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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.
-	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,
	i.e. excluding the cyclic prefix, at the UE antenna connector; average power is computed within a set of REs used for the transmission of physical channels (including user specific RSs when present), divided by the number of REs within the set, and normalized to the subcarrier spacing
F	Frequency
F _{Interferer} (offset)	Frequency offset of the interferer
F _{Interferer} F _C	Frequency of the interferer Frequency of the carrier centre frequency
FC F _{C,block, high}	Center frequency of the highest transmitted/received carrier in a sub-block.
F _{C,block, low}	Center frequency of the lowest transmitted/received carrier in a sub-block.
F _{C_low}	The centre frequency of the <i>lowest carrier</i> , expressed in MHz.
F _{C_high}	The centre frequency of the highest carrier, expressed in MHz.
$F_{DL_{low}}$	The lowest frequency of the downlink operating band
F _{DL_high}	The highest frequency of the downlink operating band
F _{UL_low}	The lowest frequency of the uplink operating band
F_{UL_high} $F_{edge,block,low}$	The highest frequency of the uplink operating band The lower sub-block edge, where $F_{edge,block,low} = F_{C,block,low} - F_{offset}$.
Fedge,block,high	The upper sub-block edge, where $F_{edge,block,high} = F_{C,block,high} + F_{offset.}$
F _{edge_low}	The <i>lower edge</i> of aggregated channel bandwidth, expressed in MHz.
Fedge_high	The higher edge of aggregated channel bandwidth, expressed in MHz.
Foffset	Frequency offset from $F_{C_{high}}$ to the <i>higher edge</i> or $F_{C_{low}}$ to the <i>lower edge</i> .
Foffset, block, low	Separation between lower edge of a sub-block and the center of the lowest component carrier
$F_{\text{offset,block,high}}$	within the sub-block Separation between higher edge of a sub-block and the center of the highest component carrier within the sub-block
F _{offset_NS_23} F _{OOB}	Frequency offset in MHz needed if NS_23 is used 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 antenna connector
L _{CRB}	Transmission bandwidth which represents the length of a contiguous resource block allocation expressed in units of resources blocks
N _{cp}	Cyclic prefix length
N _{DL}	Downlink EARFCN
N_{oc}	The power spectral density of a white noise source (average power per RE normalised to the
N	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 poise source (average power per PE pormalized to the
N _{oc1}	The power spectral density of a white noise source (average power per RE normalized to the subcorrier appaired) simulating interferences in non CRS suppole in ARS subframe from calls that
	subcarrier spacing), simulating interference in non-CRS symbols in ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector.

N _{oc2}	The power spectral density of a white noise source (average power per RE normalized to the subcarrier spacing), simulating interference in CRS symbols in ABS subframe from all cells that
N_{oc3}	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 normalised to the
	subcarrier spacing), simulating interference in non-ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector
N_{oc}	The power spectral density (average power per RE normalised to the subcarrier spacing) of the
	summation of the received power spectral densities of the strongest interfering cells explicitly defined in a test procedure plus N_{oc} , as measured at the UE antenna connector. The respective
	power spectral density of each interfering cell relative to N_{oc} is defined by its associated DIP
	value.
N _{Offs-DL}	Offset used for calculating downlink EARFCN
N _{Offs-UL}	Offset used for calculating uplink EARFCN
N_{otx}	The power spectral density of a white noise source (average power per RE normalised to the
	subcarrier spacing) simulating eNode B transmitter impairments as measured at the eNode B
N _{RB}	transmit antenna connector 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.
N _{RB_alloc}	Total number of simultaneously transmitted resource blocks in Channel bandwidth or Aggregated
	Channel Bandwidth.
N _{RB,c}	The transmission bandwidth configuration of component carrier c , expressed in units of resource
	blocks
N _{RB,largest BW}	The largest transmission bandwidth configuration of the component carriers in the bandwidth
N	combination, expressed in units of resource blocks Uplink EARFCN.
N _{UL} 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}	Maximum allowed UE output power signalled by higher layers. Same as IE <i>P-Max</i> , defined in [7].
P _{EMAX} , <i>c</i>	Maximum allowed UE output power signalled by higher layers for serving cell c. 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). The measured configured maximum UE output power.
P _{UMAX} 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 c. Allowed maximum configured output power relaxation due to support for inter-band CA operation, for serving cell c.
ΔT_{C}	Allowed operating band edge transmission power relaxation.
$\Delta T_{C,c}$	Allowed operating band edge transmission power relaxation for serving cell c.
$ ho_{\scriptscriptstyle A}$	According to Clause 5.2 in TS 36.213 [6]
$ ho_{\scriptscriptstyle B}$	According to Clause 5.2 in TS 36.213 [6]
σ	Test specific auxiliary variable used for the purpose of downlink power allocation, defined in
\mathbf{W}_{gap}	Annex C.3.2. Sub-block gap size
5"P	and and Set and

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
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
CC	Component Carriers
CPE	Customer Premise Equipment
CPE_X	Customer Premise Equipment for E-UTRA operating band X
CW	Continuous Wave
DL	Downlink
DIP	Dominant Interferer Proportion
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
EPRE	Energy Per Resource Element
E-UTRA	Evolved UMTS Terrestrial Radio Access
EUTRAN	Evolved UMTS Terrestrial Radio Access Network
EVM	Error Vector Magnitude
FDD	Frequency Division Duplex
FRC	Fixed Reference Channel
HD-FDD	Half- Duplex FDD
MCS	Modulation and Coding Scheme
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 cell-
- · •	specific RS
xCH_RB	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols containing cell-
	specific RS
	E to the second s

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)

The requirements in clauses 5, 6 and 7 which are specific to CA and UL-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 TBD

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 and UL-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.

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

4.4 RF requirements in later releases

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

NOTE: For 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 or carrier aggregation configurations 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 FuL_low – FuL_high	Downlink (DL) operating band BS transmit UE receive FDL_low - FDL_high	Duplex Mode
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz	FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz	FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	FDD
4	1710 MHz – 1755 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	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz	FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz	FDD
11	1427.9 MHz – 1447.9 MHz	1475.9 MHz – 1495.9 MHz	FDD
12	699 MHz – 716 MHz	729 MHz – 746 MHz	FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz	FDD
13	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
10	830 MHz – 845 MHz	875 MHz – 890 MHz	FDD
20	832 MHz – 862 MHz	791 MHz – 821 MHz	FDD
20	1447.9 MHz – 1462.9 MHz	1495.9 MHz – 1510.9 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	1525 MHz – 1559 MHz	FDD
25	1850 MHz – 1915 MHz	1930 MHz – 1995 MHz	FDD
26	814 MHz – 849 MHz	859 MHz – 894 MHz	FDD
27	807 MHz – 824 MHz	852 MHz – 869 MHz	FDD
28	703 MHz – 748 MHz	758 MHz – 803 MHz	FDD
29	N/A	717 MHz – 728 MHz	FDD ²
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: I	Band 6 is not applicable Restricted to E-UTRA operation whe		•
(downlink operating band is paired wi carrier aggregation configuration tha	th the uplink operating band (externation	

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 / UE transmit			BS transmit / UE receive			Mode
		Ful_low - Ful_high			F _{DL_lo}	w —	F_{DL_high}	
CA_1	1	1920 MHz	-	1980 MHz	2110 MHz	Ι	2170 MHz	FDD
CA_7	7	2500 MHz	-	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 (D	Duplex			
CA Band	Band	BS receive	BS receive / UE transmit			BS transmit / UE receive			
		F _{UL_low}	_	F _{UL_high}	F _{DL_lo}	F _{DL_high}			
	1	1920 MHz	-	1980 MHz	2110 MHz	-	2170 MHz		
CA_1-5	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	FDD	
CA 1 19	1	1920 MHz	-	1980 MHz	2110 MHz	-	2170 MHz		
CA_1-18	18	815 MHz	I	830 MHz	860 MHz	-	875 MHz	FDD	
CA 1 10	1	1920 MHz	I	1980 MHz	2110 MHz	-	2170 MHz		
CA_1-19	19	830 MHz	Ι	845 MHz	875 MHz	-	890 MHz	FDD	
CA_1-21	1	1920 MHz	Ι	1980 MHz	2110 MHz	Ι	2170 MHz	FDD	
CA_1-21	21	1447.9 MHz	Ι	1462.9 MHz	1495.9 MHz	-	1510.9 MHz	FDD	
CA 2.17	2	1850 MHz	Ι	1910 MHz	1930 MHz	-	1990 MHz	FDD	
CA_2-17	17	704 MHz	Ι	716 MHz	734 MHz	-	746 MHz	FUU	
CA_2-29	2	1850 MHz	Ι	1910 MHz	1930 MHz	-	1990 MHz	FDD	
CA_2-29	29		N/A		717 MHz	-	728 MHz	FDD	
CA_3-5	3	1710 MHz	Ι	1785 MHz	1805 MHz	-	1880 MHz	FDD	
CA_3-5	5	824 MHz	Ι	849 MHz	869 MHz	-	894 MHz	FUU	
CA_3-7	3	1710 MHz	Ι	1785 MHz	1805 MHz	-	1880 MHz	FDD	
CA_3-7	7	2500 MHz	Ι	2570 MHz	2620 MHz	-	2690 MHz		
CA_3-8	3	1710 MHz		1785 MHz	1805 MHz		1880 MHz		
CA_3-0	8	880 MHz		915 MHz	925 MHz		960 MHz	FDD	
CA 2 20	3	1710 MHz	Ι	1785 MHz	1805 MHz	-	1880 MHz	EDD	
CA_3-20	20	832 MHz	Ι	862 MHz	791 MHz	-	821 MHz	FDD	
CA 4-5	4	1710 MHz	Ι	1755 MHz	2110 MHz	-	2155 MHz	FDD	
CA_4-5	5	824 MHz	Ι	849 MHz	869 MHz	-	894 MHz	FUU	
CA_4-7	4	1710 MHz		1755 MHz	2110 MHz		2155 MHz	FDD	
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	Ι	716 MHz	729 MHz	-	746 MHz	FDD	
CA_4-13	4	1710 MHz	-	1755 MHz	2110 MHz	-	2155 MHz	FDD	
UA_4-13	13	777 MHz	-	787 MHz	746 MHz	-	756 MHz	100	
CA_4-17	4	1710 MHz	-	1755 MHz	2110 MHz	-	2155 MHz	FDD	
07_4-17	17	704 MHz	-	716 MHz	734 MHz	-	746 MHz	100	
CA_4-29	4	1710 MHz	-	1755 MHz	2110 MHz	-	2155 MHz	FDD	
CA_4-29	29		N/A		717 MHz	-	728 MHz	FDD	
CA_5-12	5	824 MHz	-	849 MHz	869 MHz	-	894 MHz	FDD	
CA_5-12	12	699 MHz	Ι	716 MHz	729 MHz	-	746 MHz	FDD	
CA_5-17	5	824 MHz	I	849 MHz	869 MHz	Ι	894 MHz	FDD	
07_0-17	17	704 MHz	Ι	716 MHz	734 MHz	-	746 MHz		
CA_7-20	7	2500 MHz	Ι	2570 MHz	2620 MHz	-	2690 MHz	FDD	
UK_1-20	20	832 MHz	I	862 MHz	791 MHz	-	821 MHz		
CA_8-20	8	880 MHz	Ι	915 MHz	925 MHz	-	960 MHz	FDD	
07_0-20	20	832 MHz	-	862 MHz	791 MHz	-	821 MHz		
CA_11-18	11	1427.9 MHz	Ι	1447.9 MHz	1475.9 MHz	-	1495.9 MHz	FDD	
	18	815 MHz	-	830 MHz	860 MHz	-	875 MHz		

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
		FUL_low - FUL_high			F _{DL_low} – F _{DL_high}			
CA_25-25	25	1850 MHz	-	1915 MHz	1930 MHz	-	1995 MHz	FDD
CA_41-41	41	2496 MHz	-	2690 MHz	2496 MHz	Ι	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.

