (Large					
	Delay CDD). The parameter $\gamma_{_{PRB}}$ applies to each antenna port separately, so the transmit power is					
	•	ne transmit antennas with CRS u d in section 7.1 in 3GPP TS 36.2	used in the test. The antenna trans 13.	mission		

Table A.5.1.5-1: OP.5 FDD: One sided dynamic 16QAM modulated OCNG FDD Pattern

A.5.1.6 OCNG FDD pattern 6: dynamic OCNG FDD 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 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 $N_{RB} - 1$.

	R					
	0					
		Allocation				
0 – (Firs	t allocated PRB of	0 – (First allocated PRB of	0 – (First allocated PRB of	PDSCH Data		
fir	rst block -1)	first block -1)	first block -1)			
	and	and	and			
``	ocated PRB of first	(Last allocated PRB of first	(Last allocated PRB of first			
) – (First allocated	block +1) – (First allocated	block +1) – (First allocated			
PRB of	second block -1)	PRB of second block -1)	PRB of second block -1)			
	0	0	0	Note 1		
Note 1:		ource blocks are assigned to an nitted over the OCNG PDSCHs				
	modulated. The pa	rameter ${\gamma}_{\scriptscriptstyle PRB}$ is used to scale the sc	he power of PDSCH.			
Note 2:	te 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 $\gamma_{_{PRB}}$ applies					
		ort separately, so the transmit p ne antenna transmission modes				

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, ..., M. The system bandwidth starts with RPB 0 and ends with $N_{RB} - 1$.

F						
	Subframe					
0	5	1-4,6-9				
	Allocation					
$0 - (PRB N_{Start,1} - 1)$	$0 - (PRB N_{Start,1} - 1)$	$0 - (PRB N_{Start,1} - 1)$				
			PDSCH Data			
$(PRBN_{End,(m-1)}) - (PRB$	$(PRBN_{End,(m-1)}) - (PRB$	$(PRBN_{End,(m-1)}) - (PRB$				
$N_{Start,m} - 1$)	$N_{Start,m} - 1$)	$N_{Start,m} - 1$)				
$(PRBN_{End,M}) - (PRB$	$(PRBN_{End,M})$ – $(PRB$	$(PRBN_{End,M}) - (PRB$				
$N_{RB} - 1$)	$N_{RB} - 1$)	$N_{RB} - 1$)				
0	0	0	Note 1			
	source blocks are assigned to a mitted over the OCNG PDSCH					
modulated. The pa	rameter $\gamma_{\scriptscriptstyle PRB}$ is used to scale t	he power of PDSCH.				
Note 2: If two or more tran	· 110					
users by all the tra	users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{_{PRB}}$ applies					
	ort separately, so the transmit p ne antenna transmission modes					

Table A.5.1.7-1: OP.7 FDD: OCNG FDD Pattern when user data is in multiple non-contiguous blocks

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).

	Relative power level $\gamma_{_{PRB}}$ [dB]					
Subframe						
	0 5 1-4,6-9					
		Allocation		Data		
First u	st unallocated PRB First unallocated PRB First unallocated PRB		First unallocated PRB			
Last u	unallocated PRB	Last unallocated PRB	Last unallocated PRB			
	0	0	0	Note 1,2,3		
Note 1:			arbitrary number of virtual UEs wit PDSCHs shall be uncorrelated ps			
	data, which is 16QAM modulated. The parameter $\gamma_{_{PRB}}$ is used to scale the power of PDSCH.					
Note 2:	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 se	t-up for TM10 transmission i.e P	MI configuration is specified to ea	ch 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).

		Relative power	level $\gamma_{\scriptscriptstyle PRB}$ [dB]				
	Subframe (only if available for DL)						
0		0 5		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 una	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 be				
	which is QPS	SK modulated. The param	neter $\gamma_{\scriptscriptstyle PRB}$ 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:	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 $\gamma_{_{PRB}}$ 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.						

Table A.5.2.1-1: OP.1 TDD: One sided dynamic OCNG TDD Pattern

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.

		Relative power	level $\gamma_{\scriptscriptstyle PRB}$ [dB]		PDSCH Data	
		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 all	ocated 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 UE; the data tra	resource blocks are assigned nsmitted over the OCNG PD	d to an arbitrary number of vi SCHs shall be uncorrelated (rtual UEs with one PDSCH p oseudo random data, which i	er virtual s QPSK	
	modulated. The	parameter $\gamma_{\scriptscriptstyle PRB}$ is used to set	cale the power of PDSCH.			
Note 2:	Subframes avail TS 36.211	lable for DL transmission dep	pends on the Uplink-Downlin	k configuration in Table 4.2-2	in 3GPP	
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 $\gamma_{_{PRB}}$ applies					
			it power is equal between all are specified in section 7.1 i	the transmit antennas with C n 3GPP TS 36.213.	CRS used	

A.5.2.3 OCNG TDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

			Relative power				
Alloca		Subframe				PDSCH Data	PMCH Data
n _{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.						which is QPSK
Note 2:			eter ${\gamma}_{_{PRB}}$ is used t r DL transmission			onfiguration in Tab	le 4.2-2 in
Nata O.		PTS 36.211.			l terre and a sine. Th	- data in a a du DD	
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 A	pplicable					

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.

		Relative power		PMCH Data		
Allocation		Subframe (PDSCH Data			
n _{PRB}	0 and 6 (as normal subframe)	1 (as special subframe)	5	3, 4, 7 – 9	1 Door Data	- mon 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
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.						
u	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.					
b b	f 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 N	Not Applicable					

Table A.5.2.4-1: OP.4 TDD: One sided dynamic OCNG TDD Pattern for MBMS transmission

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).

		Relative power	level $\gamma_{\scriptscriptstyle PRB}$ [dB]		
Subframe (only if available for DL)					
0		5	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 unallocated PRB		First unallocated PRB	First unallocated PRB -	First unallocated PRB	
Last una	Last unallocated PRB Last unallocated PRB Last unallocated PRB Last unallocated PRB				
	0 0 0 0		Note 1		
Note 1:			ssigned to an arbitrary num he OCNG PDSCHs shall b		
	which is 16Q	AM modulated. The para	meter ${\gamma}_{\scriptscriptstyle PRB}$ is used to scale	e 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:	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 3 (Large Delay				
	CDD). The parameter $\gamma_{_{PRB}}$ 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.				

Table A.5.2.5-1: OP.5 TDD: One sided dynamic 16QAM modulated OCNG TDD Pattern

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 $N_{RB} - 1$.

Relative power level $\gamma_{_{PRB}}$ [dB]					PDSCH Data
Subframe (only if 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 – (Firs	t allocated PRB	0 – (First allocated PRB	0 – (First allocated PRB	0 – (First allocated PRB	
of fir	st block -1)	of first block -1)	of first block -1)	of first block -1)	
	and	and	and	and	
(Last al	located PRB of	(Last allocated PRB of	(Last allocated PRB of	(Last allocated PRB of	
	ock +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		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 UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is					
	modulated. The	parameter $\gamma_{\scriptscriptstyle PRB}$ is used to set	cale the power of PDSCH.		
Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPI TS 36.211					in 3GPP
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 $\gamma_{_{PRB}}$ ap					applies to
each antenna port separately, so the transmit power is equal between all the transmit antennas with CF in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.					CRS used

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 the idd PDP. We are the base of the M. Theorem has the idd 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 if available for DL)						
0						
		(6 as normal subframe)	(6 as special subframe)			
	Alloc	ation				
$0 - (PRB N_{Start,1} - 1)$	$0 - (PRBN_{Start,1} - 1)$	$0 - (PRB N_{Start,1} - 1)$	$0 - (PRB N_{Start,1} - 1)$			
 (PRB N _{End,(m-1)}) –	 (PRB N _{End,(m-1)}) –	 (PRB N _{End,(m-1)}) –	 (PRB N _{End,(m-1)}) –			
(PRB $N_{Start,m} - 1$)	$(PRB \ N_{Start,m} - 1) \qquad (PRB \ N_{Start,m} - 1) \qquad (PRB \ N_{Start,m} - 1) \qquad (PRB \ N_{Start,m} - 1)$					
$(PRBN_{End,M})$ – $(PRB$	$(PRBN_{End,M}) - (PRB$	$(PRBN_{End,M}) - (PRB$	$(PRBN_{End,M})$ – $(PRB$			
$N_{RB} - 1$)	$N_{RB} - 1$)	$N_{RB} - 1$)	$N_{RB} - 1$)			
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						
	each antenna port separately, so the transmit power is equal between all the transmit antennas with CRS 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 $\gamma_{\scriptscriptstyle PRB}$ [dl	3]		
Subframe					
	0 5 1-4,6-9				
Allocation					
First unallocated PRB		First unallocated PRB First unallocated F			
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 $\gamma_{_{PRB}}$ 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 se	et-up for TM10 transmission i.e P	MI configuration is specified to ea	ich test case.	

Table A.5.1.1-1: OP.8 TDD: One sided dynamic OCNG TDD Pattern

Annex B (normative): Propagation conditions

B.1 Static propagation condition

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

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 1 & j & j & j & j \\ 1 & 1 & 1 & 1 & -j & -j & -j & -j \end{bmatrix}$$

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.

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.2.1-1 Delay profiles for E-UTRA channel models

Excess tap delay	Relative power
[ns]	[dB]
0	0.0
30	-1.0
70	-2.0
90	-3.0
110	-8.0
190	-17.2
410	-20.8

Table B.2.1-2 Extended Pedestrian A model (EPA)

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

	One antenna	Two antennas	Four antennas
eNode B Correlation	$R_{eNB} = 1$	$R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & 1 \end{pmatrix}$	$R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9} & \alpha^{1/9} & 1 & \alpha^{1/9} \\ \alpha^{4/9} & \alpha^{4/9} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9} & \alpha^{1/9} & 1 \end{pmatrix}$

Table B.2.3.1-1 eNodeB correlation matrix

Table B.2.3.1-2 defines the correlation matrix for the UE:

	One antenna	Two antennas	Four antennas
UE Correlation	$R_{UE} = 1$	$R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & 1 \end{pmatrix}$	$R_{UE} = \begin{pmatrix} 1 & \beta^{\frac{1}{9}} & \beta^{\frac{4}{9}} & \beta \\ \beta^{\frac{1}{9}^{*}} & 1 & \beta^{\frac{1}{9}} & \beta^{\frac{4}{9}} \\ \beta^{\frac{4}{9}^{*}} & \beta^{\frac{1}{9}^{*}} & 1 & \beta^{\frac{1}{9}} \\ \beta^{*} & \beta^{\frac{4}{9}^{*}} & \beta^{\frac{1}{9}^{*}} & 1 \end{pmatrix}$

Table B.2.3.1-2 UE correlation matrix

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: <i>k</i>	R_{spat}	correlation matrices
---------------------------	------------	----------------------

1x2 case	$R_{spat} = R_{UE} = \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
2x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$
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	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} & \alpha \\ \alpha^{\frac{1}{9}} & 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} \\ \alpha^{\frac{4}{9}} & \alpha^{\frac{1}{9}} & 1 & \alpha^{\frac{1}{9}} \\ \alpha^{\frac{4}{9}} & \alpha^{\frac{4}{9}} & \alpha^{\frac{1}{9}} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta^{\frac{1}{9}} & \beta^{\frac{4}{9}} & \beta \\ \beta^{\frac{1}{9}} & 1 & \beta^{\frac{1}{9}} & \beta^{\frac{4}{9}} \\ \beta^{\frac{4}{9}} & \beta^{\frac{1}{9}} & 1 & \beta^{\frac{1}{9}} \\ \beta^{\frac{4}{9}} & \beta^{\frac{1}{9}} & \beta^{\frac{1}{9}} & 1 & \beta^{\frac{1}{9}} \\ \beta^{\frac{4}{9}} & \beta^{\frac{4}{9}} & \beta^{\frac{1}{9}} & 1 & \beta^{\frac{1}{9}} \\ \beta^{\frac{4}{9}} & \beta^{\frac{4}{9}} & \beta^{\frac{1}{9}} & 1 & \beta^{\frac{1}{9}} \end{bmatrix}$

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.

Low co	rrelation	Medium C	orrelation	High Correlation		
α	β	α	β	α	β	
0	0	0.3	0.9	0.9	0.9	

Table B.2.3.2-1

The correlation matrices for high, medium and low correlation are defined in Table B.2.3.1-2, B.2.3.2-3 and B.2.3.2-4, as below.

The values in Table B.2.3.2-2 have been adjusted for the $4x^2$ and $4x^4$ 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 $4x^2$ high correlation case, a=0.00010. For the $4x^4$ 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.