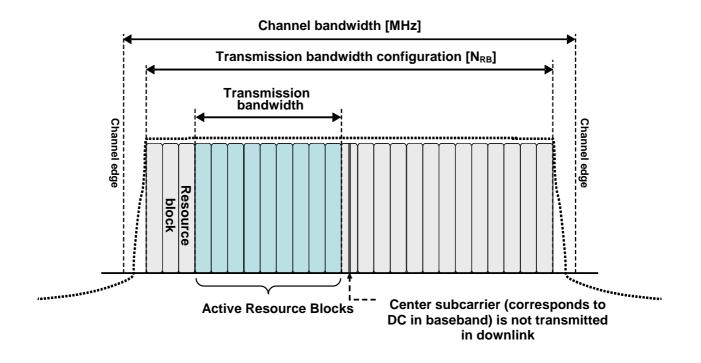


Figure 5.6-1: Definition of channel bandwidth and transmission bandwidth configuration for one E-UTRA carrier

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.

	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		Yes	Yes	Yes ¹	Yes ¹	Yes ^{1, 2}				
33			Yes	Yes	Yes	Yes				
34			Yes	Yes	Yes					
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				
41			Yes	Yes	Yes	Yes				
42			Yes	Yes	Yes	Yes				
43			Yes	Yes	Yes	Yes				
44		Yes	Yes	Yes	Yes	Yes				
	¹ refers to the			elaxation of th						
	sensitivity rec									
				num requirem	nents are so	ecified for				
	E-UTRA UL carrier frequencies confined to either 713-723 MHz or 728-									
	738 MHz					-				
		bandwidth f	or which the	uplink transm	ission band	width can				
				channel assig						
				et unwanted						
((Clause 6.6.3	5.2).								

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.

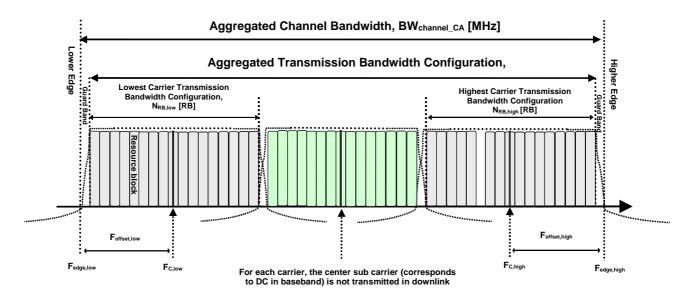


Figure 5.6A-1. Definition of Aggregated channel bandwidth and aggregated channel bandwidth edges

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

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

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

where $\Delta f_1 = \Delta f$ for the downlink with Δf the subcarrier spacing and $\Delta f_1 = 0$ for the uplink, while N_{RB,low} and N_{RB,high} are the transmission bandwidth configurations according to Table 5.6-1 for the lowest and highest assigned component carrier, 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.

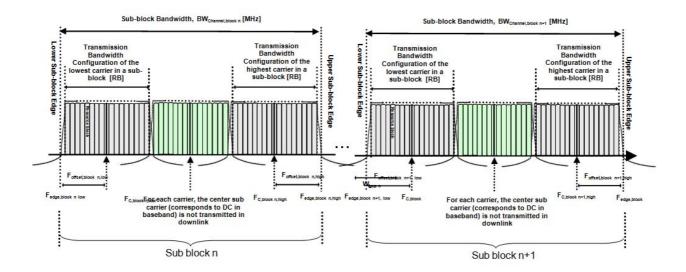


Figure 5.6A-2. Non-contiguous intraband CA terms and definitions

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

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

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:

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

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 Wgap 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	NOTE 3						
С	100 < N _{RB,agg} ≤ 200	2	0.05 max(BW _{Channel(1)} ,BW _{Channel(2)}) - 0.5∆f ₁						
D	200 < N _{RB,agg} ≤ 300	3	NOTE 3						
E	300 < N _{RB,agg} ≤ 400	4	NOTE 3						
F	400 < N _{RB,agg} ≤ 500	5	NOTE 3						
NOTE 1: BW _{Cha}	nnel(1) and BW _{Channel(2)} are c	hannel bandwidth	s of two E-UTRA component carriers						
accord	ling to Table 5.6-1 and Δf_1	= Δf for the downli	ink with Δf the subcarrier spacing while $\Delta f_1 =$						
0 for the uplink.									
NOTE 2: a ₁ = 0.	NOTE 2: $a_1 = 0.16/1.4$ for BW _{Channel(1)} = 1.4 MHz whereas $a_1 = 0.05$ for all other channel bandwidths.								
NOTE 3: Applic	aple for later releases.								

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.

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

E-UTRA CA configuration / Bandwidth combination set								
		Component carriers in o freq	Maximum					
E-UTRA CA configuration	Uplink CA configurations (NOTE 3)	Channel bandwidths for carrier [MHz]	Channel bandwidths for carrier [MHz]	aggregated bandwidth [MHz]	Bandwidth combination set			
CA_1C	CA_1C	15	15	40	0			
CA_IC		20	20	40	0			
CA_7C	CA_7C	15	15	40	0			
	UA_70	20	20	40	Ŭ			
CA_38C	CA_38C	15	15	40	0			
CA_30C		20	20	40	0			
	CA_40C	10	20		0			
CA_40C		15	15	40				
		20	10, 20					
		10	20					
CA_41C	CA_41C	15	15, 20	40	0			
		20	10, 15, 20					
index NOTE 2: For the	king letter). Absend he supported CC b	e of a CA bandwidth class for andwidth combinations, the C	a CA bandwidth class specified an operating band implies supp C downlink and uplink bandwid orted by the present release of s	oort of all classe ths are equal.				

E-UTRA CA Configuration	Uplink CA configurations (NOTE 4)	E-UTRA C E- UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth [MHz]	Bandwidth combination set
CA_1A-5A	-	1 5				Yes Yes			20	0
0.0.0.0.0.0		1			Yes	Yes	Yes	Yes	05	
CA_1A-18A	-	18			Yes	Yes	Yes		- 35	0
CA_1A-19A CA_1A-21A	-	1			Yes	Yes	Yes	Yes	- 35	0
		19			Yes	Yes	Yes			
	-	1		-	Yes	Yes	Yes	Yes		
		21 2			Yes Yes	Yes Yes	Yes		- 20	0
CA_2A-17A	-	17			Yes	Yes				
		2			Yes	Yes			-	
CA_2A-29A	-	29		Yes	Yes	Yes			20	0
		3				Yes	Yes	Yes		
		5		1	Yes	Yes			- 30	0
CA_3A-5A	-	3				Yes				1
		5			Yes	Yes			20	1
CA_3A-7A	-	3			Yes	Yes	Yes	Yes	- 40	0
CA_3A-7A	-	7				Yes	Yes	Yes		
		3				Yes	Yes	Yes	- 30 - 20	0
CA_3A-8A	-	8			Yes	Yes				
0/(_0/(0/(3				Yes				
		8			Yes	Yes	N	Mara		· · · · · ·
CA_3A-20A	-	3 20			Yes Yes	Yes Yes	Yes	Yes	- 30	0
		20 4			Yes	Yes			- 20	0
CA_4A-5A	-	5			Yes	Yes				
		4			Yes	Yes			- 30	0
CA_4A-7A	-	7			Yes	Yes	Yes	Yes		
	-	4	Yes	Yes	Yes	Yes	100		- 20	0
CA_4A-12A		12 ⁵			Yes	Yes				
		4			Yes	Yes	Yes	Yes		
		13				Yes			30	0
CA_4A-13A	-	4			Yes	Yes			20	1
		13				Yes			20	1
CA_4A-17A	-	4		ļ	Yes	Yes			- 20 - 20	0
<u> </u>	-	17 ⁵			Yes	Yes				
CA_4A-29A	-	4		N-	Yes	Yes				
		29 5		Yes	Yes	Yes			- 20	0
CA_5A -12A	-	5 12			Yes Yes	Yes Yes				
		5			Yes	Yes			- 20	0
CA_5A-17A	-	17			Yes	Yes				
CA_7A-20A		7		<u> </u>	103	Yes	Yes	Yes	- 30	0
		20			Yes	Yes				
04 04 004		8			Yes	Yes			- 20	0
CA_8A-20A	-	20		1	Yes	Yes				
CA 11A 10A		11			Yes	Yes			05	2
CA_11A-18A	-	18			Yes	Yes	Yes		25	0

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

(the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.NOTE 2: For each band combination, all combinations of indicated bandwidths belong to the set

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

NOTE 4: Uplink CA configurations are the configurations supported by the present release of specifications. NOTE 5: For the corresponding CA configuration, UE may not support Pcell transmissions in this E-UTRA band.

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

E-UTRA CA configuration			arriers in order of arrier frequency			
	Uplink CA configurations (NOTE 1)	Channel bandwidths for carrier [MHz]	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 =
$$\frac{BW_{Channel(1)} + BW_{Channel(2)} - 0.1 |BW_{Channel(1)} - BW_{Channel(2)}|}{0.6} |0.3 \text{ [MHz]}$$

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.

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

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 NDL	F _{UL_low} (MHz)	Noffs-UL	Range of NuL	
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	
c: 7 c 1	arrier extends bey 5 and 100 channe hannel numbers a 0, 15 and 20 MHz	ond the operation I numbers at the upper operation respectively.	ate carrier frequencie ting band edge shall he lower operating ba erating band edge sh vhen carrier aggrega	not be used. This in and edge and the las all not be used for c	nplies 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

5.7.4 TX–RX frequency separation

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

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	±2 ²		
3					23	±2 ²		
4					23	±2		
5					23	±2		
6					23	±2		
7					23	±2 ²		
8					23	±2 ²		
9					23	±2		
10					23	±2		
11					23	±2		
12					23	±2 ²		
13					23	±2		
14	31	+2/-3			23	±2		
••	01	12/0			20	<u></u>		
17					23	±2		
18					23	+2 ⁵		
19					23	±2		
20					23	$\pm 2^{2}$		
						±2- ±2		
21					23	+2/-3.5 ²		
22					23 23 ⁶			
23						±2 ⁶		
24					23	<u>+2</u>		
25					23	<u>+2²</u>		
26					23	<u>+2</u> ²		
27					23	<u>+2</u>		
28					23	+2/-2.5		
33					23	±2		
34					23	±2		
35					23	±2		
36					23	±2		
37					23	±2		
38					23	±2		
39					23	±2		
40					23	±2		
41					23	±2 ²		
42					23	+2/-3		
43					23	+2/-3		
44					23	+2/[-3]		
NOTE 1:	Void			·				
NOTE 2:						within FuL_low an		
		MHz and F∪∟_h nit by 1.5 dB	_{iigh} , the maxi	mum output p	ower require	ement is relaxed	d by reducing	g the lower
NOTE 3			s both Rand	11 and Band	21 operation	g frequencies, t	he tolerance	is FFS
						to account the t		
						m output power		is relaxed by
						ndwidths confin		
	818 MHz.							
NOTE 6:			the total ou	tout power wit	hin 2000-20	05 MHz shall b	o limitod to 7	dBm

Table 6.2.2-1: UE Power Class

6.2.2A UE maximum output power for CA

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

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

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

For 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/-22		
CA_38C					23	+2/-2		
CA_40C					23	+2/-2		
CA_41C		23 +2/-22						
	NOTE 1: Void NOTE 2: If all transmitted resource blocks (Figure 5.6A-1) over all component carriers are confined within FUL_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/-3 ²		
9					23	+2/-3		
10					23	+2/-3		
11					23	+2/-3		
12					23	+2/-32		
13					23	+2/-3		
14					23	+2/-3		
17					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					23	+2/-3 +2/-4.5 ²		
					23	+2/-4.0-		
23					23	+2/-3		
24					23	+2/-3		
25					23	+2/-32		
26					23	+2/-32		
27					23	+2/-3		
28					23	+2/[-3]		
						,[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		
40					23	+2/-3 ²		
42					23	+2/-4		
43					23	+2/-4		
						+2/[-3] within Fu∟ _{low} ar ement is relaxe		
	tolerance lin For the UE	nit by 1.5 dB which support	s both Band	11 and Band	21 operating	g frequencies, t to account the t	he tolerance	-

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

If UE is configured for transmission on single-antenna port, 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)					
	1.4	3.0	5	10	15	20	
	MHz	MHz	MHz	MHz	MHz	MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

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 MA is defined as follows

$M_A =$	8.00-10.12A	; 0.00< A ≤0.33
	5.67 - 3.07A	; 0.33< A ≤0.77
	3.31	; 0.77< A \leq 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	75 RB + 75	75 RB+100	100 RB + 100	(dB)	
	RB	RB	RB	RB		
QPSK	> 12 and ≤	> 16 and ≤	> 16 and ≤	> 18 and ≤	≤1	
	50	75	75	100		
QPSK	> 50	> 75	> 75	> 100	≤2	
16 QAM	≤ 12	≤ 16	≤ 16	≤ 18	≤ 1	
16 QAM	> 12 and ≤	> 16 and ≤	> 16 and ≤	> 18 and ≤	≤ 2	
	50	75	75	100		
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.