1x2 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	$R_{high} =$	$\begin{bmatrix} 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 & 0.8999 & 0.8099 \\ 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 & 0.8099 & 0.8999 \\ 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 \\ 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 \\ 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 \\ 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 \\ 0.8999 & 0.8099 & 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8894 \\ 0.8099 & 0.8099 & 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 \end{bmatrix}$
4x4 case	$R_{high} = \begin{bmatrix} 0.9882 \ 1.0000 \ 0.9541 \ 0.9882 \ 0.9767 \ 0.9882 \ 0.9767 \ 0.9882 \ 0.9430 \ 0.9767 \ 0.9884 \ 0.9430 \ 0.9541 \ 0.9557 \ 0.8894$	0.9541 0.8999 0.9882 0.9767 0.9430 0.8894 0.9541 0.9430 0.9105 0.8587 0.8999 0.894 0.8587 0.8099 0.9882 0.9541 0.9767 0.9882 0.9767 0.9430 0.9430 0.9541 0.9430 0.9105 0.8587 0.8999 0.8894 0.8587 1.0000 0.9882 0.9430 0.9767 0.9882 0.9767 0.9105 0.9430 0.9541 0.9430 0.8587 0.8894 0.8587 0.9882 1.0000 0.8894 0.9430 0.9767 0.9882 0.8587 0.9105 0.9430 0.9541 0.8099 0.8587 0.8894 0.8999 0.9430 0.8894 1.0000 0.9882 0.9541 0.8999 0.9882 0.9767 0.9430 0.9541 0.8099 0.8587 0.8894 0.8999 0.9430 0.8894 1.0000 0.9882 0.9541 0.8999 0.9882 0.9767 0.9430 0.9541 0.9430 0.9105 0.8587 0.9767 0.9430 0.9882 1.0000 0.9882 0.9541 0.9767 0.9882 0.9767 0.9430 0.9430 0.9541 0.9430 0.9105 0.9882 0.9767 0.9541 0.9882 1.0000 0.9882 0.9541 0.9767 0.9882 0.9767 0.9105 0.9430 0.9541 0.9430 0.9767 0.9882 0.8999 0.9541 0.9882 1.0000 0.8894 0.9430 0.9767 0.9882 0.8587 0.9105 0.9430 0.9541 0.9105 0.8587 0.9882 0.9767 0.9430 0.8894 1.0000 0.9882 0.9541 0.8999 0.9882 0.9767 0.9430 0.9541 0.9105 0.8587 0.9882 0.9767 0.9430 0.8894 1.0000 0.9882 0.9541 0.8999 0.9882 0.9767 0.9430 0.9541 0.9105 0.8587 0.9882 0.9767 0.9430 0.8894 1.0000 0.9882 1.0000 0.9882 0.9541 0.9767 0.9882 0.9767 0.9430 0.9105 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 0.9767 0.9882 0.9767 0.9541 0.9882 1.0000 0.8894 0.9430 0.9767 0.9882 0.9767 0.9430 0.9541 0.8944 0.9430 0.9767 0.9882 0.8999 0.9541 0.9882 1.0000 0.8894 0.9430 0.9767 0.9882 0.9767 0.9430 0.9541 0.8894 0.9430 0.9767 0.9882 0.8999 0.9541 0.9882 1.0000 0.8894 0.9430 0.9767 0.9882 0.8587 0.8099 0.9541 0.9430 0.9767 0.9882 0.9767 0.9430 0.8894 1.0000 0.9882 0.9541 0.9430 0.9767 0.9882 0.8587 0.8099 0.9541 0.9430 0.9105 0.8587 0.9882 0.9767 0.9430 0.8894 1.0000 0.9882 0.9541 0.8999 0.8894 0.9105 0.9430 0.9541 0.9430 0.9105 0.9767 0.9882 0.9767 0.9430 0.8894 1.0000 0.9882 0.9541 0.8999 0.8894 0.9105 0.9430 0.9541 0.9430 0.9767 0.9882 0.9767 0.9430 0.9882 1.0000 0.9882 1.0000 0.9882 0.8894 0.8999 0.8587 0.9105 0.9430 0.9541 0.8894 0.9430 0.9767 0.9882 0.8999 0.9541 0.9

Table B.2.3.2-2: MIMO correlation matrices for high correlation

1x2 case						N/A					
2x2 case				R_{me}	$_{dium} = \begin{vmatrix} 0\\0 \end{vmatrix}$		$\begin{array}{c} 0.3 & 0.27 \\ 0.27 & 0.3 \\ 1 & 0.9 \\ 0.9 & 1 \end{array}$				
4x2 case		R _{medium} =	$\left(\begin{array}{c}1.0000\\0.9000\\0.8748\\0.7873\\0.5856\\0.5271\\0.3000\\0.2700\end{array}\right)$	1.0000 0.7873 0.8748 0.5271 0.5856	0.8748 0.7873 1.0000 0.9000 0.8748 0.7873 0.5856 0.5271	0.7873 0.8748 0.9000 1.0000 0.7873 0.8748 0.5271 0.5856	3 0.5271 0 0.8748 0 0.7873 3 1.0000 3 0.9000 1 0.8748	0.5271 0.5856 0.7873 0.8748 0.9000 1.0000 0.7873 0.8748	0.2700 0.5856 0.5271 0.8748 0.7873 1.0000	0.2700 0.3000 0.5271 0.5856 0.7873 0.8748 0.9000 1.0000	
4x4 case	R _{medium} =	(1.0000 0.9882 0.9882 1.0000 0.9541 0.9882 0.8999 0.9541 0.8747 0.8645 0.8645 0.8747 0.8347 0.8645 0.7872 0.8347 0.5855 0.5787 0.5787 0.5855 0.5588 0.5787 0.5270 0.5588 0.3000 0.2965 0.2965 0.3000 0.2862 0.2965 0.2700 0.2862	1.0000 0.9882 0.9882 1.0000 0.8347 0.7872 0.8645 0.8347 0.8747 0.8645 0.8645 0.8747 0.5588 0.5270 0.5787 0.5588 0.5787 0.5585 0.2862 0.2700 0.2965 0.2862 0.3000 0.2965	0.8645 0.87 0.8347 0.86 0.7872 0.83 1.0000 0.98 0.9882 1.00 0.9541 0.98 0.8999 0.95 0.8747 0.86 0.8645 0.87 0.8645 0.87 0.8347 0.86 0.7872 0.83 0.5855 0.57 0.5787 0.58 0.5588 0.57	447 0.8645 645 0.8747 647 0.8645 682 0.9541 000 0.9882 682 1.0000 641 0.9882 645 0.8347 647 0.8645 645 0.8747 647 0.8645 645 0.8747 647 0.8645 645 0.8747 647 0.8645 645 0.5788 655 0.5787 787 0.5855	0.8347 (0.8645 (0.8747 (0.8999 (0.9541 (0.9882 (1.0000 (0.7872 1 0.8347 (0.8645 (0.8747 (0.5270 (0.5588 (0.5787 (0.5787 0.5855 0.5588 0.5787 0.5588 0.5787 0.5270 0.5588 0.8747 0.8645 0.8747 0.8645 0.8347 0.8645 0.7872 0.8347 0.09882 0.0000 0.9541 0.9882 0.8747 0.8645 0.8747 0.8645 0.8747 0.8645 0.8747 0.8645 0.8747 0.8645 0.8645 0.8747 0.8645 0.8747	0.5787 (0.5855 (0.5787 (0.8347 (0.8645 (0.8747 (0.8645 (0.9541 (0.9882 1 0.8347 (0.8347 (0.8347 (0.8347 (0.5588 0.2965 0.5787 0.2862 0.5787 0.2862 0.5855 0.2700 0.7872 0.5855 0.8347 0.5787 0.8645 0.5588 0.8747 0.5270 0.8999 0.8747 0.9541 0.8645 0.9882 0.8347 0.07872 1.0000 0.7872 1.0000 0.8347 0.9882 0.8347 0.9882 0.8347 0.9882	0.3000 0.2963 0.2965 0.3000 0.2862 0.2963 0.5787 0.5583 0.5787 0.5855 0.5788 0.5787 0.5588 0.5787 0.5588 0.5787 0.8645 0.8344 0.8645 0.8747 0.8645 0.8744 0.8842 0.9544 0.9882 0.9544 1.0000 0.9883	5 0.2862 0 0.2965 5 0.3000 8 0.5270 7 0.5588 5 0.5787 7 0.5855 7 0.7872 5 0.8347 7 0.8645 5 0.8747 1 0.8999 2 0.9541 0 0.9882

Table B.2.3.2-3: MIMO	correlation matrices	s for medium correlation

Table B.2.3.2-4: MIMO correlation matrices for low correlation

1x2 case	$R_{low} = \mathbf{I}_2$
2x2 case	$R_{low} = \mathbf{I}_4$
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.

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 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.

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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

$$P(a,b) = \begin{cases} 1 & for \ a = (j-1)Nr + i \ and \ b = 2(j-1)Nr + i, \\ 1 & for \ a = (j-1)Nr + i \ and \ b = 2(j-Nt/2)Nr - Nr + i, \\ 0 & otherwise \end{cases} i = 1, \dots, Nr, \ j = Nt/2 + 1, \dots, Nt + i \\ 0 & otherwise \end{cases}$$

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, $R_{eNB} = 1$.

For 4-antenna transmitter using two pairs of cross-polarized antenna elements, $R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & I \end{pmatrix}$.

For 8-antenna transmitter using four pairs of cross-polarized antenna elements,
$$R_{eNB} = \begin{pmatrix} 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} & \alpha \\ \alpha^{\frac{1}{9}} & 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} \\ \alpha^{\frac{4}{9}} & \alpha^{\frac{1}{9}} & 1 & \alpha^{\frac{1}{9}} \\ \alpha^{\frac{4}{9}} & \alpha^{\frac{4}{9}} & \alpha^{\frac{1}{9}} & 1 \end{pmatrix}$$

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 high spatial correlation are given in Table B.2.3A.3-1.

Table	B.2.3A.3-1	

High spatial correlation					
	0.9	0.9	0.3		
Note 1: Valu	e of α applies when more th	an one pair of cross-polarized a	ntenna elements at eNB side.		
Note 2: Valu	e of β applies when more th	an one pair of cross-polarized a	ntenna elements at UE side.		

The correlation matrices for high spatial correlation are defined in Table B.2.3A.3-2 as below.

The values in Table B.2.3A.3-2 have been adjusted to insure the correlation matrix is positive semi-definite after roundoff 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

		1.0000	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	1.0000	0.0000	0.9883	0.0000	0.9542	0.0000	-0.2965	0.0000	-0.3000	0.0000	-0.2965	0.0000	-0.2862	0.0000
		0.0000	0.9883	0.0000	1.0000	0.0000	0.9883	0.0000	0.9542	0.0000	0.2965	0.0000	0.3000	0.0000	0.2965	0.0000	0.2862
		0.9542	0.0000	0.9883	0.0000	1.0000	0.0000	0.9883	0.0000	-0.2862	0.0000	-0.2965	0.0000	-0.3000	0.0000	-0.2965	0.0000
		0.0000	0.9542	0.0000	0.9883	0.0000	1.0000	0.0000	0.9883	0.0000	0.2862	0.0000	0.2965	0.0000	0.3000	0.0000	0.2965
		0.8999	0.0000	0.9542	0.0000	0.9883	0.0000	1.0000	0.0000	-0.2700	0.0000	-0.2862	0.0000	-0.2965	0.0000	-0.3000	0.0000
	D	0.0000	0.8999	0.0000	0.9542	0.0000	0.9883	0.0000	1.0000	0.0000	0.2700	0.0000	0.2862	0.0000	0.2965	0.0000	0.3000
8x2 case	$R_{high} =$	-0.3000	0.0000	-0.2965	0.0000	-0.2862	0.0000	-0.2700	0.0000	1.0000	0.0000	0.9883	0.0000	0.9542	0.0000	0.8999	0.0000
		0.0000	0.3000	0.0000	0.2965	0.0000	0.2862	0.0000	0.2700	0.0000	1.0000	0.0000	0.9883	0.0000	0.9542	0.0000	0.8999
		-0.2965	0.0000	-0.3000	0.0000	-0.2965	0.0000	-0.2862	0.0000	0.9883	0.0000	1.0000	0.0000	0.9883	0.0000	0.9542	0.0000
		0.0000	0.2965	0.0000	0.3000	0.0000	0.2965	0.0000	0.2862	0.0000	0.9883	0.0000	1.0000	0.0000	0.9883	0.0000	0.9542
		-0.2862	0.0000	-0.2965	0.0000	-0.3000	0.0000	-0.2965	0.0000	0.9542	0.0000	0.9883	0.0000	1.0000	0.0000	0.9883	0.0000
		0.0000	0.2862	0.0000	0.2965	0.0000	0.3000	0.0000	0.2965	0.0000	0.9542	0.0000	0.9883	0.0000	1.0000	0.0000	0.9883
		-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

B.2.3A.4 Beam steering approach

Given the channel spatial correlation matrix in B.2.3A.1, the corresponding random channel matrix H can be calculated. The signal model for the k-th subframe is denoted as

$$y = HD_{\theta_{k}}Wx + n$$

Where

- H is the Nr xNt channel matrix per subcarrier.

- D_{θ_k} is the steering matrix, which is $D_{\theta_k} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & e^{j\theta_k} & 0 & 0 \\ 0 & 0 & e^{j2\theta_k} & 0 \\ 0 & 0 & 0 & e^{j3\theta_k} \end{bmatrix}$,

- 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 8 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.

Parameter	Value		
D_s	300 m		
D_{\min}	2 m		
ν	300 km/h		
f_d	750 Hz		

Table B.3-1: High speed train scenario

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.

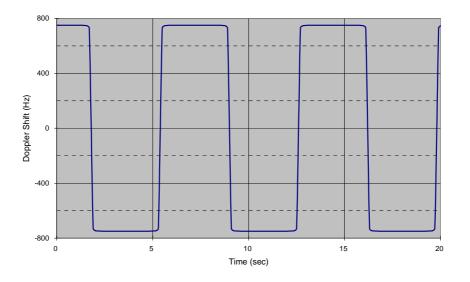


Figure B.3-1: Doppler shift trajectory

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 $y^{(p)}(i)$, $i = 0,1,...,M_{\text{symb}}^{\text{ap}} -1$, for antenna port $p \in \{5, 7, 8\}$, with $M_{\text{symb}}^{\text{ap}}$ the number of modulation symbols including the

user-specific reference symbols (DRS), and generates a block of signals $y_{bf}(i) = \begin{bmatrix} y_{bf}(i) & \tilde{y}_{bf}(i) \end{bmatrix}^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i)y^{(p)}(i)$$

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:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = \frac{1}{\sqrt{2}} \left(W_1(i) y^{(7)}(i) + W_2(i) y^{(8)}(i) \right)$$

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 $\tilde{y}_{bf}(i)$.

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, $y(i) = \begin{bmatrix} y^{(7)}(i) & y^{(8)}(i) \end{bmatrix}^T$, $i = 0, 1, ..., M_{symb}^{ap} - 1$, with M_{symb}^{ap} being the number of modulation symbols per antenna port including the user-specific reference symbols, and generates a block of signals $y_{bf}(i) = \begin{bmatrix} y_{bf}(i) & \tilde{y}_{bf}(i) \end{bmatrix}^T$ the elements of which are to be mapped onto the same physical RE but transmitted on different antenna elements:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i) \begin{bmatrix} y^{(7)}(i) \\ y^{(8)}(i) \end{bmatrix},$$

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 $\tilde{y}_{bf}(i)$.