If UE is configured for transmission on single-antenna port, 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
		0 4 40 00 05	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
	0 0 0 0 4	04	40.45	> 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
110_10	0.0.3.3.11	20	10, 15, 20	≥1	≤ 4
NS_19	6.6.3.3.12	44	10, 15, 20	Table	6.2.4-14
NS_20	6.2.2 6.6.2.2.1 6.6.3.3.14	23	5, 10, 15, 20	Table	6.2.4-15
NS_22	6.6.3.3.15	42, 43	5, 10, 15, 20	Table	6.2.4-16
NS_23	6.6.3.3.16	42, 43	5, 10, 15, 20	Ν	I/A
 NS_32	-	-	-	-	

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

Parameters	Region A		Regio	Region C		
RB _{start}		0 - 12	13 – 18	19 – 42	43 – 49	
L _{CRB} [RBs]	6-8	1 to 5 and 9-50	≥8	≥18	≤2	
A-MPR [dB]	≤ 8	≤ 12	≤ 12	≤ 6	≤ 3	
NOTE 1; RB _{start} indicates the lowest RB index of transmitted resource blocks NOTE 2; L _{CRB} is the length of a contiguous resource block allocation NOTE 3: For intra-subframe frequency hopping between two regions, notes 1 and 2 apply on a per slot basis.						
NOTE 4; For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe.						

Table 6.2.4-2: 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	LCRB [RBS]	1 -20			
	A-MPR [dB]	≤2			
	RB _{start}	0 – 15			
20	LCRB [RBS]	1 -20			
	A-MPR [dB]	≤ 5			
NOTE 1: RBstart 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-	subframe frequency hoppir	ng which intersects Region A, notes 1 and 2 apply			
on a per slot basis					
NOTE 4: For intra-subframe frequency hopping which intersect Region A, the larger A-MPR value may be applied for both slots in the subframe					

Table 6.2.4-4: A-MPR requirements for "NS_04" with bar	ndwidth >5MHz
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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				≥2004				
3	L _{CRB} [RBs]	1-1	5			>5				
	A-MPR [dB]	≤				≤ 1				
	Fc [MHz]	<20	04		200)4 ≤ Fc <	2007		≥20	07
5	L _{CRB} [RBs]	1-2	25			6 & -25	8-12		>(6
	A-MPR [dB]	≤]	7		<	4	0		<	1
	Fc [MHz]	200)5 ≤	Fc <2	2015	;		2015	5	
	RB _{start}		0	-49				0-49	9	
10	LCRB [RBS]	1-50				1-50				
	A-MPR [dB]	≤ 12					0			
	Fc [MHz]		-			<2012	2.5			
	RB _{start}	0-4	5-21		l	22-56			57-74	
	LCRB [RBS]	≥1	7-50 0-6		6 & ≥50	≤25	>2	5	>0	
	A-MPR [dB]	≤15	≤7		≤10		0	≤6	5	≤15
15	Fc [MHz]		2012.5							
	RB _{start}	0-12			13-39		40-6	5		66-74
	LCRB [RBS]	≥1		≥3	0	<30	≥ (69 RB _{star}			≥1
	A-MPR [dB]	≤10 ≤6		0	≤2			≤6.5		
	Fc [MHz]					2010)			
	RB _{start}	0-12		1	3-29)	30-68			69-99
20	LCRB [RBS]	≥1	10	-60		1-9 & >60	1-24	≥25	5	≥1
	A-MPR [dB]	≤15	4	≦7		≤10	0	≤7	,	≤15

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

Channel bandwidth [MHz]	Parameters	Reg	Region B	
	RB _{start}		0	1-2
1.4	LCRB [RBS]	≤3 ≥4		≥4
	A-MPR [dB]	≤3 ≤6		≤3
	RB _{start}	C	-3	4-5
3	LCRB [RBS]	4-9	1-3 and 10-15	≥9
	A-MPR [dB]	≤4 ≤3		≤3
	RB _{start}	0-6		7-9
5	LCRB [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	LCRB [RBS]	≤5	≥18	
	A-MPR [dB]	≤3	≤2	

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

Channel bandwidth [MHz]	Parameters	Region A		
	RB _{start}	0		
10	LCRB [RBS]	≤5	=50	
	A-MPR [dB]	≤3	≤1	
	RB _{start}	3≥	3	
15	LCRB [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	RBend [RB]			4-5
1.4	A-MPR [dB]			≤3
	RB _{end} [RB]	0-1	8-12	13-14
3	LCRB [RB]	≤2	≥8	>0
	A-MPR [dB]	≤4	≤4	≤9
	RBend [RB]	0-4	12-19	20-24
5	L _{CRB} [RB]	≤2	≥8	>0
	A-MPR [dB]	≤4	≤5	≤9
	RBend [RB]	0-12	23-36	37-49
10	LCRB [RB]	≤2	≥15	>0
	A-MPR [dB]	≤4	≤6	≤9
	RB _{end} [RB]	0-20	26-53	54-74
15	LCRB [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	LCRB [RB]			≥18
	A-MPR [dB]			≤2
	RBend [RB]	0-4	29-44	45-49
10	LCRB [RB]	≤2	≥24	>0
	A-MPR [dB]	≤4	≤4	≤9
	RBend [RB]	0-12	44-61	62-74
15	LCRB [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	LCRB [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	LCRB [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	LCRB [RBS]	16-20	≥24	16-20		
	A-MPR [dB]	≤2	≤3	≤1		
	RB _{start}	0.	-6	0-10	0-14	11-20
10 MHz	LCRB [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	LCRB [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	LCRB [RBS]			≥40
	A-MPR [dB]			≤1
	RB _{start}	0-6		7-20
15	LCRB [RBS]	≤18	≥36	≥42
	A-MPR [dB]	≤2	≤3	≤2
	RB _{start}	0-	14	15-30
20	LCRB [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 ≤	Fc < 201	2.5	2012.5 ≤ F	c ≤ 2017.5
5	RB _{start}	≤2	24		0	-3		4-6	≤2	24
5	LCRB [RBS]	^	0	1:	5-19	≥2	0	≥18	1-:	25
	A-MPR [dB]	Ì	17		≤1	<u><</u> 2	1	≤2	≤	0
	Fc [MHz]					2	2005			
	RB _{start}		0-25				26-34		35-	49
	LCRB [RBS]		>0		8	3-15		>15	>	0
10	A-MPR [dB]		≤16			≤2		≤5	≤	6
10	Fc [MHz]	2015								
	RB _{start}		0	-5					6-10	
	LCRB [RBS]		2	32				≥40		
	A-MPR [dB]		5	<u>4</u>				≤2		
	Fc [MHz]					2	012.5			
15	RB _{start}		0-14				15-24		25-39	61-74
15	LCRB [RBS]	1-9 & 4	0-75	10-3	39	24-2	29	≥30	≥36	≤6
	A-MPR [dB]	≤11		≤6		≤1	1	≤7	≤5	≤6
	Fc [MHz]	2010								
20	RB _{start}	0-21		22-31			32-38	39-49	50-68	69-99
20	LCRB [RBS]	>0	1-9 & 3	31-75	10-3	30	≥15	≥24	≥25	>0
	A-MPR [dB]	≤17 ≤12 ≤6 ≤9 ≤7 ≤5				≤16				
						10 M	Hz band	width are	specified fo	r E-UTRA
 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. 										

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

Table 6.2.4-16: A-MPR for "NS 22"	Table 6.	2.4-16:	A-MPR	for	"NS	22"
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NOTE 4; For intra-subframe frequency hopping between two regions, the larger A-MPR value of the two regions may be applied for both slots in the subframe.

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

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

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

6.2.4A UE maximum output power with additional requirements for CA

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

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

For intra-band contiguous aggregation with the UE configured for transmissions on two serving cells, the maximum output power reduction specified in Table 6.2.4A-1 is allowed for all serving cells of the applicable uplink CA configurations according to the CA network signalling value indicated by the field additionalSpectrumEmissionSCellr10. Then clause 6.2.3A does not apply, i.e. the carrier aggregation MPR = 0 dB, unless the value indicated is CA_NS_31.

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, 6.6.3.3A.8	CA_41C	6.2.4A.4		
CA_NS_05	6.6.3.3A.4	CA_38C	6.2.4A.5		
CA_NS_06	6.6.3.3A.5	CA_7C	6.2.4A.6		
CA_NS_31	NOTE 1	Table 5.6A.1-1 (NOTE 1)	N/A		
CA_NS_32		Reserved	•		
NOTE 1: Applicable for uplink CA configurations listed in Table 5.6A.1-1 for which none of the additional					
requirements in subclauses 6.6.2.2A or 6.6.3.3A apply.					
NOTE 2: The index of the sequence CA_NS corresponds to the value of additionalSpectrumEmissionSCell- r10.					

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

 $M_A = -22.5 \ A + 17 \qquad ; 0 \leq A < 0.20$

-11.0 A + 14.7 ;
$$0.20 \le A < 0.70$$

-1.7 A + 8.2 ; $0.70 \le A \le 1$

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}	LCRB [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 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.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
	27 – 63	< RB _{end} - 27	≤ 1 dB
100 RB / 100 RB	64 – 100	> RB _{end} - 20	≤ 4 dB
	101 – 171	> 68	≤ 7 dB
	172 – 199	> 0	≤ 10 dB
	0 – 20	> 0	≤ 10 dB
	21 – 45	> 0	≤ 4 dB
	46 – 75	> RB _{end} – 13	≤ 2 dB
75 RB / 75 RB	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

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

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 2: L _{CRB} is th NOTE 3: For intra- NOTE 4: For intra-	licates the lowest RB index of trar e length of a contiguous resource subframe frequency hopping whic subframe frequency hopping whic lots in the subframe	block allocation block	ation regions, notes 1 a			

Table 6.2.4A.4-1: Contigous Allocation 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 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

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

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- 						
		ed for both slots in the subfra				

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 – 99	> max(0, RB _{end} – 25)	≤ 2 dB
100RB/100RB	100 – 142	> 75	≤ 3 dB
	143 – 177	>70	≤ 5 dB
	178 – 199	> 0	≤ 10 dB
	0 – 7	>0	≤ 5 dB
	8- 74	> max(0, RB _{end} – 10)	≤ 2 dB
75RB/75RB	75 – 109	>64	≤ 2 dB
	110 – 144	>35	≤ 6 dB
	145 – 149	>0	≤ 10 dB

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

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

Where MA is defined as follows

$$\begin{split} M_A = & -13.33A + 17.5 & ; \ 0 \leq A < 0.15 \\ & -6.47A + 16.47 & ; \ 0.15 \leq A \leq 1 \end{split}$$

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.