B.4.3 Generic beamforming model (antenna ports 7-14)

The transmission on antenna port(s) p = 7,8,..., v + 6 is defined by using a precoder matrix W(i) of size $N_{CSI} \times v$, where N_{CSI} is the number of CSI reference signals configured per test and v is the number of spatial layers. This precoder takes as an input a block of signals for antenna port(s) p = 7,8,...,v + 6, $y^{(p)}(i) = \left[y^{(7)}(i) \quad y^{(8)}(i) \quad \cdots \quad y^{(6+v)}(i)\right], i = 0,1,...,M_{symb}^{ap} - 1$, with M_{symb}^{ap} being the number of modulation symbols per antenna port including the user-specific reference symbols (DM-RS), and generates a block of signals $y_{bf}^{(q)}(i) = \left[y_{bf}^{(0)}(i) \quad y_{bf}^{(1)}(i) \quad \ldots \quad y_{bf}^{(N_{CSI}-1)}(i)\right]^{T}$ 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 $y^{(p)}(i)$, $i = 0,1,...,M_{symb}^{ap} - 1$, for antenna port $p \in \{107, 109\}$, with M_{symb}^{ap} the number of modulation symbols including the user-specific reference symbols (DMRS), and generates a block of signals $y_{bf}(i) = [y_{bf}(i) \ \tilde{y}_{bf}(i)]^{t}$. When EPDCCH is associated with port 107, the transmitted block of signals is deonted as

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W_1(i) y^{(107)}(i).$$

When EPDCCH is associated with port 109, the transmitted block of signals is denoted as

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W_2(i) y^{(109)}(i).$$

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 $y^{(p)}(i)$, $i = 0,1,...,M_{symb}^{ap} - 1$, for antenna port $p \in \{107, 108, 109, 110\}$, with M_{symb}^{ap} the number of modulation symbols including the user-specific reference symbols (DMRS), and generates a

block of signals $y_{bf}(i) = [y_{bf}(i) \quad \tilde{y}_{bf}(i)]^T$ 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

 $N_{oc}' = \sum_{i=2}^{N} \hat{I}_{or(j)} + N_{oc}$ 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. 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 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. 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 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.

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.

Physical Channel
PBCH
SSS
PSS
PCFICH
PDCCH
EPDCCH
PHICH
PDSCH

Table C.2-1: Downlink Physical Channels required for connection set-up

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.

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 signal power ratio $E_{\rm RS}$ / $I_{\rm or}$		0 dB	

Table C.3.1-2: Power allocation for OFDM symbols and reference signals

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	$PBCH_RA = \rho_A + \sigma$
	$PBCH_RB = \rho_B + \sigma$
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 = ρ_A + δ
	EPDCCH_RB = $\rho_B + \delta$
PDSCH	PDSCH_RA = ρ_A
	PDSCH_RB = ρ_B
PMCH	PMCH_RA = ρ_A
	PMCH_RB = ρ_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.

Parameter	Unit	Value	Note
Total transmitted power	dBm/15 kHz	Test specific	1. I_{or} shall be kept
spectral density I_{or}			constant throughout all OFDM symbols
Cell-specific reference		Test specific	1. Applies for antenna
signal power ratio $E_{\rm RS}$ / $I_{\it or}$			port p
Energy per resource element EPRE		Test specific	1. The complex-valued symbols $y^{(p)}(i)$ and
			$a_{k,l}^{\left(p ight) }$ 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.

Table C.3.2-2: Power allocation for OFDM symbols and reference signals

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

Dhusiaal Channel	Parameters	Unit	EPRE Ratio	
Physical Channel			Non-ABS	ABS
	PBCH_RA	dB	ρ _Α	Note 1
PBCH	PBCH_RB	dB	ρ _Β	Note 1
PSS	PSS_RA	dB	ρΑ	Note 1
SSS	SSS_RA	dB	ρΑ	Note 1
PCFICH	PCFICH_RB	dB	ρ _Β	Note 1
PHICH	PHICH_RA	dB	ρ _Α	Note 1
	PHICH_RB	dB	ρ _Β	Note 1
PDCCH	PDCCH_RA	dB	ρΑ	Note 1
	PDCCH_RB	dB	ρ _Β	Note 1
PRSCH	PDSCH_RA	dB	N/A	Note 1
PDSCH	PDSCH_RB	dB	N/A	Note 1
00010	OCNG_RA	dB	ρΑ	Note 1
OCNG	OCNG_RB	dB	ρ _Β	Note 1

Physical Channel	Parameters	Unit	EPRE Ratio	
Physical Channel		Unit	Non-ABS	ABS
PBCH	PBCH_RA	dB	ρΑ	ρΑ
FBCH	PBCH_RB	dB	ρ _B	ρ _B
PSS	PSS_RA	dB	ρ _Α	ρΑ
SSS	SSS_RA	dB	ρΑ	ρΑ
PCFICH	PCFICH_RB	dB	ρв	Note 1
PHICH	PHICH_RA	dB	ρ _Α	Note 1
	PHICH_RB	dB	ρ _B	Note 1
PDCCH	PDCCH_RA	dB	ρΑ	Note 1
	PDCCH_RB	dB	ρ _B	Note 1
PDSCH	PDSCH_RA	dB	N/A	Note 1
	PDSCH_RB	dB	N/A	Note 1
OCNG	OCNG_RA	dB	ρ _Α	Note 1
OCING	OCNG_RB	dB	ρ _Β	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

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

Physical Channel	EPRE Ratio	
PBCH	$PBCH_RA = \rho_A + \sigma$	
	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 = $\rho_B + \sigma$	

Table C.3.4-1: Downlink physical channels transmitted in the serving cell (TP1)

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

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.

	Channel bandwidth					
	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 [°] C	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.

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.

Frequency	ASD (Acceleration Spectral Density) random vibration		
5 Hz to 20 Hz	0,96 m ² /s ³		
20 Hz to 500 Hz	0,96 m ² /s ³ at 20 Hz, thereafter –3 dB/Octave		

Table E.2.3-1

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).

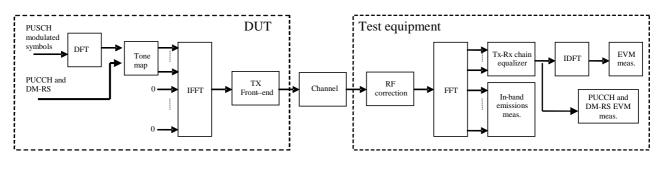


Figure F.1-1: EVM measurement points

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

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \frac{1}{|T_s|} \sum_{t \in T_s} \sum_{\substack{max(f_{\min}, f_l + 12 \cdot \Delta_{RB} + \Delta f) \\ min(f_{\max}, f_l + 12 \cdot \Delta_{RB} + \Delta f) \\ min(f_{\max}, f_h + 12 \cdot \Delta_{RB} + \Delta f) \\ \frac{1}{|T_s|} \sum_{t \in T_s} \sum_{\substack{f_h + (12 \cdot \Delta_{RB} - 11) + \Delta f \\ f_h + (12 \cdot \Delta_{RB} - 11) + \Delta f}} |Y(t, f)|^2, \Delta_{RB} > 0 \end{cases}$$

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,

 $f_l\,\,{\rm and}\,\,f_h\,\,{\rm are}$ 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

$$Emissions_{relative}(\Delta_{RB}) = \frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s| \cdot N_{RB}} \sum_{t \in T_s} \sum_{f_l}^{f_l + (12 \cdot N_{RB} - 1)\Delta f} |Y(t, f)|^2}$$

where

 N_{RB} 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 signal under test is modified and, in the case of PUSCH data signal, decoded according to::

$$Z'(t,f) = IDFT\left\{\frac{FFT\left\{z(v - \Delta \tilde{t}) \cdot e^{-j2\pi\Delta \tilde{f}v}\right\}}{\tilde{a}(t,f) \cdot e^{j\tilde{\varphi}(t,f)}}\right\}$$

where

z(v) is the time domain samples of the signal under test.

The PUCCH or PUSCH demodulation reference signal or PUCCH data signal under test is equalised and, in the case of PUCCH data signal decoded according to:

$$Z'(t,f) = \frac{FFT\left\{z(v - \Delta \tilde{t}) \cdot e^{-j2\pi\Delta \tilde{f}v}\right\}}{\tilde{a}(t,f) \cdot e^{j\tilde{\varphi}(t,f)}} e^{j2\pi j\Delta \tilde{t}}$$

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.

 $\tilde{\varphi}(t, f)$ 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

- > detect the start of each slot and estimate $\Delta \tilde{t}$ and $\Delta \tilde{f}$,
- > 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

> correct the RF frequency offset $\Delta \tilde{f}$ 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 IQ origin offset shall be removed from the evaluated signal before calculating the EVM and the in-band emissions; however, the removed relative IQ origin offset power (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, 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 $\tilde{a}(t)$ and $\tilde{\varphi}(t)$ 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. $\tilde{a}(t, f) = \tilde{a}(t)$ and $\tilde{\varphi}(t, f) = \tilde{\varphi}(t)$. The TX chain coefficient are chosen independently for each preamble transmission and for each $\Delta \tilde{t}$.

At this stage estimates of $\Delta \tilde{f}$, $\tilde{a}(t, f)$, $\tilde{\varphi}(t, f)$ and $\Delta \tilde{c}$ are available. $\Delta \tilde{t}$ is one of the extremities of the window

W, i.e. $\Delta \tilde{t}$ can be $\Delta \tilde{c} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$ or $\Delta \tilde{c} + \left\lfloor \frac{W}{2} \right\rfloor$, where $\alpha = 0$ if *W* is odd and $\alpha = 1$ if *W* is even. The EVM

analyser shall then

> calculate EVM₁ with $\Delta \tilde{t}$ set to $\Delta \tilde{c} + \alpha - \left\lfloor \frac{W}{2} \right\rfloor$,

> 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.

Channel Bandwidth MHz	Cyclic prefix length ¹ N _{cp} for symbol 0	Cyclic prefix length ¹ N_{cp} for symbols 1 to 6	Nominal FFT size	Cyclic prefix for symbols 1 to 6 in FFT samples	EVM window length <i>W</i> in FFT samples	Ratio of <i>W</i> 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	160	144	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.								

Table F.5.3-1 EVM window length for normal CP

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	Cyclic prefix length N_{cp}	Nominal FFT size	Cyclic prefix in FFT samples	EVM window length <i>W</i> 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	512	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	$\begin{array}{c} \textbf{Cyclic} \\ \textbf{prefix} \\ \textbf{length}^1 \ N_{cp} \end{array}$	Nominal FFT size ²	EVM window length <i>W</i> in FFT samples	Ratio of <i>W</i> to CP*			
0	3168	24576	3072	96.7%			
1	21024	24576	20928	99.5%			
2	2 6240		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: T	hese percentage	es are informat	ive				

F.6 Averaged EVM

The general EVM is averaged over basic EVM measurements for 20 slots in the time domain.

$$\overline{EVM} = \sqrt{\frac{1}{20} \sum_{i=1}^{20} EVM_i^2}$$

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:

$$EVM = \max(EVM_1, EVM_h)$$

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 \overline{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 $\Delta \tilde{t} = \Delta \tilde{t}_i$ if $\overline{EVM}_1 > \overline{EVM}_h$, and it is set to $\Delta \tilde{t} = \Delta \tilde{t}_i$ otherwise, where \overline{EVM}_1 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 $\overline{\text{EVM}}_{\text{PRACH,1}}$ is calculated using $\Delta \tilde{t} = \Delta \tilde{t}_1$ and $\overline{\text{EVM}}_{\text{PRACH,h}}$ is calculated using $\Delta \tilde{t} = \Delta \tilde{t}_h$.

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 or exceed 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