If UE is configured for transmission on single-antenna port, 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:

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

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

Р _{СМАХ,с} (dBm)	Tolerance T(Р _{Смах,с}) (dB)
$23 < P_{CMAX,c} \le 33$	2.0
$21 \le P_{CMAX,c} \le 23$	2.0
20 ≤ P _{CMAX,c} < 21	2.5
$19 \le P_{CMAX,c} < 20$	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 the 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]	
CA_1A-5A	1	0.3	
	5	0.3	
CA_1A-18A	18	0.3	
	1	0.3	
CA_1A-19A	19	0.3	
CA 1A-21A	1	0.3	
	21	0.3	
CA_2A-17A	2	0.3	
 CA 2A-29A	17	0.8	
CA_ZA-Z9A	Ζ	0.3	
	3	0.3	
CA_3A-5A	5	0.3	
CA_3A-7A	3	0.5	
UA_3A-7A	7	0.5	
CA_3A-8A	3	0.3	
	8	0.3	
CA_3A-20A	3 20	0.3	
	4	0.3	
CA_4A-5A	5	0.3	
	4	0.5	
CA_4A-7A	7	0.5	
CA_4A-12A	4	0.3	
0/_ // 12/(12	0.8	
CA_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	
	17	0.4	
CA_7A-20A	7 20	0.3	
	8	0.3	
CA_8A-20A	20	0.4	
0.0.44.0.40.0	11	0.3	
CA_11A-18A	18	0.3	
bands	ove additional tolerances are only ap that belong to the supported inter-bar irations		
suppor	ove additional tolerances also apply i ted E-UTRA operating bands that bel aggregation configurations		
NOTE 3: In case aggreg	e the UE supports more than one of the lation configurations and a E-UTRA of er-band carrier aggregation configura	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 maximum		
	ported carrier aggregation configuration		
	en the E-UTRA operating band freque	ency range is >1 GHz. the	
	icable additional tolerance shall be th		
	ies for that operating band among the		

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 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:

$$P_{CMAX_L} \leq P_{CMAX} \leq P_{CMAX_H}$$

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;
- $\Delta T_{IB,c}$ 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:

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

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

where $p_{UMAX,c}$ denotes the measured maximum output power for serving cell *c* expressed in linear scale. The tolerances $T_{LOW}(P_{CMAX})$ and $T_{HIGH}(P_{CMAX})$ for applicable values of P_{CMAX} are specified in Table 6.2.5A-2 for intra-band carrier

aggregation. The tolerance T_L is the absolute value of the lower tolerance for applicable E-UTRA CA configurations as specified in Table 6.2.2A-1 for intra-band contiguous carrier aggregation.

Р _{СМАХ} (dBm)	Tolerance T _{Low} (P _{CMAX}) (dB)	Tolerance Тнівн(Рсмах) (dB)
$21 \le P_{CMAX} \le 23$	2.0	1
20 ≤ P _{CMAX} < 21	2.5	
19 ≤ P _{CMAX} < 20	3.5	
18 ≤ P _{CMAX} < 19	4.0	
13 ≤ P _{CMAX} < 18	5.0	
8 ≤ P _{CMAX} < 13	6.0	
-40 ≤ P _{CMAX} < 8	7.0	

Table 6.2.5A-2: PCMAX tolerance for dual uplink intra-band contiguous CA

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

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

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

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

Table 6.2.5B-1: PCMAX,c tolerance in closed-loop spatial multiplexing scheme

Рсмах, <i>с</i> (dBm)	Tolerance Tolerance TLOW(PCMAX_L,c) (dB) THIGH(PCMAX_H,c) (dB)				
$P_{CMAX,c} = 23$	3.0	2.0			
22 ≤ P _{CMAX,c} < 23	5.0	2.0			
21 ≤ P _{CMAX,c} < 22	5.0	3.0			
20 ≤ P _{CMAX,c} < 21	6.0	4.0			
16 ≤ P _{CMAX,c} < 20	5.0				
11 ≤ P _{CMAX,c} < 16	6.0				
-40 ≤ P _{CMAX,c} < 11	7.	.0			

If UE is configured for transmission on single-antenna port, 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 3.0 5 10 15 20 MHz MHz MHz MHz MHz 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.

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

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

6.3.2B UE Minimum output power for UL-MIMO

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

6.3.2B.1 Minimum requirement

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

	Channel bandwidth / Minimum output power / Measurement bandwidth					
	1.4 3.0 5 10 15 20 MHz MHz MHz MHz MHz 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 6.3.2B	5.1-1:	Minimum	output	power
--------------	--------	---------	--------	-------

If UE is configured for transmission on single-antenna port, 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 3.0 5 10 15 20 MHz MHz MHz MHz MHz 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 3.0 5 10 15 20 MHz MHz MHz MHz MHz MHz					
Transmit OFF power	-50 dBm					
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 3.0 5 10 15 20 MHz MHz MHz MHz MHz 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 6.3.3B.1-1: Transmit OFF power per antenna port

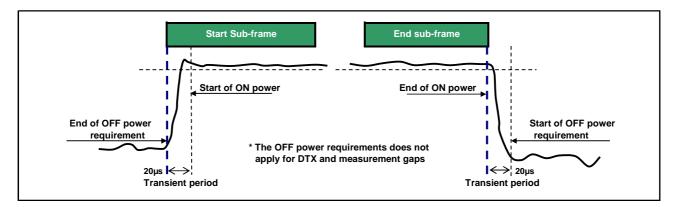
6.3.4 ON/OFF time mask

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.





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

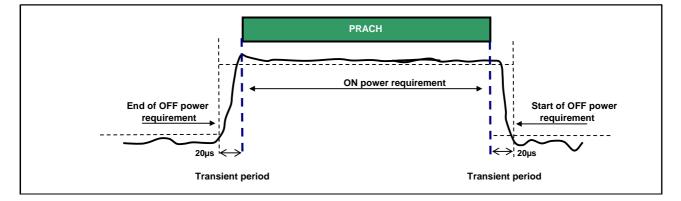


Figure 6.3.4.2-1: PRACH ON/OFF time mask

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.

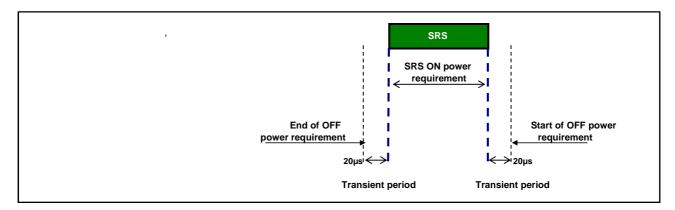


Figure 6.3.4.2.2-1: Single SRS time mask

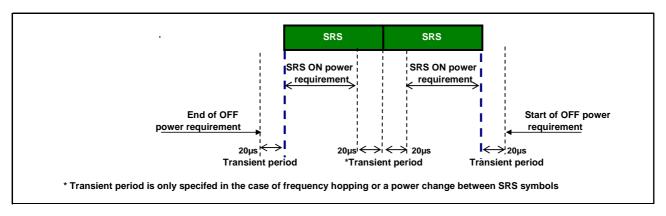
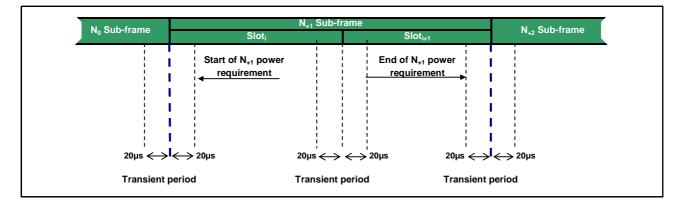


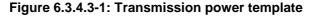
Figure 6.3.4.2.2-2: Dual SRS time mask for the case of UpPTS transmissions

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.

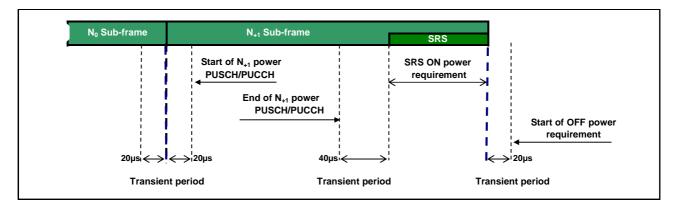


Figure 6.3.4.4-1: PUCCH/PUSCH/SRS time mask when there is a transmission before SRS but not after

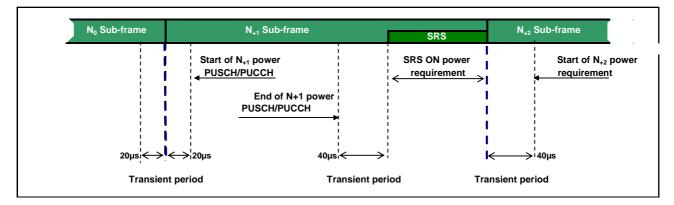


Figure 6.3.4.4-2: PUCCH/PUSCH/SRS time mask when there is transmission before and after SRS

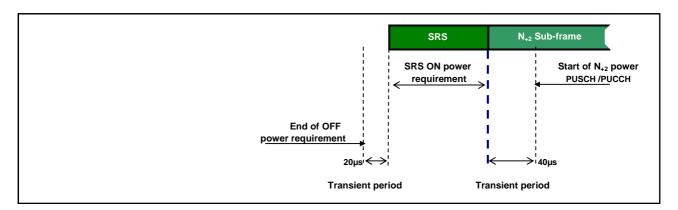
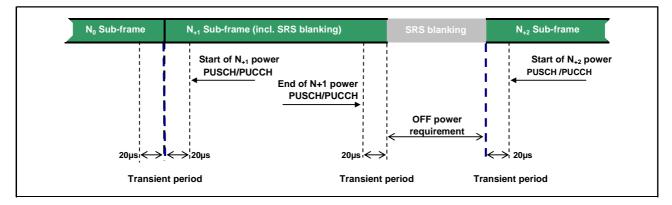


Figure 6.3.4.4-3: PUCCH/PUSCH/SRS time mask when there is a transmission after SRS but not before





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.

If UE is configured for transmission on single-antenna port, 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

Table 6.3.5.1.1-1: Absolute power tolerance

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 ≤ ∆F	' < 3	±3.0	±4.0	±3.0
3 ≤ ∆F	° < 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: For operating bands under Note 2 in Table 6.2.2-1, the relative power tolerance is relaxed by increasing the upper limit by 1.5 dB if the transmission bandwidth of the reference sub-frames is confined within FUL_Iow and FUL_Iow + 4 MHz or FUL_high - 4 MHz and FUL_high and the target sub-frame is not confined within any one of these frequency ranges; if the transmission bandwidth of the target sub-frame is confined within FUL_Iow and FUL_low + 4 MHz or FUL_high - 4 MHz and FUL_high and the target sub-frame is not confined within any one of these frequency ranges; if the transmission bandwidth of the target sub-frame is confined within FUL_low and FUL_low + 4 MHz or FUL_high - 4 MHz and FUL_high and the reference sub-frame is not confined within any one of these frequency ranges, then the tolerance is relaxed by reducing the lower limit by 1.5 dB. NOTE 3: For PUSCH to PUSCH transitions with the allocated resource blocks fixed in frequency and no transmission gaps other than those generated 				
by downlink subframes, DwPTS fields or Guard Periods for TDD: for a power step $\Delta P \le 1$ dB, the relative power tolerance for transmission is ±1.0 dB.				

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

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.

If UE is configured for transmission on single-antenna port, 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
- In-band emissions for the non-allocated RB

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

6.5.2.1 Error Vector Magnitude

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

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

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

6.5.2.1.1 Minimum requirement

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

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

6.5.2.2.1 Minimum requirements

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

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

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

6.5.2.3 In-band emissions

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

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

6.5.2.3.1 Minimum requirements

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

Parameter description	Unit	Limit (Note 1)		Applicable Frequencies	
		ma	$x \{ -25 - 10 \cdot \log_{10} (N_{RB} / L_{CRB}),$		
General dB		$20 \cdot \log_{10} EVM - 3 - 5 \cdot (\Delta_{RB} - 1) / L_{CRB}$,		Any non-allocated	
			$7 \ dBm \ / \ 180 \ kHz - P_{RB} $	(Note 2)	
		-28	Image frequencies when carrier center frequency < 1 GHz and Output power > 10 dBm		
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	dBc	-25	Output power > 10 dBm and carrier center frequency ≥ 1 GHz	Carrier frequency	
leakage		-25	0 dBm ≤ Output power ≤10 dBm	(Notes 4, 5)	
		-20 -10	-30 dBm ≤ Output power ≤ 0 dBm -40 dBm ≤ Output power < -30 dBm		
	n in-hand emissio		nit is evaluated in each non-allocated RB. For each s	uch RB the	
NOTE 2: T a NOTE 3: T b F	he measurement I llocated RB to the llocated RBs. he applicable freq andwidth, based c RBs.	bandwidth is 1 F measured aver uencies for this n symmetry wit	age) that apply. P_{RB} is defined in Note 10. RB and the limit is expressed as a ratio of measured rage power per allocated RB, where the averaging is limit are those that are enclosed in the reflection of the h respect to the centre carrier frequency, but excluding RB and the limit is expressed as a ratio of measured.	done across all ne allocated ng any allocated	
a	llocated RB to the	measured total	RB and the limit is expressed as a ratio of measured power in all allocated RBs. limit are those that are enclosed in the RBs containir		
fr	frequency if N_{RB} is odd, or in the two RBs immediately adjacent to the DC frequency if N_{RB} is even, but excluding any allocated RB.				
NOTE 6:					
NOTE 7:	7: N_{RB} is the Transmission Bandwidth Configuration (see Figure 5.6-1).				
			et between the allocated RB and the measured non-a	llocated RB (e.g.	
Z	$\Delta_{_{RB}}=1$ or $\Delta_{_{RB}}=1$	= -1 for the firs	at adjacent RB outside of the allocated bandwidth.		
NOTE 10:	$P_{_{RB}}$ is the transmit	ted power per 1	80 kHz in allocated RBs, measured in dBm.		