2 Image: TBD TBD 3 Image: TBD TBD 4 Image: TBD TBD 5 Image: TBD TBD 6 Image: TBD TBD 7 Image: TBD TBD 8 Image: TBD TBD 9 Image: TBD TBD 10 Image: TBD TBD 11 Image: TBD TBD 12 Image: TBD TBD 13 Image: TBD Image: TBD 14 Image: TBD Image: TBD 17 Image: TBD Image: TBD 18 Image: TBD Image: TBD 19 Image: TBD Image: TBD 20 Image: TBD Image: TBD 21 Image: TBD Image: TBD 22 Image: TBD Image: TBD 23 Image: TBD Image: TBD 24 Image: TBD Image: TBD 23 Image: TBD Image: TBD 24 Image: TBD Image: TBD 33 Image: TBD Image: TB	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
3 TBD 4 TBD 5 TBD 6 TBD 7 TBD 8 TBD 9 TBD 10 TBD 11 TBD 12 TBD 13 TBD 14 TBD 17 TBD 18 TBD 19 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 24 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 39 [-102] 40 [-102] 43 [-102]			FDD
4 TBD 5 TBD 6 TBD 7 TBD 8 TBD 9 TBD 10 TBD 11 TBD 12 TBD 13 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 18 TBD 20 TBD 21 TBD 22 TBD 23 TBD 24 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 40 [-102] 42 [-102]			FDD
5 TBD 6 TBD 7 TBD 8 TBD 9 TBD 10 TBD 11 TBD 12 TBD 13 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 24 TBD 25 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 40 [-102] 42 [-102]			FDD
6 TBD 7 TBD 8 TBD 9 TBD 10 TBD 11 TBD 12 TBD 13 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 24 TBD 25 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 39 [-102] 40 [-102] 43 [-102]			FDD
7 TBD 8 TBD 9 TBD 10 TBD 11 TBD 12 TBD 13 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 18 TBD 20 TBD 21 TBD 22 TBD 23 TBD 24 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 39 [-102] 40 [-102] 43 [-102]			FDD
8 TBD 9 TBD 10 TBD 11 TBD 12 TBD 13 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 39 [-102] 42 [-102]			FDD
9 TBD 10 TBD 11 TBD 11 TBD 12 TBD 13 TBD 14 TBD TBD 14 TBD TBD TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 28 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 40 [-102] 42 [-102] 43 [-102]			FDD
10 TBD 11 TBD 12 TBD 13 TBD 13 TBD 14 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 40 [-102] 43 [-102]			FDD
10 TBD 11 TBD 12 TBD 13 TBD 13 TBD 14 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 40 [-102] 43 [-102]			FDD
11 TBD 12 TBD 13 TBD 14 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 40 [-102] 43 [-102]			FDD
12 TBD 13 TBD 14 TBD 14 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 23 TBD 26 TBD 27 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 40 [-102] 43 [-102]			FDD
13 TBD 14 TBD 14 TBD 17 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 28 TBD ITBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 38 [-102] 40 [-102] 42 [-102] 43 [-102]			FDD
14 TBD 17 TBD 17 TBD 18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 28 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 38 [-102] 39 [-102] 42 [-102] 43 [-102]			FDD
IT IT IT 17 IT IT IT 18 IT IT IT 19 IT IT IT 20 IT IT IT 20 IT IT IT 20 IT IT IT 20 IT IT IT 21 IT IT IT 22 IT IT IT 23 IT IT IT 26 IT IT IT 26 IT IT IT 28 IT IT IT 33 Image: I			FDD
17 TBD TBD 18 TBD TBD 19 TBD TBD 20 TBD TBD 21 TBD TBD 22 TBD TBD 23 TBD TBD 26 TBD TBD 28 TBD TBD 33 [-102] 34 34 [-102] 35 37 [-102] 38 [-102] 39 [-102] 40 [-102] 43			
18 TBD 19 TBD 20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 28 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 40 [-102] 43 [-102]			FDD
20 TBD 21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 28 TBD			FDD
21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 28 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 39 [-102] 40 [-102] 43 [-102]			FDD
21 TBD 22 TBD 23 TBD 26 TBD 27 TBD 28 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 39 [-102] 40 [-102] 43 [-102]			FDD
22 TBD 23 TBD 26 TBD 27 TBD 28 TBD TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 39 [-102] 40 [-102] 43 [-102]			FDD
23 TBD 26 TBD 27 TBD 28 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 39 [-102] 40 [-102] 43 [-102]			FDD
26 TBD 27 TBD 28 TBD Image: Constraint of the second seco			FDD
27 TBD 28 TBD 33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 39 [-102] 40 [-102] 42 [-102] 43 [-102]			FDD
28 TBD Image: Constraint of the second seco			FDD
33 33 33 34 35 36 37 38 39 40 42 43			FDD
33 [-102] 34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 39 [-102] 40 [-102] 42 [-102] 43 [-102]			
34 [-102] 35 [-102] 36 [-102] 37 [-102] 38 [-102] 39 [-102] 40 [-102] 42 [-102] 43 [-102]			TDD
35 [-102] 36 [-102] 37 [-102] 38 [-102] 39 [-102] 40 [-102] 42 [-102] 43 [-102]			TDD
36 [-102] 37 [-102] 38 [-102] 39 [-102] 40 [-102] 42 [-102] 43 [-102]			TDD
37 [-102] 38 [-102] 39 [-102] 40 [-102] 42 [-102] 43 [-102]			TDD
38 [-102] 39 [-102] 40 [-102] 42 [-102] 43 [-102]		<u> </u>	TDD
39 [-102] 40 [-102] 42 [-102] 43 [-102]			TDD
40 [-102] 42 [-102] 43 [-102]			TDD
42 [-102] 43 [-102]		<u> </u>	TDD
43 [-102]			TDD
			TDD
[-102]			TDD
Note 1: The transmitter shall be set to P _{UMAX} as defined in Note 2: Reference measurement channel is G.3 with one s OP.1 FDD/TDD as described in Annex A.5.1.1/A.5	sided dy		
 Note 3: The signal power is specified per port Note 4: For the UE which supports both Band 3 and Band level is FFS. Note 5: For the UE which supports both Band 11 and Ban 	d 9 the re		-

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.

E-UTRA Band / Channel bandwidth / NRB / Duplex mode							
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
10				[6] ¹			FDD
				[0]			100
 17				[6] ¹			FDD
18				[0] [6] ¹			FDD
10				[6] ¹			FDD
20				[6] ¹			FDD
20				[0] [6] ¹			FDD
21				[6] ¹			FDD
23				[6] ¹			FDD
26				[6] ¹			FDD
20				[0] [6] ¹			FDD
28				[0] ¹			FDD
				[U]			TUU
				50			
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	<u> </u>	l		50			TDD
 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 							
	downlink op configuration For the UE uplink config For Band 20 blocks shall	erating ba n for the c which sup guration fc); in the ca be locate	and but co hannel ba ports both or reference ase of 15M d at RBsta	nfined with andwidth (T a Band 11 a ce sensitivit /IHz channe art _11 and	in t abl and ty is el b l in	he trans le 5.6-1) Band 2 s FFS. andwid the cas	he transmission ba e 5.6-1). Band 21 the minir FFS. andwidth, the UL r

 Table G.2-2: Minimum uplink configuration for reference sensitivity

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.

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
35	NS_03
36	NS_03

Table G.2-3: Network Signalling Value for reference sensitivity

G.3 Reference measurement channel for REFSENSE in lower SNR

Tables G.3-1A 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 Requ	uirements (FDD)
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Parameter	Unit	Unit Value					
Channel bandwidth	MHz	10					
Allocated resource blocks		50					
Subcarriers per resource block		12					
Allocated subframes per Radio Frame		10					
Modulation		QPSK					
Target Coding Rate		1/3					
Number of HARQ Processes	Processes	8					
Maximum number of HARQ transmissions		[4]					
Information Bit Payload per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4392					
For Sub-Frame 5	Bits	N/A					
For Sub-Frame 0	Bits	4392					
Transport block CRC	Bits	24					
Number of Code Blocks per Sub-Frame							
(Note 4)							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits						
For Sub-Frame 5	Bits	N/A					
For Sub-Frame 0	Bits						
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	kbps	3952.					
		8					
UE Category		1-8					
		/IHz and 10MHz channel BW. 3 symbols allocated to					
PDCCH for 5 MHz and 3 MHz. 4							
Note 2: Reference signal, Synchronization	2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]						
	e 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 sequ	ence is {0, 1, 2	, 3} for QPSK.					

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.				
			6				
UE Category			1-5				
Note 1: For normal subframes(0,4,5,9), 2 channel BW; 3 symbols allocated for 1.4 MHz. For special subframe	to PDCCH for	5 MHz and 3 MHz; 4 sym	bols allocated	to PDCCH			
for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. lote 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 [Note 5: As per Table 4.2-2 in TS 36.211 [4]						
Note 6: Redundancy version coding sequ							

Table A.3.2-2A Fixed Reference Channel for Receiver Requirements (TDD)

Annex H (informative): Change history

Table G.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 8.3.0
09-2008	RP#41	RP-080732	53 56	Update of symbol and definitions Addition of MIMO (4x2) and (4x4) Correlation Matrices	8.2.0 8.2.0	8.3.0
09-2008	RP#41	RP-080743			8.3.0	8.4.0
12-2008 12-2008	RP#42 RP#42	RP-080908 RP-080909	94r2 105r1	CR TX RX channel frequency separation 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	8.3.0	8.4.0
12 2009	RP#42	RP-080909	75	1.6MHZ channel from 36.803	8.3.0	8.4.0
12-2008 12-2008	RP#42 RP#42	RP-080909 RP-080909	81	Removal of [] from Section 6 transmitter characteristcs Clarification for PHS band protection	8.3.0	8.4.0
12-2008	RP#42 RP#42	RP-080909 RP-080909	101	Alignement for the measurement interval for transmit signal quality	8.3.0	8.4.0
12-2008	RP#42 RP#42	RP-080909	98r1	Maximum power	8.3.0	8.4.0
12-2008	RP#42 RP#42	RP-080909 RP-080909	57r1	CR UE spectrum flatness	8.3.0	8.4.0
12-2008	RP#42 RP#42	RP-080909 RP-080909	71r1	UE in-band emission	8.3.0	8.4.0
12-2008	RP#42 RP#42	RP-080909 RP-080909	58r1	CR Number of TX exceptions	8.3.0	8.4.0
12-2008	RP#42 RP#42	RP-080909 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-080910	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#42	RP-080911 RP-080911	59 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
12-2000	111 #44	11-000911	3011	Introduction of Maximum Scholavity Degradation	0.0.0	0.4.0

			169	Editorial correction to in-band blocking table. (Technically	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	167	for 1.4 MHz and 3 MHz bandwiths. (Technically Endorsed CR in R4-50bis - R4-091205)	8.5.1	8.6.0
03-2009	RP#44			Editorial correction in Table 6.2.4-1 Boundary between E-UTRA fOOB and spurious emission domain		0.0.1
		111-030308			8.5.0	8.5.1
03-2009	RP#43	RP-090369	111	Reference Measurement Channel for TDD	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	161	CQI reference measurement channels	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	125	Update of Clause 9	8.4.0	8.5.0
03-2009	RP#43	RP-090369		Correction of 36.101 DL RMC table notes	8.4.0	8.5.0
03-2009	RP#43	RP-090369	121	Addition of MIMO (4x4, medium) Correlation Matrix	8.4.0	8.5.0
03-2009			114	Correction to UL Reference Measurement Channel		
	RP#43	RP-090173	110		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-090172	163r1	MBSFN-Unicast demodulation test case for TDD	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	145	Number of information bits in DwPTS	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	139r1	Performance requirement structure for TDD PDSCH	8.4.0	8.5.0
)3-2009	RP#43	RP-090172	109	Update of Clause 8: additional test cases	8.4.0	8.5.0
03-2009 03-2009	RP#43 RP#43	RP-090171 RP-090172	141	AWGN level for UE DL demodulation performance tests	8.4.0 8.4.0	8.5.0
)3-2009)3-2009	RP#43 RP#43	RP-090171 RP-090171	137r1 141	Vide band intermodulation Correction of reference sensitivity power level of Band 9	8.4.0 8.4.0	8.5.0 8.5.0
03-2009 03-2009	RP#43 RP#43	RP-090171 RP-090171	127 137r1	In-band blocking and sensitivity requirement for band 17 Wide band intermodulation	8.4.0 8.4.0	8.5.0 8.5.0
03-2009	RP#43	RP-090171	113	In-band blocking	8.4.0	8.5.0
03-2009	RP#43	RP-090170	140	Removal of ACLR2bis requirements	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	132r2	PUCCH EVM	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	128	Transmission BW Configuration	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	120	Removal of "Out-of-synchronization handling of output power" heading	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	116	Clarification of PHS band including the future plan	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#43	RP-090170 RP-090170	108	Removal of [] from Transmitter Intermodulation	8.4.0	8.5.0
03-2009 03-2009	RP#43 RP#43	RP-090170 RP-090170	156r2 170	A-MPR table for NS_07 Corrections of references (References to tables and figures)	8.4.0 8.4.0	8.5.0 8.5.0
12-2008	RP#42	RP-080927	84r1	Clarification of HST propagation conditions	8.3.0	8.4.0 8.5.0
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-080917	85r1	New Clause 5 outline	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-080915	67	Correction to the figure with the Transmission Bandwidth configuration	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-080912	104	Reference measurement channels for PDSCH performance requirements (TDD)	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	73r1	Addition of 64QAM DL referenbce measurement channel	8.3.0	8.4.0
12-2008	RP#42 RP#42	RP-080912 RP-080912	62 78	Alignement of TB size n Ref Meas channel for RX characteristics TDD Reference Measurement channel for RX characterisctics	8.3.0	8.4.0
2-2008		DD 000010	62	Alignament of TD size a Def Mass shannel for DV sharestoristics	8.3.0	8.4.0

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
05-2009	RP#44	RP-090540	178r2	No additional emission mask indication. (Technically Endorsed CR in R4-50bis - R4-091421)	8.5.1	8.6.0
05-2009	RP#44	RP-090540	220r1	Spectrum emission requirements for band 13	8.5.1	8.6.0
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 ACCR 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
	-		1			
09-2009	RP#45	RP-090877	320	CR Sensitivity relaxation for small BW	9.0.0	9.1.0

00.0000	DD#45		0.40 D.4		000	
09-2009 09-2009	RP#45 RP#45	RP-090877	249R1	CR Pcmax definition (working assumption)	9.0.0 9.0.0	9.1.0 9.1.0
09-2009	RP#45	RP-090877 RP-090877	330 332	Spectrum flatness clarification Transmit power: removal of TC and modification of REFSENS	9.0.0	9.1.0
09-2009	RP#45	RP-090877	282R1	note 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
12-2009	RP-46	RP-091264	335	Test case numbering in TDD PDSCH performance test (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-specific reference signal (Technically endorsed at RAN 4 52bis in R4-093525)	9.1.0	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) A-MPR notation in NS_07 (Technically endorsed at RAN 4 52bis	9.1.0	9.2.0
12-2009	RP-46	RP-091261	355	in R4-093706) Single- and multi-PMI requirements (Technically endorsed at RAN	9.1.0	9.2.0
12-2009	RP-46	RP-091263	359	4 52bis in R4-093846) CQI reference measurement channel (Technically endorsed at	9.1.0	9.2.0
12-2009	RP-46	RP-091263	363	RAN 4 52bis in R4-093970) LTE MBSFN Channel Model (Technically endorsed at RAN 4	9.1.0	9.2.0
12-2009	RP-46	RP-091292	364	52bis in R4-094020) Numbering of PDSCH (User-Specific Reference Symbols)	9.1.0	9.2.0
12-2009 12-2009	RP-46 RP-46	RP-091264 RP-091264	367 369	Numbering of PDSCH (Oser-Specific Reference Symbols) Demodulation Tests Numbering of PDCCH/PCFICH, PHICH, PBCH Demod Tests	9.1.0 9.1.0	9.2.0 9.2.0
12-2009	RP-46	RP-091264	371	Remove [] from Reference Measurement Channels in Annex A	9.1.0	9.2.0
12-2009	RP-46	RP-091264	373R1	Corrections to RMC-s for Maximum input level test for low UE categories	9.1.0	9.2.0
12-2009	RP-46	RP-091261	377	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
12-2009	RP-46	RP-091262	386R3	Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain	9.1.0	9.2.0
12-2009	RP-46	RP-091262	390	Spurious emission table correction for TDD bands 33 and 38.	9.1.0	9.2.0
12-2009 12-2009	RP-46 RP-46	RP-091262 RP-091262	392R2 394	36.101 Symbols and abreviations for Pcmax UTRAACLR1 requirement definition for 1.4 and 3 MHz BW	9.1.0 9.1.0	9.2.0 9.2.0
12-2009	RP-46	RP-091263	396	completed Introduction of the ACK/NACK feedback modes for TDD	9.1.0	9.2.0
				requirements		
12-2009 12-2009	RP-46 RP-46	RP-091262 RP-091262	404R3 416R1	CR Power control exception R8 Relative power tolerance: special case for receiver tests	9.1.0 9.1.0	9.2.0 9.2.0
12-2009	RP-46	RP-091263	420R1	CSI reporting: test configuration for CQI fading requirements	9.1.0	9.2.0
12-2009	RP-46	RP-091284	421R1	Inclusion of Band 20 UE RF parameters	9.1.0	9.2.0