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

6.5.2.4 EVM equalizer spectrum flatness

The zero-forcing equalizer correction applied in the EVM measurement process (as described in Annex F) must meet a spectral flatness requirement for the EVM measurement to be valid. The EVM equalizer spectrum flatness is defined in terms of the maximum peak-to-peak ripple of the equalizer coefficients (dB) across the allocated uplink block. The basic measurement interval is the same as for EVM.

6.5.2.4.1 Minimum requirements

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

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

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

	Frequency range	Maximum ripple [dB]
F _{UL_Meas}	s – $F_{UL_Low} \ge 3 \text{ MHz}$ and $F_{UL_High} - F_{UL_Meas} \ge 3 \text{ MHz}$	4 (p-p)
	(Range 1)	
Ful_Mea	as – FUL_Low < 3 MHz or FUL_High – FUL_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 $F_{\text{UL}_\text{High}}$ 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]
FUL_Meas	s – F∪L_Low ≥ 5 MHz and F∪L_High – F∪L_Meas ≥ 5 MHz	4 (p-p)
	(Range 1)	
FUL_Mea	as – FUL_Low < 5 MHz or FUL_High – FUL_Meas < 5 MHz	12 (p-p)
	(Range 2)	
NOTE 1:	FUL_Meas refers to the sub-carrier frequency for which	the equalizer coefficient is
	evaluated	
NOTE 2:	FUL_Low and FUL_High refer to each E-UTRA frequency	band specified in Table
	5.5-1	

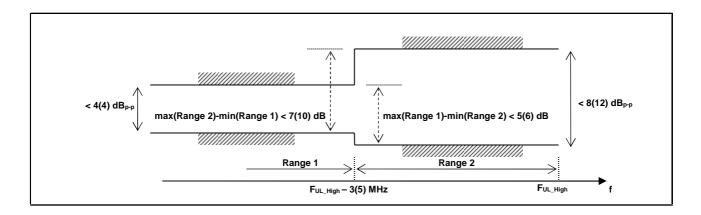


Figure 6.5.2.4.1-1: The limits for EVM equalizer spectral flatness with the maximum allowed variation of the coefficients indicated (the ETC minimum requirement within brackets).

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. Similar transmitter impairment removal procedures are applied for CA waveform before EVM calculation as is specified for non-CA waveform in sub-section 6.5.2.1.

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

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

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

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

6.5.2A.2 Carrier leakage for CA

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

6.5.2A.2.1 Minimum requirements

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

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

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

6.5.2A.3 In-band emissions

6.5.2A.3.1 Minimum requirement for CA

For intra-band contiguous carrier aggregation bandwidth class 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.

Parameter	Unit		Limit	Applicable Frequencies			
General	dB	$20 \cdot \log_{10}$	$25 - 10 \cdot \log_{10} (N_{RB} / L_{CRB}),$ $EVM - 3 - 5 \cdot (\Delta_{RB} - 1) / L_{CRB},$ $/ 180 kHz - P_{RB} \}$	Any non-allocated (Note 2)			
IQ Image	dB		-25	Exception for IQ image (Note 3)			
Carrier leakage	dBc	-25 -20 -10	Output power > 0 dBm -30 dBm ≤ Output power ≤ 0 dBm -40 dBm ≤ Output power < -30 dBm	Exception for Carrier frequency (Note 4)			
 NOTE 1: An in-band emissions combined limit is evaluated in each non-allocated RB. For each such RB, the minimum requirement is calculated as the higher of <i>P_{RB}</i> - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply. <i>P_{RB}</i> is defined in Note 9. The limit is evaluated in each non-allocated RB. NOTE 2:The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs 							
NOTE 3: Ex	ceptions to the g	eneral limit are	e allowed for up to $ L_{\scriptscriptstyle CRBs} $ +1 RBs within	a contiguous width of $L_{\it CRBs}$ +1			
NOTE 4: Ex ba	non-allocated RBs. The measurement bandwidth is 1 RB.						
NOTE 5: L_c	CRB is the Transr	nission Bandw	ridth (see Figure 5.6-1) not exceeding	$N_{RB}/2-1$			
NOTE 8: Δ							
Δ	$\Delta_{RB} = 1$ or $\Delta_{RB} = -1$ for the first adjacent RB outside of the allocated bandwidth).						
NOTE 9: P_{l}	$_{RB}$ is the transmit	ted power per	180 kHz in allocated RBs, measured in	dBm.			

meter Note 1 Frequencies Frequencies General dB BW of 1 RB (180KHz) rectangular) max { -25 - 10 \cdot log 10} (N_{BB} / L_{CBB}), rectangular) The reference value is the allocated The reference value is the allocated Any RB in the non allocated component 0 · log 10 EVM - 3 - 5 · (Δ_{BB} - 1) / L_{CBB}, -57 dBm / 180 kHz - P_{BB}} The reference value is the allocated The reference value is the allocated The frequencies W of 1 RB (180KHz) rectangular) BW of 1 RB (180KHz) rectangular) -25 Note 2 The reference value is the average power per allocated RB in the allocated RB in the allocated RB is derived The reference value is the average power per allocated RB in the allocated RB in the allocated RB is derived The reference value is the allocated when this component carrier IQ Image dB BW of 1 RB (180KHz rectangular) Note 3 The reference value is the allocated when this component carrier The reference value is the total power of the up to 2 non-allocated RBs in the allocated component The reference value is the total power of the up to 2	Para-	Unit	Meas BW		Limit	remark	Applicable		
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NOTE1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement bandwidth.		NOTE1: Resolution BWs smaller than the measurement BW may be integrated to achieve the measurement							
NOTE 2: Exceptions to the general limit is are allowed for up to L_{CRB} +1 RBs within a contiguous width of L_{CRB}	NOTE 2: E	is width of $L_{{\it CRB}}$							
+1 non-allocated RBs.	-	⊦1 non-al	located RBs.				_ `		
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NOTE 4: Notes 1, 5, 6, 7, 8, 9 from Table 6.5.2A.3.1-1 apply for Table 6.5.2A.3.1-2 as well.									
NOTE 5: Δ_{RB} for measured non-allocated RB in the non allocated component carrier may take non-integer	NOTE 5:	$\Delta_{\it RB}$ for r	measured non-a	llocated RB	in the non allocated component ca	arrier may take	non-integer		

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.

If UE is configured for transmission on single-antenna port, the requirements in subclause 6.5.2 apply.

values when the carrier spacing between the CCs is not a multiple of RB.

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.

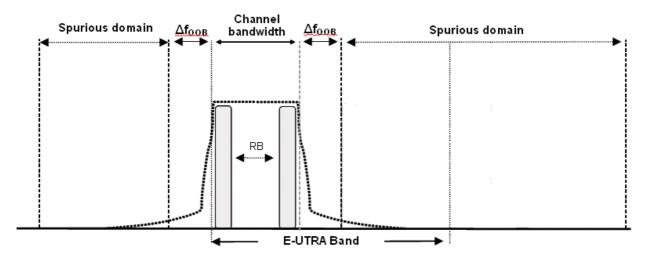


Figure 6.6-1: Transmitter RF spectrum

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 bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
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.

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

Table 6.6.1B-1: Occupied channel bandwidth

If UE is configured for transmission on single-antenna port, 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}								
Δfoob	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		
± 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							
Δfoob	1.4	3.0	5	10	15	20	Measurement	
(MHz)	MHz	MHz	MHz	MHz	MHz	MHz	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 _{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
± 2.8-5.5		-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
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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					
<u></u> Δf _{ООВ} (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.1-1.

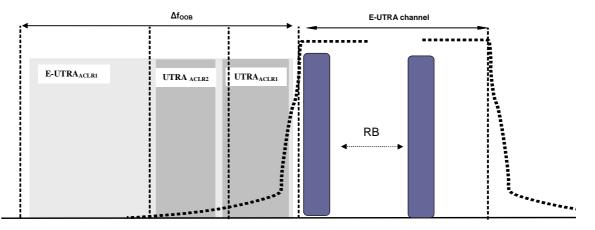
	Spectrum emission limit [dBm]/BW _{Channel_CA}						
Δf _{оов} (MHz)	50+100RB (29.9 MHz)	75+75RB (30 MHz)	75+100RB (34.85 MHz)	100+100RB (39.8 MHz)	Measurement bandwidth		
± 0-1	-22.5	-23	-23.5	-24	30 kHz		
± 1-5	-10	-10	-10	-10	1 MHz		
± 5-27.9	-13	-13	-13	-13	1 MHz		
± 27.9-28.5	-25	-13	-13	-13	1 MHz		
± 28.5-32.85	-25	-25	-25	-13	1 MHz		
± 32.85-34.9	-25	-25	-25	-13	1 MHz		
± 34.9-37.8		-25	-25	-13	1 MHz		
± 37.8-39.85			-25	-25	1 MHz		
$\pm 39.85-44.8$				-25	1 MHz		

Table 6.6.2.2A.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.

6.6.2.3 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.

	Char	Channel bandwidth / E-UTRAACLR1 / 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 centre frequency	+1.4 /	+3.0 /	+5 /	+10 /	+15 /	+20 /		
offset [MHz]	-1.4	-3.0	-5	-10	-15	-20		

Table 6.6.2.3.1-1: General requirements for E-UTRAACLR

1.4	20	_			
	3.0	5	10	15	20
MHz	MHz	MHz	MHz	MHz	MHz
		37 dB	37 dB		
		4.5 MHz	9.0 MHz		
		+5	+10		
		/	/		
		-5	-10		
	1 shall be	shall be applicab	4.5 MHz +5 /	4.5 MHz 9.0 MHz +5 +10 / / -5 -10	4.5 MHz 9.0 MHz +5 +10 / / -5 -10

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 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
UTRA _{ACLR1}	33 dB	33 dB	33 dB	33 dB	33 dB	33 dB
Adjacent channel centre frequency	0.7+BW _{UTRA} /2 / -0.7- BW _{UTRA} /2	1.5+BWutra/2 / -1.5- BWutra/2	+2.5+BW _{UTRA} /2 / -2.5-BW _{UTRA} /2	+5+BW _{UTRA} /2 / -5-BW _{UTRA} /2	+7.5+BWutra/2 / -7.5-BWutra/2	+10+BW _{UTRA} /2 / -10-BW _{UTRA} /2
offset [MHz] 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 UTRAACLR1/2

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 α =0.22. The assigned aggregated channel bandwidth power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.2A-1. 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.

Table 6.6.2.3.3A-1: General	equirements for	CA E-UTRA _{ACLR}
-----------------------------	-----------------	---------------------------

	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	BWChannel_CA - 2* BWGB
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.

If UE is configured for transmission on single-antenna port, 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.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

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

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

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

This clause specifies the spurious emission requirements for carrier aggregation.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

For 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-1the 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	BWChannel_CA + 5

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	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)	Note		
1	E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21,	_		_	-50	1			
	22, 26, 27, 28, 38, 40, 41, 42, 43, 44 E-UTRA Band 3, 34		-	F _{DL_high}	-50	1	15		
	Frequency range	F _{DL_low} 1880	-	F _{DL_high} 1895	-30	1	15,27		
	Frequency range	1895		1895	-40	5	15, 26, 27		
	Frequency range	1895	-	1913	+1.6	5	15, 26, 27		
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	1	13		
	E-UTRA Band 22, 42	F _{DL_low}	-	F_{DL_high}	-50	1	2		
	Frequency range	1884.5	-	1915.7	-41	0.3	13		
4	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 41, 43	F _{DL_low}	-	F_{DL_high}	-50	1			
	E-UTRA Band 42	F _{DL_low}	-	F_{DL_high}	-50	1	2		
5	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 28, 29,42, 43	F _{DL_low}	-	F _{DL_high}	-50	1			
	E-UTRA Band 41	F _{DL_low}	-	F_{DL_high}	-50	1	2		
	E-UTRA Band 26	859	-	869	-27	1			
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	5	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	1	2		
	E-UTRA band 7	F _{DL_low}	-	F_{DL_high}	-50	1	2		
	E-UTRA Band 8	F _{DL_low}	-	F _{DL_high}	-50	1	15		
	E-UTRA Band 22, 41, 42, 43	F _{DL_low}	-	F _{DL_high}	-50	1	2		
	E-UTRA Band 11, 21	F _{DL_low}	-	F_{DL_high}	-50	1	23		
	Frequency range	860	-	890	-40	1	15, 23		
	Frequency range	1884.5	-	1915.7	-41	0.3	8, 23		
9	E-UTRA Band 1, 11, 18, 19, 21, 26, 28, 34	$F_{DL_{low}}$	-	F_{DL_high}	-50	1			
	E-UTRA Band 42	F _{DL_low}	-	F_{DL_high}	-50	1	2		
	Frequency range	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			
10	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 41, 43	F _{DL low}	-	F _{DL high}	-50	1			
	E-UTRA Band 22, 42	F _{DL} low	-	F _{DL_high}	-50	1	2		
11	E-UTRA Band 1, 11, 18, 19, 21, 28, 34, 42	F _{DL_low}	-	F _{DL_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			

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, 25, 26, 27, 29, 41	$F_{DL_{low}}$	-	F_{DL_high}	-50	1	
	Frequency range	769	-	775	-35	0.00625	15
	Frequency range	799	-	805	-35	0.00625	11, 15
	E-UTRA Band 14	F _{DL_low}	_	F _{DL_high}	-50	1	15
	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, 23, 24, 25, 26, 27, 29, 41				-50	1	
		F _{DL_low}	-	F _{DL_high}	-35	0.00625	12, 15
	Frequency range	769 799	-	775 805	-35	0.00625	11, 12, 15
17	Frequency range E-UTRA Band 2, 5, 13, 14, 17, 23, 24,	799	-	605			11, 12, 13
	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
18	E-UTRA Band 1, 11, 21, 34, 42	F _{DL low}	-	F _{DL_high}	-50	1	
	Frequency range	860	-	890	-40	1	
	Frequency range	1884.5	-	1915.7	-41	0.3	8
	Frequency range	758	-	799	-50	1	
	Frequency range	799	-	803	-40	1	15
	Frequency range	945	-	960	-50	1	10
	Frequency range	1839.9	-	1879.9	-50	1	
		2545			-50	1	
19	Frequency range		-	2575	-50	1	
10	E-UTRA Band 1, 11, 21, 28, 34, 42 Frequency range	F _{DL_low} 1884.5	-	F _{DL_high} 1915.7	-30	0.3	8
	Frequency range	945	-	960	-50	1	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	F _{DL low}	-	F _{DL high}	-50	1	
	E-UTRA Band 20	F _{DL low}	-	F _{DL high}	-50	1	15
	E-UTRA Band 38, 42	F _{DL low}	-	F _{DL high}	-50	1	2
	Frequency range	758	-	788	-50	1	
21	E-UTRA Band 1, 18, 19, 28, 34, 42	F _{DL low}	-	F _{DL 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	$F_{DL_{low}}$	-	$F_{DL_{high}}$	-50	1	
	Frequency range	3510	-	3525	-40	1	15
	Frequency range	3525	-	3590	-50	1	
23	E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 41	F_{DL_low}	-	F_{DL_high}	-50	1	
~ 4	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17,			F_{DL_high}	-50	1	
24	23, 24, 25, 26, 29, 41	$F_{DL_{low}}$	-	DL_high			
24 25		F _{DL_low}	-		-50	1	
	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23,	_	-	F _{DL_high} F _{DL_high}	-50 -50	1	15
	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42	F _{DL_low}		F_{DL_high}			15 15
	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42 E-UTRA Band 2	F _{DL_low} F _{DL_low} F _{DL_low}		F _{DL_high} F _{DL_high} F _{DL_high}	-50	1	
	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42 E-UTRA Band 2 E-UTRA Band 25 E-UTRA Band 43 E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18, 19, 21, 23, 24, 25, 26, 29,	F _{DL_low} F _{DL_low} F _{DL_low} F _{DL_low}		F _{DL_high} F _{DL_high} F _{DL_high} F _{DL_high}	-50 -50	1	15
25	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42 E-UTRA Band 2 E-UTRA Band 25 E-UTRA Band 43 E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18, 19, 21, 23, 24, 25, 26, 29, 34, 40, 42, 43	F _{DL} low F _{DL} low F _{DL} low F _{DL} low		F _{DL_high} F _{DL_high} F _{DL_high} F _{DL_high}	-50 -50 -50	1 1 1	15
25	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42 E-UTRA Band 2 E-UTRA Band 25 E-UTRA Band 43 E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18, 19, 21, 23, 24, 25, 26, 29,	F _{DL_low} F _{DL_low} F _{DL_low} F _{DL_low}		F _{DL_high} F _{DL_high} F _{DL_high} F _{DL_high}	-50 -50 -50 -50	1 1 1 1	15 2 2
25	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42 E-UTRA Band 2 E-UTRA Band 25 E-UTRA Band 43 E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 23, 24, 25, 26, 29, 34, 40, 42, 43 E-UTRA Band 41 Frequency range	F _{DL} low F _{DL} low F _{DL} low F _{DL} low F _{DL} low F _{DL} low 1884.5	-	$\label{eq:first} \begin{array}{c} F_{DL_high} \\ \hline 1915.7 \end{array}$	-50 -50 -50 -50 -50	1 1 1 1 1	15 2
25	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42 E-UTRA Band 2 E-UTRA Band 25 E-UTRA Band 43 E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 23, 24, 25, 26, 29, 34, 40, 42, 43 E-UTRA Band 41	F _{DL} low F _{DL} low F _{DL} low F _{DL} low F _{DL} low F _{DL} low 1884.5 703	-	$F_{DL high}$ $F_{DL high}$ $F_{DL high}$ $F_{DL high}$ $F_{DL high}$ $F_{DL high}$ 1915.7 799	-50 -50 -50 -50 -50 -41	1 1 1 1 1 0.3	15 2 2
25	23, 24, 25, 26, 29, 41 E-UTRA Band 4, 5, 10,12, 13, 14, 17, 23, 24, 26, 27, 28, 29, 41, 42 E-UTRA Band 2 E-UTRA Band 25 E-UTRA Band 43 E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 23, 24, 25, 26, 29, 34, 40, 42, 43 E-UTRA Band 41 Frequency range	F _{DL} low F _{DL} low F _{DL} low F _{DL} low F _{DL} low F _{DL} low 1884.5	-	$\label{eq:first} \begin{array}{c} F_{DL_high} \\ \hline 1915.7 \end{array}$	-50 -50 -50 -50 -50 -41 -50	1 1 1 1 1 0.3 1	15 2 2 8

	14, 17, 23, 25, 26, 27, 29, 38, 41, 42, 43						
	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	-	694	-42	8	15, 32
	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
		002	-	1915.7	-41	0.3	8, 19
	Frequency range	1884.5					-, -
33	E-UTRA Band 1, 7, 8, 20, 22, 28, 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,	F		-	-50	1	5
	44	F _{DL_low}	-	F _{DL_high}			
	Frequency range	1884.5	-	1915.7	-41	0.3	8
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, 28, 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
				1879.9	-50	1	30
42	Frequency range E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 11, 18, 19, 20, 21, 25, 26, 27, 28, 33, 34, 38,	1839.9 F _{DL_low}	_	F _{DL_high}	-50	1	
	40, 41, 44				ł	+	
	40, 41, 44 Frequency range		-	1915.7	-41	0.3	8
43	Frequency range E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20,	1884.5	-	1915.7 F _{DL high}	-41 -50	0.3	8
43 44	Frequency range		-	1915.7 F _{DL_high} F _{DL_high}			8

	F_{DL_low} and F_{DL_high} refer to each E-UTRA frequency band specified in Table 5.5-1 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 2 nd , 3 rd 4 th [or 5 th] harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2MHz + N x L _{CRB} x 180kHz), where N is 2, 3, 4, [5] for the 2 nd , 3 rd , 4 th [or 5 th] harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.
NOTE 3:	
NOTE 4:	
	For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
NOTE 6:	
	Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz. Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz.
NOTE 10:	
NOTE 11:	Whether the applicable frequency range should be 793-805MHz instead of 799-805MHz is TBD The emissions measurement shall be sufficiently power averaged to ensure a standard deviation <
NOTE 13:	0.5 dB This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1744.9MHz and 1784.9MHz.
NOTE 14: NOTE 15:	N/A. These requirements also apply for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.
NOTE 16:	•
NOTE 17:	
NOTE 18:	
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. 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. This requirement is applicable for any channel bandwidths within the range 2570 - 2615 MHz with
NOTE 22.	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 <i>P-Max</i> .
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. As exceptions, measurements with a level up to the applicable requirement of -38 dBm/MHz is
NOTE 24.	permitted for each assigned E-UTRA carrier used in the measurement due to 2 nd 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 2 nd 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 3 rd 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 3 rd 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.
INUTE 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 requency is within
	היה המחקט הסברהט - הסבטהט ואודוג מחט זטו טמוחפרס טו בט ואודוג טמווטאוטנוד אחפור טמוחפר טפוונופ
	frequency is within the range 1930 - 1938 MHz the requirement is applicable only for an uplink

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.
NOTE 32: This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

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-	Spurious emission							
UTRA CA Config uration	Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)	Note	
CA_1C	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	F _{DL_low}	-	F _{DL_high}	-50	1	10	
			-					
CA_7C	E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28,				-	4		
_	29, 33, 34, 40, 42, 43	F _{DL low}	-	F _{DL high}	-50	1		
CA_38C	E-UTRA Band 1,3, 8, 20, 22, 27, 28, 29,							
	33, 34, 40, 42, 43	F _{DL low}	-	F _{DL high}	-50	1		
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		
	6.6.3.1-2 are permitted for each assigned 4 th [or 5 th] harmonic spurious emissions is also allowed for the first 1 MHz freque both sides of the harmonic emission. The harmonic emission of (2MHz + N x LCRE harmonic respectively. The exception is partially overlaps the overall exception is restriction will be needed for either the or N/A N/A N/A N/A N/A N/A N/A The requirement also applies for the fre 6.6.3.1-1 and Table 6.6.3.1A-1 from the	vel up to th ed E-UTRA . Due to sp ency range is results in x 180kHz) allowed if nterval. NC operating b	e a ca rea imi n ar , whe DTE anc	pplicable re rrier used i ding of the mediately of n overall ex here N is 2 measurem 3: To mea l or protect	equirements de n the measurer harmonic emis outside the harr cception interva 2, 3, 4, [5] for th nent bandwidth et these require ed band	efined in Ta ment due to ssion the e monic emis al centred a e 2 nd , 3 rd , 2 (MBW) tot ements son	o 2 nd , 3 rd , xception ssion on at the t th [or 5 th] ally or ne	
NOTE 11: NOTE 12:								
	. 10//							

Table 6.6.3.2A-1: Requirements for intra-band contiguous CA

NOTE: The restriction on the maximum uplink transmission to 54 RB in Notes 21, 22, and 27 of Table 6.6.3.2-1 is intended for conformance testing and may be applied to network operation to facilitate coexistence when the aggressor and victim bands are deployed in the same geographical area. The applicable spurious emission requirement of -15.5 dBm/5MHz is a least restrictive technical condition for FDD/TDD coexistence and may have to be revised in the future.

6.6.3.3 Additional spurious emissions

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

6.6.3.3.1 Minimum requirement (network signalled value "NS_05")

When "NS_05" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Frequency band (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 restrictions for additional requirement (PHS).
--

15 MHz channel bandwidth with $f_c = 1932.5$ MHz						
RB _{start}	0-7	8-66	67-74			
LCRB	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			
LCRB	N/A	≤ MIN(24, 76 – RB _{start})	N/A			

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						
769 ≤ f ≤ 775	-57	6.25 kHz					
NOTE: The emissions measurement shall be sufficiently power averaged to ensure							
standard sta	standard standard deviation < 0.5 dB.						