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12:2003 RP-46 RP-091263 438 CR R1 reporting configuration in PUCCH 11 test 9.1.0 9.2.0 12:2003 RP-46 RP-09122 439 Parformance requirements for LTE MBMS 9.1.0 9.2.0 12:2003 RP-46 RP-09122 442R1 In Band Emissions Requirements Correction CR 9.1.0 9.2.0 12:2004 RP-46 RP-091262 444R1 PCMAX definition 9.2.0 9.3.0 0:3010 RP-47 RP-100244 44531 Corrections of various montant table Correction 9.2.0 9.3.0 0:3010 RP-47 RP-100244 48611 CR Band 12 PMS corrections of various montant table Correction 9.2.0 9.3.0 0:3010 RP-47 RP-100244 4961 CR Correction to R1 test 9.2.0 9.3.0 0:3010 RP-47 RP-100244 4461 CR correction to R1 test 9.2.0 9.3.0 0:3010 RP-47 RP-100244 44641 CCR correction to R1 test parformance test in presence of 9.2.0 9.3.0 0:302101 RP-47 RP-100249	12-2009	RP-46	RP-091263	434		9.1.0	9.2.0
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06-2010 RP-48 RP-100628 564 LTE MBMS performance requirements (TDD) 9.3.0 9.4.0 06-2010 RP-48 RP-100629 553r2 Performance requirements for dual-layer beamforming 9.3.0 9.4.0 06-2010 RP-48 RP-100630 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 TS36.101 9.3.0 9.4.0 06-2010 RP-48 RP-100630 526 TS36.101 9.3.0 9.4.0 06-2010 RP-48 RP-100630 508r1 Correction 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 category TDD CRS single-antenna port tests 9.3.0 9.4.0 06-2010 RP-48							
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NP-46 NP-100630 539 Category Category Category 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 RP-48 RP-100631 549r3 Introduction of sustained downlink data-rate performance 9.3.0 9.4.0	06-2010		DD 400000	500		9.3.0	9.4.0
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RP-48 RP-100631 549r3 requirements 9.3.0 9.4.0	06-2010	111 -10		000		0.0.0	0.4.0
				549r3	requirements		
	06-2010	RP-48	RP-100683		Band 20 Rx requirements	9.3.0	9.4.0

00.0040	DD (0	DD 400000			0.4.0	0.5.0
09-2010	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 9.4.0	9.5.0
09-2010	RP-49	RP-100920	597r1	Beamforming model for transmission on antenna port 7/8		9.5.0
09-2010	RP-49	RP-100920	600r1	Correction of full correlation in frequency-selective CQI test	9.4.0	9.5.0
09-2010		DD 400000	004	Correction on single-antenna transmission fixed reference	0.4.0	0.5.0
	RP-49	RP-100920	601	channel	9.4.0	9.5.0
09-2010		DD 400044	005	Reference sensitivity requirements for the 1.4 and 3 MHz	0.4.0	0.5.0
	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				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
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-100914	596r2	CR LTE_TDD_2600_US spectrum band definition additions to TS	9.5.0	10.0.0
03-2010	111-43	11 - 100921	55012	36.101	9.5.0	10.0.0
12-2010	RP-50	RP-101309	680	Demodulation performance requirements for dual-layer	10.0.0	10.1.0
12-2010	KF-00	KF-101309	000	beamforming	10.0.0	10.1.0
12-2010	RP-50	RP-101325	672	Correction on the statement of TB size and subband selection in	10.0.0	10.1.0
12-2010	RP-30	RP-101325	072		10.0.0	10.1.0
40.0040		DD 404007	050	CSI tests	10.0.0	10.1.0
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
				(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
				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
010			0.011	performance test		
12-2010	RP-50	RP-101380	679r1	Adding antenna configuration in CQI fading test case	10.0.0	10.1.0
01-2011	00		0.011	Clause numbering correction	10.0.0	10.1.1
03-2011	RP-51	RP-110359	695	Removal of E-UTRA ACLR for CA	10.1.1	10.1.1
03-2011	RP-51	RP-110338	699	PDCCH and PHICH performance: OCNG and power settings	10.1.1	10.2.0
03-2011	RP-51 RP-51	RP-110336	706r1	Spurious emissions measurement uncertainty	10.1.1	
						10.2.0
03-2011	RP-51	RP-110352	707r1	REFSENSE in lower SNR	10.1.1	10.2.0
03-2011	RP-51	RP-110338	710	PMI performance: Power settings and precoding granularity	10.1.1	10.2.0
03-2011	RP-51	RP-110359	715r2	Definition of configured transmitted power for Rel-10	10.1.1	10.2.0
03-2011	RP-51	RP-110359	717	Introduction of requirement for adjacent intraband CA image	10.1.1	10.2.0
				rejection	46.5.5	4.0.5
03-2011	RP-51	RP-110343	719	Minimum requirements for the additional Rel-9 scenarios	10.1.1	10.2.0
03-2011	RP-51	RP-110343	723	Corrections to power settings for Single layer beamforming with	10.1.1	10.2.0
				simultaneous transmission		
03-2011	RP-51	RP-110343	726r1	Correction to the PUSCH3-0 subband tests for Rel-10	10.1.1	10.2.0
03-2011	RP-51	RP-110338	730	Removing the square bracket for TS36.101	10.1.1	10.2.0
03-2011	RP-51	RP-110349	739	Removal of square brackets for dual-layer beamforming	10.1.1	10.2.0
				demodulation performance requirements		
03-2011	RP-51	RP-110359	751	CR: Maximum input level for intra band CA	10.1.1	10.2.0
03-2011	RP-51	RP-110349	754r2	UE category coverage for dual-layer beamforming	10.1.1	10.2.0
03-2011	RP-51	RP-110343	756r1	Further clarifications for the Sustained Downlink Data Rate Test	10.1.1	10.2.0
03-2011	RP-51	RP-110343	759	Removal of square brackets in sustained data rate tests	10.1.1	10.2.0
		RP-110337	762r1	Clarification to LTE relative power tolerance table		10.2.0
	RP-51		10211		10.1.1	10.2.0
03-2011 03-2011	RP-51 RP-51	RP-110337	764	Introducing UE-selected subband CQI tests	10.1.1 10.1.1	10.2.0

00.0044	DD 5 4	DD (100.10	705		40.4.4	40.0.0
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		DD 440004	700	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 Fixing Band 24 inclusion in TS 36.101	10.2.1	10.3.0
06-2011 06-2011	RP-52 RP-52	RP-110795 RP-110788	768 772	CR: Corrections for UE to UE co-existence requirements of Band	10.2.1	10.3.0 10.3.0
00-2011	111-52	111-110700	112	3	10.2.1	10.5.0
06-2011	RP-52	RP-110812	774	Add 2GHz S-Band (Band 23) in 36.101	10.2.1	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
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 TDD	10.2.1	10.3.0
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 category 1 UE test	10.2.1	10.3.0
06-2011	RP-52	RP-110789	834	Performance requirements for PUCCH 2-0, PUCCH 2-1 and	10.2.1	10.3.0
00 2011	11 02		007	PUSCH 2-2 tests	10.2.1	10.0.0
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
				tables		
09-2011	RP-53	RP-111248	869r1	Clarification on BS precoding information field for RI FDD and PUCCH 2-1 PMI tests	10.3.0	10.4.0
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 spatial multiplexing test	10.3.0	10.4.0
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	RP-111252	895	Further clarification for the dual-layer beamforming demodulation requirements	10.3.0	10.4.0
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
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
09-2011	RP-53	RP-111265	866r1	Intra-band contiguous CA EVM	10.3.0	10.4.0
09-2011	RP-53	RP-111266	935	Introduction of the downlink CA demodulation requirements	10.3.0	10.4.0
09-2011	RP-53	RP-111266	936r1	Introduction of CA UE demodulation requirements for TDD	10.3.0	10.4.0
12-2011	RP-54	RP-111684	947	Corrections of UE categories of Rel-10 reference channels for RF requirements	10.4.0	10.5.0
12-2011	RP-54			Alternative way to define channel bandwidths per operating band	10.4.0	10.5.0
10 0044		RP-111684	948	for CP for TS26 101: Adding note to the function of MPP	10.4.0	1050
12-2011 12-2011	RP-54 RP-54	RP-111686	949	CR for TS36.101: Adding note to the function of MPR Clarification on applying CSI reports during rank switching in RI	10.4.0	10.5.0 10.5.0
		RP-111680	950	FDD test - Rel-10		
12-2011	RP-54	RP-111734	953r1	Corrections for Band 42 and 43 introduction	10.4.0	10.5.0
12-2011	RP-54	RP-111680	956	UE spurious emissions	10.4.0	10.5.0
12-2011	RP-54	RP-111682	959	Add scrambling identity n_SCID for MU-MIMO test	10.4.0	10.5.0
12-2011	RP-54	RP-111690	960r1	P-MPR definition	10.4.0	10.5.0
12-2011	RP-54	RP-111693	962	Pcmax,c Computation Assumptions	10.4.0	10.5.0
12-2011	RP-54	RP-111733	963r1	Correction of frequency range for spurious emission requirements	10.4.0	10.5.0
12-2011	RP-54	RP-111680	966	General review of the reference measurement channels	10.4.0	10.5.0
12-2011	RP-54	RP-111691	945	Corrections of Rel-10 demodulation performance requirements	10.4.0	10.5.0
			-	This CR is only partially implemented due to confliction with CR		
				966		
12-2011	RP-54	RP-111684	946	966 Corrections of UE categories for Rel-10 CSI requirements	10.4.0	10.5.0