6.6.3.3.3 Minimum requirement (network signalled value "NS_08")

When "NS 08" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.3-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

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

Table 6.6.3.3.3-1: Additional requirement

6.6.3.3.4 Minimum requirement (network signalled value "NS_09")

When "NS 09" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.4-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.4-1: Additional requirement

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)		Measurement bandwidth	
	5MHz	10MHz	15MHz	
1475.9 ≤ f ≤ 1510.9	-35	-35	-35	1 MHz

NOTE 1: Void

NOTE 2: To improve measurement accuracy, A-MPR values for NS_09 specified in Table 6.2.4-1 in subclause 6.2.4 are derived based on 100 kHz RBW.

6.6.3.3.5 Minimum requirement (network signalled value "NS_12")

When "NS 12" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3.5-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 from the edge of the channel bandwidth.

Table 6.6.3.3.5-1:	Additional re	quirements
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Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
	1.4 MHz, 3 MHz, 5 MHz	
806 ≤ f ≤ 813.5	806 ≤ f ≤ 813.5 -42 6.25 kHz	
NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 814.2 MHz.		
NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a 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)	Measurement bandwidth
	5 MHz	
806 ≤ f ≤ 816	-42	6.25 kHz
NOTE 1: The requirement applies for E-UTRA carriers with lower channel edge at or above 819 MHz.		
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 applies for E-UTRA carriers with lower channel edge at or above 824 MHz.		
NOTE 2: The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.		

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.

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.

Table 6.6.3.3.12-1:	Additional	requirements
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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
	easurement bandwidth is 1% of the ap I bandwidth.	plicable E-UTRA

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.

	ency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW			
		5, 10, 15, 20 MHz				
3400	≤ f ≤ 3800	-23 (Note 1, Note 3)	5 MHz			
		-40 (Note 2)	1 MHz			
Note 1:	This requirem	ement applies within an offset between 5 MHz and 25 MHz				
		r and from the upper edge of the channel banc se frequencies overlap with the specified frequ				
Note 2:	This requirem	ent applies from 3400 MHz to 25 MHz below t	he lower E-			
	UTRA channe	el edge and from 25 MHz above the upper E-U	r E-UTRA			
	channel edge	to 3800 MHz.				
Note 3:		on limit might imply risk of harmful interference to UE(s) operatin sted operating band.				

Table 6.6.3.3.15-1: Additional requirement

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.

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW					
	5, 10, 15, 20 MHz						
3400 ≤ f ≤ 3800	-23 (Note 1, Note 4)	5 MHz					
	-40 (Note 2)	1 MHz					
NOTE 1: This requiren	nent applies within an offset between 5 MHz +	- Foffset_NS_23					
and 25 MHz	+ Foffset_NS_23 from the lower and from the upper	er edges of					
the channel b	andwidth, whenever these frequencies overlap	encies overlap with the					
specified freq	requency band.						
NOTE 2: This requiren	irement applies from 3400 MHz to 25 MHz + Foffset_NS_23						
below the low	ver E-UTRA channel edge and from 25 MHz -	F					
Foffset_NS_23 ab	ove the upper E-UTRA channel edge to 3800	MHz.					
NOTE 3: Foffset_NS_23 is:							
0 MHz for 5	MHz channel BW,						
5 MHz for 10	MHz channel BW,						
9 MHz for 15	MHz channel BW and						
12 MHz for 2	0 MHz channel BW.	annel BW.					
NOTE 4: This emission	n limit might imply risk of harmful interference	e to UE(s)					
operating in t	he protected operating band	č 1.					

Table 6.6.3.3.16-1: Additional requirement

6.6.3.3A Additional spurious emissions for CA

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell reconfiguration message.

NOTE: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

6.6.3.3A.1 Minimum requirement for CA_1C (network signalled value "CA_NS_01")

When "CA_NS_01" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.1-1. This requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

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	-	1915.7	-41	0.3	1
NOTE 1: Applicable w	when the aggre	gate	ed channel band	dwidth is confined within frequence	cy range 1940 - 19	80 MHz

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

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	Frequend	cy ra	nge (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
E-UTRA band 34	$F_{DL_{low}}$	I	F _{DL_high}	-50	1	
Frequency range	1900	I	1915	-15.5	5	1, 2
Frequency range	1915	-	1920	+1.6	5	1, 2
NOTE 1:The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.NOTE 2:For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.						

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)	Note
E-UTRA band 34	$F_{DL_{low}}$	I	FDL_high	-50	1	
Frequency range	1880	I	1895	-40	1	
Frequency range	1895	I	1915	-15.5	5	1, 2
Frequency range	1915	1	1920	+1.6	5	1, 2
 NOTE 1: The requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth. NOTE 2: For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band. 						

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)	Note
Frequency range	2620	-	2645	-15.5	5	1, 2, 3
Frequency range	2645	-	2690	-40	1	1, 3
Table 6.6 NOTE 2 [:] For these UE(s) op NOTE 3: This requ	3.3.1-1 and T adjacent ba erating in the	able ands, e prot	6.6.3.1A-1 fi the emission ected operation	equency ranges that are le rom the edge of the chanr n limit could imply risk of h ting band. ers with aggregated chanr	el bandwidth. armful interfere	nce to

Table 6.6.3.3A.4-1: Additional re	quirements
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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)		nge (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
Frequency range	2570	I	2575	+1.6	5	1, 2
Frequency range	2575	I	2595	-15.5	5	1,2
Frequency range	2595	I	2620	-40	1	
NOTE 1: The requirement also applies for the frequency ranges that are less than F _{OOB} (MHz) in Table 6.6.3.1-1 and Table 6.6.3.1A-1 from the edge of the channel bandwidth.						
NOTE 2 [:] For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.						

Table 6.6.3.3A.5-1: Additional requirements

- 6.6.3.3A.6 Void
- 6.6.3.3A.7 Void

6.6.3.3A.8 Minimum requirement for CA_41C (network signalled value "CA_NS_04")

When "CA_NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.3.3A.8-1. This requirement also applies for the frequency ranges that are less than F_{OOB} (MHz) in Table 6.6.3.1A-1 from the edge of the aggregated channel bandwidth.

Table 6.6.3.3A.8-1: Additional requ

Frequency band (MHz)	Spectrum emission limit (dBm)	Measurement bandwidth
2490.5 ≤ f < 2495	-13	1 MHz
0 < f < 2490.5	-25	1 MHz

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.

If UE is configured for transmission on single-antenna port, 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)	5M	IHz	10MHz		15MHz		20MHz	
Interference Signal Frequency Offset	5MHz	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_CA}	
Interference CW Signal Level	-40dBc		
Intermodulation Product	-29dBc	-35dBc	
Measurement bandwidth	BW _{Channel_CA} - 2* BW _{GB}		

Table 6.7.1A-1: Transmit Intermodulation

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.

If UE is configured for transmission on single-antenna port, the requirements in subclause 6.7.1 apply.

- 6.8 Void
- 6.8.1 Void
- 6.8A Void

6.8B Time alignment error for UL-MIMO

For UE(s) with multiple transmit antenna connectors supporting UL-MIMO, this requirement applies to frame timing differences between transmissions on multiple transmit antenna connectors in the closed-loop spatial multiplexing scheme.

The time alignment error (TAE) is defined as the average frame timing difference between any two transmissions on different transmit antenna connectors.

6.8B.1 Minimum Requirements

For UE(s) with multiple transmit antenna connectors, the Time Alignment Error (TAE) shall not exceed 130 ns.

7 Receiver characteristics

7.1 General

Unless otherwise stated the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi is assumed for each antenna port(s). UE with an integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna. For UEs with more than one receiver antenna connector, identical interfering signals shall be applied to each receiver antenna port if more than one of these is used (diversity).

The levels of the test signal applied to each of the antenna connectors shall be as defined in the respective sections below.

With the exception of subclause 7.3, the requirements shall be verified with the network signalling value NS_01 configured (Table 6.2.4-1).

All the parameters in clause 7 are defined using the UL reference measurement channels specified in Annexes A.2.2 and A.2.3, the DL reference measurement channels specified in Annex A.3.2 and using the set-up specified in Annex C.3.1.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers (one component carrier per sub-block), an in-gap test refers to the case when the interfering signalis located at a negative offset with respect to the assigned channel frequency of the highest carrier frequency and located at a positive offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers (one component carrier per sub-block), an out-of-gap test refers to the case when the interfering signal(s) is (are) located at a positive offset with respect to the assigned channel frequency of the highest carrier frequency, or located at a negative offset with respect to the assigned channel frequency of the lowest carrier frequency.

For the additional requirements for intra-band non-contiguous carrier aggregation of two component carriers with channel bandwidth larger than or equal to 5 MHz (one component carrier per sub-block), the existing adjacent channel selectivity requirements, in-band blocking requirements (for each case), and narrow band blocking requirements apply for in-gap tests only if the corresponding interferer frequency offsets with respect to the two measured carriers satisfy the following condition in relation to the sub-block gap size W_{gap} for at least one of these carriers j, j = 1,2, so that the interferer frequency position does not change the nature of the core requirement tested:

 $W_{gap} \ge 2 \cdot |F_{Interferer (offset),j}| - BW_{Channel(j)}$

where $F_{\text{Interferer (offset)},j}$ is the interferer frequency offset with respect to carrier *j* as specified in subclause 7.5.1, subclause 7.6.1 and subclause 7.6.3 for the respective requirement and BW_{Channel(j)} the channel bandwidth of carrier *j*. The interferer frequency offsets for adjacent channel selectivity, each in-band blocking case and narrow- band blocking shall be tested separately with a single in-gap interferer at a time.

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

E-UTRA Band 1 2 3 4	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz	10 MHz	15 MHz	20 MHz	Duplex
1 2 3	(ubiii)	(ubiii)	(dBm)	(dBm)	(dBm)	(dBm)	Mode
2 3			(dBm) -100	-97	-95.2	-94	FDD
3	-102.7	-99.7	-98	-95	-93.2	-92	FDD
	-102.7	-99.7	-98	-93	-93.2	-92	FDD
	-101.7	-98.7	-100	-94 -97	-92.2	-91	FDD
-					-95.2	-94	
5	-103.2	-100.2	-98	-95			FDD
6			-100	-97	02.0	00	FDD
7	100.0	00.0	-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	7		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
44 [-100.2] [-98] [-95] [-93.2] [-92] IDD NOTE 1: The transmitter shall be set to PUMAX as defined in subclause 6.2.5 NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 NOTE 3: The signal power is specified per port							
NOTE 4: NOTE 5:	For the UE which level is FFS. For the UE which	h supports	both Band	I 3 and Bar			-
 level is FFS. NOTE 6: ⁶ indicates that the requirement is modified by -0.5 dB when the carrier frequency of the assigned E-UTRA channel bandwidth is within 865-894 MHz. NOTE 7: For a UE that support both Band 18 and Band 26, the reference sensitivity level for Band 26 applies for the applicable channel bandwidths. 							