				This CR is only partially implemented due to confliction with CR		
12-2011	RP-54	RP-111691	982r2	966 Introduction of SDR TDD test scenario for CA UE demodulation This CR is only partially implemented due to confliction with CR	10.4.0	10.5.0
				966		
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	RP-111686	985	Adding missing UL configuration specification in some UE receiver requirements for case of 1 CC UL capable UE	10.4.0	10.5.0
12-2011	RP-54	RP-111684	998	Correction and maintenance on CQI and PMI requirements (Rel- 10)	10.4.0	10.5.0
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 eICIC 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-120303	1021	Harmonic exceptions in LTE UE to UE co-ex tests	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1023	Unified titles for Rel-10 CSI tests	10.5.0	10.6.0
03-2012	RP-55	RP-120300	1033r1	Introduction of reference channel for eICIC demodulation	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1040r1	Correction of Actual code rate for CSI RMCs	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1041r1	Definition of synchronized operation	10.5.0	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 1061	CA demodulation performance requirements for LTE TDD	10.5.0	10.6.0 10.6.0
03-2012	RP-55 RP-55	RP-120304 RP-120293	1064r1	Requirement for CA SDR FDD test scenario TS36.101 RF editorial corrections Rel 10	10.5.0 10.5.0	10.6.0
03-2012	RP-55	RP-120293	1067r1	Introduction of TM9 demodulation performance requirements	10.5.0	10.6.0
03-2012	RP-55	RP-120304	1071r1	Introduction of a CA demodulation test for UE soft buffer 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 eICIC	10.5.0	10.6.0
03-2012	RP-55	RP-120300	1083r1	Introduction of requirements of CQI reporting definition for ecICIC	10.5.0	10.6.0
03-2012 03-2012	RP-55 RP-55	RP-120304	1084 1070r1	eDL MIMO CSI requirements	10.5.0	10.6.0
03-2012	RP-55 RP-55	RP-120306 RP-120310	1070r1 1074	Introduction of Band 26/XXVI to TS 36.101 Band 41 CA CR for TS36.101, section 5	10.6.0 10.6.0	11.0.0 11.0.0
03-2012	RP-55	RP-120310 RP-120310	1074 1075r1	Band 41 CA CR for TS36.101, section 6	10.6.0	11.0.0
03-2012	RP-55	RP-120310	1075	Band 41 CA CR for TS36.101, section 7	10.6.0	11.0.0
06-2012	RP-56	RP-120795	1070 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	11.0.0	11.1.0
06-2012	RP-56	RP-120779	1097	CR to TS36.101: Correction on parameters for the eDL-MIMO CQI and PMI tests	11.0.0	11.1.0
				CR to TS36.101: Fixed reference channel for PDSCH		
				demodulation performance requirements on eDL-MIMO – NOT		
06-2012	RP-56	RP-120780	1098r1	demodulation performance requirements on eDL-MIMO – NOT 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	implemented as it is based on a wrong version of the spec RMC correction on eDL-MIMO RI test	11.0.0	11.1.0
06-2012 06-2012	RP-56 RP-56	RP-120774 RP-120774	1107 1108r1	implemented as it is based on a wrong version of the spec RMC correction on eDL-MIMO RI test FRC correction on frequency selective CQI and PMI test (Rel-11)	11.0.0 11.0.0	11.1.0 11.1.0
06-2012 06-2012 06-2012	RP-56 RP-56 RP-56	RP-120774 RP-120774 RP-120774	1107 1108r1 1111	implemented as it is based on a wrong version of the spec RMC correction on eDL-MIMO RI test FRC correction on frequency selective CQI and PMI test (Rel-11) Correction on test point for PMI test (Rel-11)	11.0.0 11.0.0 11.0.0	11.1.0 11.1.0 11.1.0
06-2012 06-2012 06-2012 06-2012	RP-56 RP-56 RP-56 RP-56	RP-120774 RP-120774 RP-120774 RP-120784	1107 1108r1 1111 1114r1	implemented as it is based on a wrong version of the spec RMC correction on eDL-MIMO RI test FRC correction on frequency selective CQI and PMI test (Rel-11) Correction on test point for PMI test (Rel-11) Corrections and clarifications on eICIC demodulation test	11.0.0 11.0.0 11.0.0 11.0.0	11.1.0 11.1.0 11.1.0 11.1.0
06-2012 06-2012 06-2012 06-2012 06-2012	RP-56 RP-56 RP-56 RP-56 RP-56	RP-120774 RP-120774 RP-120774 RP-120784 RP-120784	1107 1108r1 1111 1114r1 1117r1	implemented as it is based on a wrong version of the spec RMC correction on eDL-MIMO RI test FRC correction on frequency selective CQI and PMI test (Rel-11) Correction on test point for PMI test (Rel-11) Corrections and clarifications on eICIC demodulation test Corrections and clarifications on eICIC CSI tests	11.0.0 11.0.0 11.0.0 11.0.0 11.0.0	11.1.0 11.1.0 11.1.0 11.1.0 11.1.0 11.1.0
06-2012 06-2012 06-2012 06-2012 06-2012 06-2012	RP-56 RP-56 RP-56 RP-56 RP-56	RP-120774 RP-120774 RP-120774 RP-120784 RP-120784 RP-120783	1107 1108r1 1111 1114r1 1117r1 1119r1	implemented as it is based on a wrong version of the spec RMC correction on eDL-MIMO RI test FRC correction on frequency selective CQI and PMI test (Rel-11) Correction on test point for PMI test (Rel-11) Corrections and clarifications on eICIC demodulation test Corrections and clarifications on eICIC CSI tests Corrections on UE performance requirements	11.0.0 11.0.0 11.0.0 11.0.0 11.0.0 11.0.0	11.1.0 11.1.0 11.1.0 11.1.0 11.1.0 11.1.0 11.1.0
06-2012 06-2012 06-2012 06-2012 06-2012	RP-56 RP-56 RP-56 RP-56 RP-56	RP-120774 RP-120774 RP-120774 RP-120784 RP-120784	1107 1108r1 1111 1114r1 1117r1	implemented as it is based on a wrong version of the spec RMC correction on eDL-MIMO RI test FRC correction on frequency selective CQI and PMI test (Rel-11) Correction on test point for PMI test (Rel-11) Corrections and clarifications on eICIC demodulation test Corrections and clarifications on eICIC CSI tests	11.0.0 11.0.0 11.0.0 11.0.0 11.0.0	11.1.0 11.1.0 11.1.0 11.1.0 11.1.0 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 eICIC 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 elCIC demodulation	11.0.0	11.1.0
				requirements		
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-56	RP-120778 RP-120782	1165r1	Clean-up of UL-MIMO for TS36.101 Removal of unnecessary references to single carrier requirements	11.0.0	11.1.0
06-2012			1171	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 06-2012	RP-56	RP-120784 RP-120780	1193r1 1196	Target SNR setting for eICIC demodulation requirement	11.0.0	11.1.0 11.1.0
06-2012	RP-56 RP-56	RP-120780 RP-120778	1196	Editorial simplification to CA REFSENS UL allocation table Correction of wrong table references in CA receiver tests	11.0.0 11.0.0	11.1.0
06-2012	RP-56	RP-120778	1200r1	Introduction of e850_LB (Band 27) to TS 36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120791 RP-120764	120011	Correction of PHS protection requirements for TS 36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120764 RP-120793	1212 1213r1	Introduction of Band 28 into TS36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120793 RP-120781	121311 1215r1	Proposed revision of subclause 4.3A for TS36.101	11.0.0	11.1.0
06-2012	RP-56	RP-120781	121511 1217r1	Proposed revision of subclause 4.3A for TS36.101 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-120782	121311	SNR definition	11.0.0	11.1.0
06-2012	RP-56	RP-120778	1223	Correction of CSI configuration for CA TM4 tests R11	11.0.0	11.1.0
06-2012	RP-56	RP-120773	1225	CR on CA UE receiver timing window R11	11.0.0	11.1.0
06-2012	RP-56	RP-120784	1226	Extension of static eICIC 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 (ReI-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 eICIC 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	1247	Target SNR setting for eICIC MBSFN-ABS demodulation requirements (Rel-11)	11.1.0	11.2.0
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	11.1.0	11.2.0
				in Japan		
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	Applicability 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 09-2012	RP-57 RP-57	RP-121327 RP-121313	1269 1271	Introduction of CA_B7_B20 in 36.101 Corrections of FRC subframe allocations and other minor	11.1.0 11.1.0	11.2.0 11.2.0
09-2012	RP-57	RP-121305	1274	problems Introduction of requirements for TDD CA Soft Buffer Limitation	11.1.0	11.2.0
09-2012	RP-57	RP-121307	1276	Correction of eDL-MIMIO CSI RMC tables and references	11.1.0	11.2.0
09-2012	RP-57	RP-121307	1278	Correction of MIMO channel model for polarized antennas	11.1.0	11.2.0
09-2012	RP-57	RP-121303	1280	Addition of 15 and 20MHz Bandwidths for Band 23 to TS 36.101 (Rel-11)	11.1.0	11.2.0
09-2012	RP-57	RP-121334	1283r1	Add requirements for inter-band CA of B_1-18 and B_11-18 in TS36.101	11.1.0	11.2.0
09-2012	RP-57	RP-121304	1285r1	CR for MPR mask for multi-clustered simultaneous transmission in single CC in Rel-11	11.1.0	11.2.0
	RP-57	RP-121447	1288r2	Introduction of Japanese Regulatory Requirements to LTE Band	11.1.0	11.2.0
09-2012	-			8(R11)		

09-2012	RP-57	DD 404045	1000	CR for Band 27 A-MPR	11 1 0	11 2 0
09-2012	RP-57 RP-57	RP-121315 RP-121316	1290 1291	CR to replace protected frequency range with new band number	11.1.0 11.1.0	11.2.0 11.2.0
03-2012	111-57	11-121310	1231	27	11.1.0	11.2.0
09-2012	RP-57	RP-121215	1292r1	Introduction of CA band combination Band3 + Band5 to TS	11.1.0	11.2.0
				36.101		
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 09-2012	RP-57 RP-57	RP-121331	1325 1326	Introduction of CA_3_20 RF requirements into TS36.101 A-MPR table correction for NS_18	<u>11.1.0</u> 11.1.0	11.2.0
09-2012	RP-57 RP-57	RP-121316 RP-121304	1326 1332r1	Bandwidth combination sets for intra-band and inter-band carrier	11.1.0	11.2.0 11.2.0
09-2012	NF-37	KF-121304	155211	aggregation	11.1.0	11.2.0
09-2012	RP-57	RP-121325	1339	Introduction of LTE Advanced Carrier Aggregation of Band 4 and	11.1.0	11.2.0
00 2012	14 07	111 121020	1000	Band 13		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		
09-2012	RP-57	RP-121306	1351	FRC for TM9 FDD	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	11.2.0	11.3.0
12-2012	RP-58	RP-121860	1368	measurement channels Correction of eICIC CQI tests	11.2.0	11 2 0
12-2012	RP-56	RP-121860 RP-121860	1300	Correction of eICIC Contests	11.2.0	11.3.0 11.3.0
12-2012	RP-58	RP-121860	1370	Correction on CSI-RS subframe offset parameter	11.2.0	11.3.0
12-2012	RP-58	RP-121862	1374	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
		111 121002	1002			
12-2012	RP-58	RP-121850	1386	L OCNG patterns for Sustained Data rate testing	11.2.0	11.3.0
12-2012 12-2012	RP-58 RP-58	RP-121850 RP-121867	1386 1388r1	OCNG patterns for Sustained Data rate testing Introduction of one periodic CQI test for CA deployments	11.2.0 11.2.0	11.3.0 11.3.0
12-2012	RP-58 RP-58 RP-58	RP-121867	1388r1	Introduction of one periodic CQI test for CA deployments	11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0
	RP-58			Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101	11.2.0	11.3.0
12-2012 12-2012	RP-58 RP-58	RP-121867 RP-121894	1388r1 1396	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121887	1388r1 1396 1401 1406r1	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12	11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121887 RP-121860	1388r1 1396 1401 1406r1 1407	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121887 RP-121860 RP-121862	1388r1 1396 1401 1406r1 1407 1409	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121887 RP-121860	1388r1 1396 1401 1406r1 1407	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121887 RP-121860 RP-121862 RP-121861	1388r1 1396 1401 1406r1 1407 1409 1416	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121887 RP-121860 RP-121862 RP-121861 RP-121861	1388r1 1396 1401 1406r1 1407 1409 1416 1418	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121887 RP-121860 RP-121862 RP-121861 RP-121861 RP-121890	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121887 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121861 RP-121861	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121862 RP-121861 RP-121861 RP-121867 RP-121867	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121871	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections ReI-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121862 RP-121861 RP-121861 RP-121867 RP-121867	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121871	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections ReI-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121871 RP-121896	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections ReI-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101	11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0 11.2.0	11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58 RP-58	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121890 RP-121867 RP-121867 RP-121867 RP-121896 RP-121896	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121867	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1449 1450	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012 12-2012	RP-58	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121867 RP-121860 RP-121861 RP-121862 RP-121860 RP-121860	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1449 1450	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (Rel-11)	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012	RP-58 RP-58 </td <td>RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121860 RP-121861 RP-121862 RP-121860 RP-121860 RP-121860 RP-121860 RP-121860</td> <td>1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1449 1450 1455 1459</td> <td>Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (Rel-11) Correction on FRC table</td> <td>11.2.0 11.2.0</td> <td>11.3.0 11.3.0</td>	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121860 RP-121861 RP-121862 RP-121860 RP-121860 RP-121860 RP-121860 RP-121860	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1449 1450 1455 1459	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (Rel-11) Correction on FRC table	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012	RP-58 RP-58 </td <td>RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121860 RP-121862 RP-121862 RP-121862 RP-121860 RP-121860 RP-121862 RP-121860 RP-121862 RP-121863</td> <td>1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1449 1450 1455 1459 1461r1</td> <td>Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1)</td> <td>11.2.0 11.2.0</td> <td>11.3.0 11.3.0</td>	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121860 RP-121862 RP-121862 RP-121862 RP-121860 RP-121860 RP-121862 RP-121860 RP-121862 RP-121863	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1449 1450 1455 1459 1461r1	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1)	11.2.0 11.2.0	11.3.0 11.3.0
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12-2012 12-2012	RP-58 RP-58 </td <td>RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121862 RP-121862 RP-121860 RP-121862 RP-121862 RP-121862 RP-121862 RP-121879 RP-121882 RP-121882 RP-121803 RP-121903</td> <td>1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1447 1447 1447 1463r1 1473r1</td> <td>Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections ReI-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (ReI-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (ReI-11) Introduction of ther-band CA_11-18 into TS36.101 Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD)</td> <td>11.2.0 11.2.0</td> <td>11.3.0 11.3.0</td>	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121862 RP-121862 RP-121860 RP-121862 RP-121862 RP-121862 RP-121862 RP-121879 RP-121882 RP-121882 RP-121803 RP-121903	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1447 1447 1447 1463r1 1473r1	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections ReI-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (ReI-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (ReI-11) Introduction of ther-band CA_11-18 into TS36.101 Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD)	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012	RP-58 RP-58 </td <td>RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121862 RP-121863 RP-121864 RP-121865 RP-121882 RP-121803 RP-121886</td> <td>1388r1 1396 1401 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1445 1445 1445 1445 1445 14451 1461r1 1468r1 1472r1 1473r1</td> <td>Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of advanced receivers demodulation performance (FDD) Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101</td> <td>11.2.0 11.2.0</td> <td>11.3.0 11.3.0</td>	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121862 RP-121863 RP-121864 RP-121865 RP-121882 RP-121803 RP-121886	1388r1 1396 1401 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1445 1445 1445 1445 1445 14451 1461r1 1468r1 1472r1 1473r1	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for eICIC CSI/demodulation CR on eICIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of advanced receivers demodulation performance (FDD) Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012	RP-58 RP-58 </td <td>RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121862 RP-121862 RP-121860 RP-121862 RP-121862 RP-121862 RP-121862 RP-121879 RP-121882 RP-121882 RP-121803 RP-121903</td> <td>1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1447 1447 1447 1463r1 1473r1</td> <td>Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for elCIC CSI/demodulation CR on elCIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of advanced receivers demodulation performance (FDD) Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101</td> <td>11.2.0 11.2.0</td> <td>11.3.0 11.3.0</td>	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121867 RP-121862 RP-121862 RP-121860 RP-121862 RP-121862 RP-121862 RP-121862 RP-121879 RP-121882 RP-121882 RP-121803 RP-121903	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1444 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1445 1447 1447 1447 1463r1 1473r1	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for elCIC CSI/demodulation CR on elCIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of advanced receivers demodulation performance (FDD) Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012	RP-58 RP-58 </td <td>RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121863 RP-121864 RP-121865 RP-121886 RP-121886 RP-121886</td> <td>1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1443 1442 1444 14450 1455 1459 1461r1 1468r1 1472r1 1473r1 1474 1476</td> <td>Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of SNR definition Brackets clean up for elCIC CSI/demodulation CR on elCIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of advanced receivers demodulation performance (FDD) Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101 Correction of some errors in reference sensitivity for CA in TS 36.101 (R11)</td> <td>11.2.0 11.2.0</td> <td>11.3.0 11.3.0</td>	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121863 RP-121864 RP-121865 RP-121886 RP-121886 RP-121886	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1443 1442 1444 14450 1455 1459 1461r1 1468r1 1472r1 1473r1 1474 1476	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of SNR definition Brackets clean up for elCIC CSI/demodulation CR on elCIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of advanced receivers demodulation performance (FDD) Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101 Correction of some errors in reference sensitivity for CA in TS 36.101 (R11)	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012	RP-58 RP-58 </td <td>RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121863 RP-121864 RP-121886 RP-121886 RP-121886 RP-121803</td> <td>1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1443 1442 1444 14450 1455 1459 1461r1 1468r1 1472r1 1473r1 1474 1480r1</td> <td>Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for elCIC CSI/demodulation CR on elCIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of cA_8_20 RF requirements into TS36.101 Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101 Correction of Some the appropriate beamform TS36.101 Introduction of come the square bracket of A-MPR in TS36.101 Introduction of Advanced receivers Test Cases for TDD</td> <td>11.2.0 11.2.0</td> <td>11.3.0 11.3.0</td>	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121863 RP-121864 RP-121886 RP-121886 RP-121886 RP-121803	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1443 1442 1444 14450 1455 1459 1461r1 1468r1 1472r1 1473r1 1474 1480r1	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of eDL-MIMO RI test and RMC table for the CSI test Minor correction to ceiling function example - rel11 Correction of SNR definition Brackets clean up for elCIC CSI/demodulation CR on elCIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of cA_8_20 RF requirements into TS36.101 Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101 Correction of Some the appropriate beamform TS36.101 Introduction of come the square bracket of A-MPR in TS36.101 Introduction of Advanced receivers Test Cases for TDD	11.2.0 11.2.0	11.3.0 11.3.0
12-2012 12-2012	RP-58 RP-58 </td <td>RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121863 RP-121864 RP-121865 RP-121886 RP-121886 RP-121886</td> <td>1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1443 1442 1444 14450 1455 1459 1461r1 1468r1 1472r1 1473r1 1474 1476</td> <td>Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of SNR definition Brackets clean up for elCIC CSI/demodulation CR on elCIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of advanced receivers demodulation performance (FDD) Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101 Correction of some errors in reference sensitivity for CA in TS 36.101 (R11)</td> <td>11.2.0 11.2.0</td> <td>11.3.0 11.3.0</td>	RP-121867 RP-121894 RP-121850 RP-121850 RP-121860 RP-121861 RP-121861 RP-121861 RP-121861 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121867 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121862 RP-121863 RP-121864 RP-121865 RP-121886 RP-121886 RP-121886	1388r1 1396 1401 1406r1 1407 1409 1416 1418 1422 1431 1436 1437r1 1438 1442 1443 1442 1444 14450 1455 1459 1461r1 1468r1 1472r1 1473r1 1474 1476	Introduction of one periodic CQI test for CA deployments Introduction of CA_B5_B12 in 36.101 Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3 Reference sensitivity for the small bandwidth of CA_4-12 CR on elCIC RI test Cleaning of 36.101 Performance sections Rel-11 Out-of-band blocking requirements for inter-band carrier aggregation Adding missed SNR reference values for CA soft buffer tests Introduction of CA_4A-5A into 36.101 Clean up of specification R11 Band 1 to Band 33 and Band 39 UE coexistence requirements Editorial corrections for Band 26 Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101 Correction of SNR definition Brackets clean up for elCIC CSI/demodulation CR on elCIC RI testing (Rel-11) Correction on FRC table CR for LTE B14 HPUE (Power Class 1) Adding references to the appropriate beamforming model (Rel-11) Introduction of advanced receivers demodulation performance (FDD) Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD) CR to remove the square bracket of A-MPR in TS36.101 Correction of some errors in reference sensitivity for CA in TS 36.101 (R11)	11.2.0 11.2.0	11.3.0 11.3.0

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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
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12-2012	RP-58	RP-121860		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	11.3.0	11.4.0
				aggregation		
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 03-2013	RP-59 RP-59	RP-130260 RP-130287	1574 1575	Remove [] from CSI test case parameters Corrections to UE co-existence	11.3.0 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 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	RP-59	RP-130263	1588	Correction of Transmit modulation quality requirements for CA	11.3.0	11.4.0
03-2013	RP-59	RP-130268	1590	Revision of Common Test Parameters for User-specific Demodulation Tests	11.3.0	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-130264	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 06-2013	RP-59 RP-60	RP-130263 RP-130765	1602 1604r1	Correction of table reference Complementary description for definition of MIMO Correlation	11.3.0 11.4.0	11.4.0 11.5.0
06-2013	RP-60	RP-130763	1607	Matrices using cross polarized antennas 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 eICIC performance requirements	11.4.0	11.5.0
06-2013	RP-60	RP-130765	1625	Correction of test parameters for eICIC 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
06-2013	RP-60	RP-130770	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	1654r1	MPR for intra-band non-contiguous CA	11.4.0	11.5.0
06-2013	RP-60	RP-130765	1656	Modification of configured output power to account for larger tolerance	11.4.0	11.5.0
06-2013	RP-60	RP-130769	1658r1	Missing symbols in the NS_15 table	11.4.0	11.5.0

06-2013	RP-60	RP-130766	1673	Corrections to Rx requirements for inter-band CA configurations with REFSENS exceptions	11.4.0	11.5.0
06-2013	RP-60	RP-130770	1681r1	Correction for TS 36.101	11.4.0	11.5.0
06-2013	RP-60	RP-130763	1684	RF: Corrections to RMC-s for sustained data rate test	11.4.0	11.5.0
06-2013	RP-60	RP-130770	1685	Non-contiguous intraband CA channel spacing	11.4.0	11.5.0
06-2013	RP-60	RP-130766	1689	Carrier aggregation in multi RAT and multiple band combination terminals	11.4.0	11.5.0
06-2013	RP-60	RP-130766	1691	Completion of out-of-band blocking requirements for inter-band CA with one UL	11.4.0	11.5.0
06-2013	RP-60	RP-130767	1695r1	CR on the bandwidth coverage issue of CA demodulation performance (Rel-11)	11.4.0	11.5.0
06-2013	RP-60	RP-130765	1697	Correction on UE maximum output power for intra-band CA (R11)	11.4.0	11.5.0
06-2013	RP-60	RP-130770	1698r1	CR for introduction of FeICIC demodulation performance requirements	11.4.0	11.5.0
06-2013	RP-60	RP-130770	1701	Removing bracket from CA_11A-18A requirments	11.4.0	11.5.0
06-2013	RP-60	RP-130767	1703	CR on the bandwidth coverage issue of CA CQI performance (Rel-11)	11.4.0	11.5.0
06-2013	RP-60	RP-130766	1705	Corrections to ACLR for Rel-11 CA	11.4.0	11.5.0
06-2013	RP-60	RP-130765	1716	Corrections to NS_11 A-MPR Table	11.4.0	11.5.0
06-2013	RP-60	RP-130769	1717	Corrections to NS_12 A-MPR Table	11.4.0	11.5.0
09-2013	RP-61	RP-131285	1731r1	CR on performance requirements of CA soft buffer managemen (Rel-11)	11.5.0	11.6.0
09-2013	RP-61	RP-131281	1735	CR on applicability of CA sustained data rate tests (Rel-11)	11.5.0	11.6.0
09-2013	RP-61	RP-131293	1738r1	Performance requirement for UE under EVA200	11.5.0	11.6.0
09-2013	RP-61	RP-131290	1742r1	CR for introduction of FeICIC PBCH performance requirement	11.5.0	11.6.0
09-2013	RP-61	RP-131290	1744r1	CR for introduction of FeICIC RI reporting requirements	11.5.0	11.6.0
09-2013	RP-61	RP-131292	1746	Beamforming model for EPDCCH test	11.5.0	11.6.0
09-2013	RP-61	RP-131285	1753r1	Introduction of performance requirements for verifying the receiver type for CSI-RS based advanced receivers (FDD/TDD)	11.5.0	11.6.0
09-2013	RP-61	RP-131285	1754r1	CR for 36.101 : Add the definition of 5+20MHz for spectrum emission mask for CA	11.5.0	11.6.0
09-2013	RP-61	RP-131281	1766	UE REFSENS when supporting intra-band CA and inter-band CA	11.5.0	11.6.0
09-2013	RP-61	RP-131279	1771	Correlation matrix for high speed train demodulation scenarios (Rel-11)	11.5.0	11.6.0
09-2013	RP-61	RP-131280	1775	Corrections to sustained data rate test (Rel-11)	11.5.0	11.6.0
09-2013	RP-61	RP-131290	1785r1	CR for introduction of FeICIC CQI requirements	11.5.0	11.6.0
09-2013	RP-61	RP-131281	1793	Clarification of multi-cluster transmission	11.5.0	11.6.0
09-2013	RP-61	RP-131293	1799r1	CA UE Coexistence Table update (Release 11)	11.5.0	11.6.0
09-2013	RP-61	RP-131302	1801	Coexistence between Band 27 and Band 38 (Release 11)	11.5.0	11.6.0
09-2013	RP-61	RP-131281	1806	Incorrect REFSENS UL allocation for CA_1C	11.5.0	11.6.0
09-2013 09-2013	RP-61 RP-61	RP-131281 RP-131293	1810 1812r1	Contiguous intraband CA REFSENS with one UL Remianed Transmitter requirements for intra-band non-contiguous	11.5.0 11.5.0	11.6.0 11.6.0
09-2013	RP-61	RP-131281	1816	CA Correction to Rel-11 A-MPR for CA_NS_04	11.5.0	11.6.0
09-2013	RP-61	RP-131281	1820	The Pcmax clauses restructured	11.5.0	11.6.0
09-2013	RP-61	RP-131285	1830	MPR for intra-band non-contiguous CA	11.5.0	11.6.0
12-2013	RP-62	RP-131928	1846r1	Corrections to the notes in the band UE co-existence requirements table (Rel-11)	11.6.0	11.7.0
12-2013	RP-62	RP-131924	1851	Clean-up of uplink reference measurement channels (Rel-11)	11.6.0	11.7.0
12-2013	RP-62	RP-131937	1853r2	Introduction of test 1-A for CoMP	11.6.0	11.7.0
12-2013	RP-62	RP-131931	1866	CA_NS_05 Emissions	11.6.0	11.7.0
12-2013	RP-62	RP-131939	1868	NS signaling for CA refsens	11.6.0	11.7.0
12-2013	RP-62	RP-131928	1876r2	Intraband CA channel bandwidth combination table restructuring	11.6.0	11.7.0
12-2013	RP-62	RP-131937	1879	CR Minimum requirement with Same Cell ID (with multiple NZP CSI-RS resources)	11.6.0	11.7.0
12-2013	RP-62	RP-131939	1886	CR on correction of definition on Fraction of Maximum Throughput for CA	11.6.0	11.7.0
12-2013	RP-62	RP-131939	1888	CR on correction of test configurations of CA soft buffer tests	11.6.0	11.7.0
12-2013	RP-62	RP-131936	1892r1	CR for FeICIC demodulation performance requirements	11.6.0	11.7.0
12-2013	RP-62	RP-131936	1894r3	CR on FeICIC PBCH performance requirement	11.6.0	11.7.0
12-2013	RP-62	RP-131936	1896r3	CR on RI reporting requirement	11.6.0	11.7.0
12-2013	RP-62	RP-131938	1898	Beamforming model for EPDCCH localized test	11.6.0	11.7.0
	RP-62	RP-131938	1900	Downlink physical setup for EPDCCH test	11.6.0	11.7.0
12-2013			1903	Correction on the UE category for eICIC CQI test	11.6.0	11.7.0
12-2013 12-2013	RP-62	RP-131926				11.7.0
12-2013 12-2013 12-2013	RP-62 RP-62	RP-131931	1905	CR for receiver type verification test of CSI-RS based advanced receivers (Rel-11)	11.6.0	
12-2013 12-2013 12-2013 12-2013	RP-62 RP-62 RP-62	RP-131931 RP-131928	1905 1915r2	receivers (Rel-11) Allowed power reductions for multiple transmissions in a subframe	11.6.0	11.7.0
12-2013 12-2013 12-2013 12-2013 12-2013	RP-62 RP-62 RP-62 RP-62	RP-131931 RP-131928 RP-131936	1905 1915r2 1925r2	receivers (Rel-11) Allowed power reductions for multiple transmissions in a subframe Introduce high SNR TM3 test for FeICIC PDSCH	11.6.0 11.6.0	11.7.0 11.7.0
12-2013 12-2013 12-2013 12-2013 12-2013 12-2013	RP-62 RP-62 RP-62 RP-62	RP-131931 RP-131928 RP-131936 RP-131927	1905 1915r2 1925r2 1933r1	receivers (Rel-11) Allowed power reductions for multiple transmissions in a subframe Introduce high SNR TM3 test for FeICIC PDSCH CR on correction of FRC of power imbalance test	11.6.0 11.6.0 11.6.0	11.7.0 11.7.0 11.7.0
12-2013 12-2013 12-2013 12-2013 12-2013 12-2013 12-2013	RP-62 RP-62 RP-62 RP-62 RP-62	RP-131931 RP-131928 RP-131936 RP-131927 RP-131927	1905 1915r2 1925r2 1933r1 1936	receivers (Rel-11) Allowed power reductions for multiple transmissions in a subframe Introduce high SNR TM3 test for FeICIC PDSCH CR on correction of FRC of power imbalance test UE-UE coexistence for Band 40	11.6.0 11.6.0 11.6.0 11.6.0	11.7.0 11.7.0 11.7.0 11.7.0
12-2013 12-2013 12-2013 12-2013 12-2013 12-2013 12-2013 12-2013	RP-62 RP-62 RP-62 RP-62 RP-62 RP-62	RP-131931 RP-131928 RP-131936 RP-131927 RP-131927 RP-131937	1905 1915r2 1925r2 1933r1 1936 1939r2	receivers (Rel-11) Allowed power reductions for multiple transmissions in a subframe Introduce high SNR TM3 test for FeICIC PDSCH CR on correction of FRC of power imbalance test UE-UE coexistence for Band 40 CR to Introduce fading CQI test for CoMP (FDD)	11.6.0 11.6.0 11.6.0 11.6.0 11.6.0	11.7.0 11.7.0 11.7.0 11.7.0 11.7.0
12-2013 12-2013 12-2013 12-2013 12-2013 12-2013 12-2013	RP-62 RP-62 RP-62 RP-62 RP-62	RP-131931 RP-131928 RP-131936 RP-131927 RP-131927	1905 1915r2 1925r2 1933r1 1936	receivers (Rel-11) Allowed power reductions for multiple transmissions in a subframe Introduce high SNR TM3 test for FeICIC PDSCH CR on correction of FRC of power imbalance test UE-UE coexistence for Band 40	11.6.0 11.6.0 11.6.0 11.6.0	11.7.0 11.7.0 11.7.0 11.7.0

12-2013	RP-62	RP-131931	1960	CA performance requirements for TDD intra-band NC CA	11.6.0	11.7.0
12-2013	RP-62	RP-131936	1961r1	Introduction of reference SNR-s for FeICIC demodulation	11.6.0	11.7.0
0.0				performance requirements		
12-2013	RP-62	RP-131938	1963	OCNG pattern for EPDCCH test	11.6.0	11.7.0
12-2013	RP-62	RP-131939	1967r1	Introduction of UE TM3 demodulation performance requirements under ETU300	11.6.0	11.7.0
12-2013	RP-62	RP-131937	1969r1	Introduction of test 1-A for CoMP TDD	11.6.0	11.7.0
12-2013	RP-62	RP-131939	1971	Modification of TM9 test to verify correct SNR estimation	11.6.0	11.7.0
12-2013	RP-62	RP-131928	1983r1	Correction to blocking requirements and use of ΔR_{IB}	11.6.0	11.7.0
12-2013	RP-62	RP-131939	1987r1	CR on test point clarification for CA demodulation test	11.6.0	11.7.0
12-2013	RP-62	RP-131937	1993r1	CR to Introduce fading CQI test for CoMP (TDD)	11.6.0	11.7.0
12-2013	RP-62	RP-131937	1995	CR to Introduce channel model for CoMP fading CQI tests	11.6.0	11.7.0
12-2013	RP-62	RP-131937	1997r1	CR to Introduce RI test for CoMP (FDD)	11.6.0	11.7.0
12-2013	RP-62	RP-131924	1999r1	Simplification of Band 12/17 in-band blocking test cases	11.6.0	11.7.0
12-2013	RP-62	RP-131938	2000r1	Distributed EPDCCH Demodulation Test	11.6.0	11.7.0
12-2013	RP-62	RP-131938	2002r1	Localized EPDCCH Demodulation Test	11.6.0	11.7.0
12-2013	RP-62	RP-131938	2004r1	Reference Measurement Channels for EPDCCH	11.6.0	11.7.0
12-2013	RP-62	RP-131937	2006r1	Introduction of DL CoMP FDD static CQI test	11.6.0	11.7.0
12-2013	RP-62	RP-131937	2008r1	Introduction of DL CoMP TDD static CQI test	11.6.0	11.7.0
12-2013	RP-62	RP-131924	2013 2023r2	P-max for Band 38 to Band 7 coexistence	11.6.0	11.7.0
12-2013	RP-62	RP-131937		Minimum requirement with Same Cell ID (with multiple NZP CSI- RS resources) TDD	11.6.0	11.7.0
12-2013	RP-62	RP-131937	2025r2	CR Minimum requirement with Different Cell ID and Colliding CRS (with single NZP CSI-RS resource) TDD	11.6.0	11.7.0
12-2013	RP-62	RP-131936	2027	Editoral change on FeICIC PBCH Noc setup	11.6.0	11.7.0
12-2013	RP-62	RP-131931	2034r1	Correction of nominal guard bands for bandwidth classes A and C	11.6.0	11.7.0
12-2013	RP-62	RP-131937	2041r1	CR to Introduce RI test for CoMP (TDD)	11.6.0	11.7.0
12-2013	RP-62	RP-131931	2044	Correction of TDD PCFICH/PDCCH test parameter table	11.6.0	11.7.0
12-2013	RP-62	RP-131939	2046	Add EVA200 to table of channel model parameters	11.6.0	11.7.0
12-2013	RP-62	RP-131926	2058	CA_1C: Correction on CA_NS_02 A-MPR table	11.6.0	11.7.0
12-2013	RP-62	RP-131938	2065	Introduction of EPDCCH TM10 localized test R-11	11.6.0	11.7.0
12-2013	RP-62	RP-131938	2067	Introduction of SDR test for PDSCH with EPDCCH scheduling	11.6.0	11.7.0
03-2014	RP-63	RP-140368	2091r1	CR for maintanence of CA soft buffer tests in Rel-11	11.7.0	11.8.0
03-2014	RP-63	RP-140374	2096r1	CR on TM9 localized ePDCCH test	11.7.0	11.8.0
03-2014	RP-63	RP-140374	2100r1	CR on reference measurement channel for ePDCCH test	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2105	Cleanup of the specification for FeICIC (Rel-11)	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2107r1	UL-DL configuration and other parameters for FeICIC TDD CQI fading test (Rel-11)	11.7.0	11.8.0
03-2014	RP-63	RP-140375	2088	CR for introduction of 15MHz based SDR tests in Rel-11	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2109r1	CR for TS36.101 COMP demodulation requirements	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2111r1	CR for Combinations of channel model parameters	11.7.0	11.8.0
03-2014	RP-63	RP-140374	2112	CR for EPDCCH power allocation (Rel-11)	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2085	CR on reference measurement channel for TM10 PDSCH	11.7.0	11.8.0
03-2014	RP-63	RP-140374	2073r1	demodulation test CR of EPDCCH localzied test with TM10 QCL Type-B	11.7.0	11.8.0
				configuration (Rel-11)		
03-2014	RP-63	RP-140368	2146	Correction of coding rate for 18RBs in UL RMC table	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2130r1	CR to finalize RI test for CoMP	11.7.0	11.8.0
03-2014	RP-63	RP-140374	2162r1	Distributed EPDCCH Demodulation Test	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2128r1	CR to finalize fading CQI test for CoMP	11.7.0	11.8.0
03-2014	RP-63	RP-140370	2159r1	Correction of table notes for NS_12-NS_15 spurious emissions requirements	11.7.0	11.8.0
03-2014	RP-63	RP-140368	2136	Configured transmitted power for CA	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2143r1	Channel spacing for non-contiguous intra-band carrier aggregation	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2141	Clarification of contiguous and non-contiguous intra-band UE capabilities in the same band	11.7.0	11.8.0
03-2014	RP-63	RP-140368	2158	Correction of a table note for Pcmax	11.7.0	11.8.0
03-2014	RP-63	RP-140368	2121	CR for 36.101. Editorial correction on OCNG pattern	11.7.0	11.8.0
03-2014	RP-63	RP-140374	2124r1	CR on correction of downlink SDR tests with EPDCCH scheduling	11.7.0	11.8.0
03-2014	RP-63	RP-140375	2118	Introduction of requirements for SNR test for TM9	11.7.0	11.8.0
03-2014	RP-63	RP-140371	2126r2	Correction on DL CoMP static CQI tests (Rel 11)	11.7.0	11.8.0
06-2014	RP-64	RP-140909	2176r2	RF: Corrections to spurious emission requirements with NS different than NS_01 (Rel-11)	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2197r1	CR on correction on TDD IRC CQI test	11.8.0	11.9.0
06-2014	RP-64	RP-140917	2206r1	CR of EPDCCH localzied test with TM10 QCL Type-B configuration (Rel-11): correction of CSI-RS configurations	11.8.0	11.9.0
06-2014	RP-64	RP-140918	2208	Clean up of TM9 SNR tests	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2214r1	Correction of UE TM3 demodulation performance requirements	11.8.0	11.9.0
06-2014	RP-64	RP-140917	2215r1	CR for EPDCCH test (Rel-11)	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2217r1	CR of modification on FelCIC rank testing (Rel-11)	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2219r1	CR on FeICIC PBCH performance requirement (Rel-11)	11.8.0	11.9.0
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06-2014	RP-64	RP-140918	2221r1	Correction on out-of-band blocking for CA Update demodualtion performance requirements with new UE	11.8.0	11.9.0

				categories		
06-2014	RP-64	RP-140911	2227r1	Correction for CA sustained data rate test (Rel-11)	11.8.0	11.9.0
06-2014	RP-64	RP-140918	2230r1	CR on OCNG and propagation conditions for dual layer TM9 test	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2232	Clarification of Intra-band contiguous CA class C Narrow band blocking requirements	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2238	Correction for CA soft buffer test (Rel-11)	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2246r1	Remove [] from eICIC TDD RI requirement	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2255	Verification of exceptions of REFSENS requirements for carrier aggregation	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2257	Applicability of exceptions to reference sensitivity requirements for CA	11.8.0	11.9.0
06-2014	RP-64	RP-140918	2261r1	Editorial corrections for UE performance requirments for R11	11.8.0	11.9.0
06-2014	RP-64	RP-140909	2268	In-band blocking case nubering re-establisment	11.8.0	11.9.0
06-2014	RP-64	RP-140918	2272	CR for TS36.101 FRC tables for COMP demodulation requirements	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2281r1	Finalization of CoMP demodulation test cases	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2285	CR for finalizing DL COMP CSI reporting requirements	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2287r1	CR for adding DL CoMP CSI RMC tables (Rel-11)	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2313	UE to UE co-existence between B42/B43	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2317	Perf: Corrections to CA (Class C) performance with power imbalance (Rel-11)	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2320r1	CR of modification on FeICIC rank testing (Rel-11)	11.8.0	11.9.0
06-2014 06-2014	RP-64 RP-64	RP-140914 RP-140917	2322r1 2324r1	CR of introducing FelCIC TM9 testing (Rel-11) CR for EPDCCH SDR test (Rel-11)	11.8.0	11.9.0
06-2014	RP-64 RP-64	RP-140917 RP-140911	232411	CR for EPDCCH SDR test (Rel-11) Clean-up CR for demodulation requirements (Rel-11)	11.8.0 11.8.0	11.9.0 11.9.0
06-2014	RP-64 RP-64	RP-140911 RP-140911	2327	Throughput calculation for elCIC demodulation requirements	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2334r1	Introduction of Band 28 requirements for flexible operation in Japan	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2336r1	Add missing Uplink downlink configuration to eICIC TDD RI requirement	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2340	Cleanup of terminology for Rx requirements	11.8.0	11.9.0
06-2014	RP-64	RP-140918	2343	CR on separating CA UE demodulation tests from single carrier tests in Rel-11	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2350	Test configuration for intra-band contiguous carrier aggregation power control	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2361r1	Correction of test configurations for intra-band non-contiguous aggregation	11.8.0	11.9.0
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06-2014	RP-64	RP-140911	2376	Corrections on CA CQI tests	11.8.0	11.9.0
06-2014	RP-64	RP-140911	2386r1	CR on PDSCH transmission for elCIC CSI requirements (Rel-11)	11.8.0	11.9.0
06-2014	RP-64	RP-140914	2390	CA_7C A-MPR Corrections	11.8.0	11.9.0
06-2014	RP-64	RP-140918	2393	CR for TS36.101 CSI RMC table	11.8.0	11.9.0
06-2014 09-2014	RP-64 RP-65	RP-140914 RP-141525	2424 2503	CR on correction for TM10 CSI reporting requirements Perf: Cleanup and better description of DL-RMC-s with dynamic action rate for CSI requirements (Bol 11)	11.8.0 11.9.0	11.9.0 11.10.0
09-2014	RP-65	RP-141525	2564	coding rate for CSI requirements (Rel-11) Corrections to UE coex table	11.9.0	11.10.0
09-2014	RP-65	RP-141525	2433	Correction on support of a bandwidth combination set	11.9.0	11.10.0
09-2014	RP-65	RP-141527	2465	Unequal DL CC RB allocations in Maximum input level	11.9.0	11.10.0
09-2014	RP-65	RP-141527	2468	Intra-band contiguous CA ACS case 2 test clarification	11.9.0	11.10.0
09-2014	RP-65	RP-141527	2483	Corrections on delta Tc for UE MOP for intra-band contiguous CA	11.9.0	11.10.0
09-2014	RP-65	RP-141527	2486	Removal of Class B in UE TX requirement	11.9.0	11.10.0
09-2014	RP-65	RP-141527	2515r1	CR for CA applicability rule in 36.101 in Rel-11	11.9.0	11.10.0
09-2014	RP-65	RP-141527	2518	Editorial CR for CA performance tests in 36.101 in Rel-11	11.9.0	11.10.0
09-2014	RP-65	RP-141527	2547	Correction to NS_20 A-MPR for Band 23	11.9.0	11.10.0
09-2014	RP-65	RP-141530	2446r1	CR of introducing FeICIC TM9 testing (Rel-11)	11.9.0	11.10.0
09-2014	RP-65	RP-141530	2453	Maintenance of CoMP demodulation performance requirements (Rel-11)	11.9.0	11.10.0
09-2014	RP-65	RP-141530	2455	Clean-up CR for EPDCCH and FeICIC PBCH (Rel-11)	11.9.0	11.10.0
09-2014	RP-65	RP-141530	2470	Throughput calculation for feICIC demodulation requirements	11.9.0	11.10.0
09-2014	RP-65	RP-141532	2438	CR on correction on CQI reporting TDD CSI meas in case two CSI subframe sets with CRS test (Rel-11)	11.9.0	11.10.0
09-2014	RP-65	RP-141532	2440	CR on correction on RI reporting CSI meas in case two CSI subframe sets with CRS tests (Rel-11)	11.9.0	11.10.0
09-2014	RP-65	RP-141532	2443	Clarification of high speed train scenario in 36.101 (Rel-11)	11.9.0	11.10.0
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09-2014 09-2014	RP-65 RP-65	RP-141532 RP-141532	2489 2498	RF: Corrections to spurious emission band co-existence requirement for Band 44	11.9.0 11.9.0	11.10.0 11.10.0

History

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