Table 7.3.1-1: Reference sensitivity	QPSK	PREFSENS
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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 G (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 CA	E-UTRA Band	ΔR _{IB,c} [dB]						
Configuration								
CA_1A-5A	1	0						
	5	0						
CA_1A-18A	18	0						
	1	0						
CA_1A-19A	19	0						
	1	0						
CA_1A-21A	21	0						
	2	0						
CA_2A-17A	17	0.5						
04.04.54	3	0						
CA_3A-5A	5	0						
04 04 74	3	0						
CA_3A-7A	7	0						
	3	0						
CA_3A-8A	8	0						
CA 2A 20A	3	0						
CA_3A-20A	20	0						
CA_4A-5A	4	0						
UA_4A-5A	5	0						
CA_4A-7A	4	0.5						
07_47-17	7	0.5						
CA_4A-12A	4	0						
0/(_+/(12/(12	0.5						
CA_4A-13A	4	0						
	13	0						
CA_4A-17A	4	0						
0.12.07.10.11	17	0.5						
CA_5A-12A	5	0.5						
	12	0.3						
CA_5A-17A	5	0.5						
	17	0.3						
CA_7A-20A	7	0						
	20	0						
CA_8A-20A	8	0						
	20	0						
CA_11A-18A	18							
NOTE 1. The of	•	0 plicable for the E LITPA operating						
	bove additional tolerances are only ap that belong to the supported inter-bar							
	urations	la camer aggregation						
	pove additional tolerances also apply i	n intra-band CA and non-						
	gated operation for the supported E-U							
	pported inter-band carrier aggregation							
	e the UE supports more than one of th							
aggree	pation configurations and a E-UTRA o	perating band belongs to more than						
	ter-band carrier aggregation configura							
- W	hen the E-UTRA operating band freq	uency range is \leq 1GHz, the						
ar	plicable additional tolerance shall be	the average of the tolerances in						
T	able 7.3.1-1A, truncated to one decimation	al place that would apply for that						
	perating band among the supported CA							
	harmonic relation between low band UL and high band DL, then the							
maximum tolerance among the different supported carrier aggregation								
	onfigurations involving such band sha							
	Then the E-UTRA operating band freq							
	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 / NRB / 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		
24	Ű		25	50		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	Ŭ	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		TDD		
35	6	15	25	50	75	100	TDD		
36	6	15	25	50	75	100	TDD		
37			25	50	75	100	TDD		
38			25	50	75	100	TDD		
39			25	50	75	100	TDD		
40			25	50	75	100	TDD		
41			25	50	75	100	TDD		
42			25	50	75	100	TDD		
43			25	50	75	100	TDD		
44		15	25	50	75	100	TDD		
 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 bandwidth, the UL resource blocks shall be located at RB _{start} 11 and in the case of 2000Hz									

 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

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-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	
	3				N/A	N/A	N/A	FDD	
CA_3A-8A ⁴	8			N/A	N/A			TUU	
CA 4A 42A56	4	-89.2	-89.2	-90	-89.5			FDD	
CA_4A-12A ^{5,6}	12			-96.5	-93.5			FUU	
CA_4A-17A ^{5,6}	4			-90	-89.5			FDD	
0A_4A-17A**	17			-96.5	-93.5			FDD	
NOTE 3: The s NOTE 4: No re bandy transr not th NOTE 5: These transr down NOTE 6: The re f_{UL}^{LB}	 NOTE 1: The transmitter shall be set to P_{UMAX} as defined in subclause 6.2.5A. NOTE 2: Reference measurement channel is A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 NOTE 3: The signal power is specified per port NOTE 4: No requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 2nd transmitter harmonic is within the downlink transmission bandwidth of the high band. The reference sensitivity is only verified when this is not the case (the requirements specified in clause 7.3.1 apply). NOTE 5: These requirements apply when there is at least one individual RE within the uplink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the low band for which the 3rd transmitter harmonic is within the downlink transmission bandwidth of the high band. 								

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		
 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			
	2			-98	-95			FDD			
CA_2A-29A	29		-98.7	-97	-94			FUU			
	4			-100	-97			FDD			
CA_4A-29A	29		-98.7	-97	-94			FDD			
NOTE 1: The transmitter shall be set to PUMAX 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

E-UTRA Band / Channel bandwidth / NRB / 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			FDD			
CA_2A-29A	29		N/A	N/A	N/A			FUU			
CA_4A-29A	4			25	50						
	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 as defined in Table 7.3.1A-1 form a contiguous allocation where TX–RX frequency separations of the component carriers are as defined in Table 5.7.4-1. 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 / NRB_agg / Duplex mode										
Uplink CA configuration	100RB+50RB		75RB+75RB		100RB+75RB		100RB+100RB		Duplex	
	PCC	SCC	PCC	SCC	PCC	SCC	PCC	SCC	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	N/A	N/A	75	75	N/A	N/A	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 contiguous 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 W _{gap} / [MHz] bandwidth (PCC+SCC)		UL PCC allocation	ΔR _{IBNC} (dB)	Duplex mode			
	25RB+25RB 30.0 < W _{gap} ≤ 55.0		10 ¹	5.0				
	2510-2510	$0.0 < W_{gap} \le 30.0$	25 ¹	0.0				
	25RB+50RB	$25.0 < W_{gap} \le 50.0$	10 ¹	4.5				
CA 25A-25A	2568+5068	$0.0 < W_{gap} \le 25.0$	25 ¹	0.0	FDD			
CA_25A-25A	50RB+25RB	15.0 < W _{gap} ≤ 50.0	10 ⁴	5.5	FUU			
	JUKD+2JKD	0.0 < W _{gap} ≤ 15.0	32 ¹	0.0				
	50RB+50RB	10.0 < W _{gap} ≤ 45.0	10 ⁴	5.0				
	JUKD+JUKD	$0.0 < W_{gap} \le 10.0$	32 ¹	0.0				
CA_41A-41A	NOTE 6	NOTE 7	NOTE 8	0.0	TDD			
CA_41A-41A NOTE 6 NOTE 7 NOTE 8 0.0 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. 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 non-contiguous CA uplink configuration for reference sensitivity with one uplink

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		
				IVITIZ	IVITIZ				
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.									

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	ameter 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,c or PCMAX_L as defined in subclause 6.2.5A. NOTE 2: Reference measurement channel is Annex A.3.2: 64QAM, R=3/4 variant with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1. 								

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		REFSENS + 14 dB						
Bandwidth				KEI SENS	0 T 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 transmitter shall be set to 4dB below PCMAX_L at the minimum uplink configuration specified in Table 7.3.1-								
2 with PCMAX_L as defined in subclause 6.2.5.								
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided								
dynam	ic OCNG	Pattern OP.1 FD	D/TDD as desc	cribed in Annex A	.5.1.1/A.5.2.1 a	nd set-up accor	ding to Annex	
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	
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 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 int	erferer co	nsists of the Ref	ference measur	ement channel sp	pecified in Anne	x 3.2 with one s	ided dynamic	
OCNG	Pattern O	P.1 FDD/TDD a	as described in A	Annex A.5.1.1/A.	5.2.1 and set-up	according to A	nnex 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 Bandwidth Class						
		В	С	D	E	F		
Pw in Transmission Bandwidth			REFSENS +					
Configuration, per CC			14 dB					
	dBm		Aggregated					
			power + 22.5					
PInterferer			dB					
BWInterferer	MHz		5					
FInterferer (offset)	MHz		2.5 + Foffset					
			/					
			-2.5 - Foffset					
NOTE 1: The transmitter shall be	e set to 4dB	below Pcm	ax_l,c or Pcmax_l a	as defined in s	ubclause 6.2.5	5A.		
NOTE 2: The interferer consists								
dynamic OCNG Patterr	n OP.1 FDD	/TDD as de	escribed in Annex	x A.5.1.1/A.5.2	2.1 and set-up	according to		
Annex C.3.1								
	The Finterferer (offset) is the frequency separation of the center frequency of the carrier closest to the							
interferer and the center						djusted to		
$F_{interferer} / 0.015 + 0.5 0.$	015 + 0.007	5 MHz to b	e offset from the	sub-carrier ra	ster.			

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

Table 7.5.1A-3: Test parameters for Adjacent channel selectivity, C	260 2
Table 1.J. IA-J. Test barameters for Autacent channel selectivity. C	

Rx Parameter	Units	Units CA Bandwidth Class						
		В	С	D	E	F		
Pw in Transmission Bandwidth Configuration, per CC	dBm		-47.5+10 log10(Nrb,c/ Nrb agg)					
PInterferer	dBm		-25					
BWInterferer	MHz		5					
F _{Interferer} (offset)	MHz		2.5+ F _{offset}					
			/					
			-2.5- F _{offset}					
 NOTE 1: The transmitter shall be set to 24dB below PCMAX_L,c or PCMAX_L as defined in subclause 6.2.5A. NOTE 2: The interferer consists of the Reference measurement channel specified in Annex 3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to Annex C.3.1 								
NOTE 3: The F _{interferer} (offset) is t interferer and the cente $F_{interferer}/0.015 + 0.5$]0.	r frequenc	y of the adjace	ent channel interf	ferer and shal	l be further adju			

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 b	andwidth		
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in			REFSENS	+ channel band	width specific v	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	Table 7.3.1-2 with PCMAX_L as defined in subclause 6.2.5.						
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one							
sided 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	ng to An	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 - Floffset,case 1 & =+BW/2 + Floffset,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	FInterferer	MHz	(Note 2)	F _{DL_low} – 15 to F _{DL_high} + 15			F _{DL_low} -11	
NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band NOTE 2: For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency -BW/2 - Floffset, case 1 and b. the carrier frequency +BW/2 + Floffset, case 1 NOTE 3: Flinterferer 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	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	may not fall inside the			
UE receive band, but within the first 15 MHz below or above the UE receive band NOTE 2: For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency -BW/2 - Floffset, case 1 and b. the carrier frequency +BW/2 + Floffset, case 1							
NOTE 3: F _{Interferer} range values for unwanted modulated interfering signal are interferer center frequencies							

For 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		RE	EFSENS + CA B	andwidth Class	specific value belo	wc		
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,c OF P	CMAX_L as define	d in subclause 6.	2.5A		
NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with one sided								
dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.1 and set-up according to								
Annex C.3.1								

Table 7	7.6.1.1	A-1: In	band	blocking	parameters
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CA co	onfiguration	Parameter	Unit	Case 1	Case 2	
			dBm	-56	-44	
		F _{Interferer} (offset)	MHz	=-F _{offset} - F _{loffset,case 1} & =+F _{offset} + F _{loffset,case 1}	≤-F _{offset} F _{loffset,case 2} & ≥+F _{offset} + F _{loffset,case 2}	
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: a. the carrier frequency -Foffset - Floffset, case 1 b. the carrier frequency +Foffset + Floffset, case 1 						
NOTE 3: Foffset is the frequency offset from the center frequency of the CC being tested to the edge of aggregated channel bandwidth.						
NOTE 4: The F _{interferer} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and the center frequency of the interferer tested and shall be further adjusted to $\lfloor F_{interferer} / 0.015 + 0.5 \rfloor 0.015 + 0.0075 \text{ MHz}$ to be offset from the sub-carrier raster.						

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 $\max(24, 6 \cdot \lceil N_{RR} / 6 \rceil)$ 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	REFSENS + channel bandwidth specific value below						e below		
Transmission	dBm								
Bandwidth	UDIII	6	6	6	6	7	9		
Configuration									
NOTE 1: The transmit	tter shall be	e set to 40	dB below I	Рсмах_L at	the minim	num uplink	(
configuration	n specified i	in Table 7	7.3.1-2 wit	h PCMAX_L	as define	d in subcla	ause		
6.2.5.	6.2.5.								
	Reference measurement channel is specified in Annex A.3.2 with one sided								
dynamic OC	NG Patterr	OP.1 FE	DD/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		Free	quency		
			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 (NOTE 2), 43 (NOTE 2), 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 the UE which supports both Band 11 and Band 21 the out of blocking is FFS. NOTE 2: The power level of the interferer (P_{Interferer}) for Range 3 shall be modified to -20 dBm for F_{Interferer} > 2800 MHz and F_{Interferer} < 4400 MHz. 							

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.

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

Paramete	er Unit	Range 1	Range 2	Range 3				
Pw	dBm	Table 7.6.	2.1-1 for both component of	arriers				
Pinterferer	dBm	-44 + ΔR _{IB,c}	-30 + ΔR _{IB,c}	-15 + ∆R _{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				
		nd F _{DL_High(1)} denote the respec						
	operating b	and, FDL_Low(2) and FDL_High(2) th	ne respective lower and up	per frequency limits of the				
		ating band.						
NOTE 2:	For FDL_Low	$(2) - F_{DL_High(1)} < 145 \text{ MHz and}$	FInterferer in FDL_High(1) < f < F	DL_Low(2), FInterferer can be				
	in both Rar	nge 1 and Range 2. Then the l	ower of the PInterferer applies					
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 appropriate adjacent channel selectivity and in-band blocking in the respective							
	subclauses	7.5.1A and 7.6.1.1A shall be	applied.					
NOTE 4:	ΔR _{IB,c} acco	rding to Table 7.3.1-1A applies	s when serving cell <i>c</i> is me	asured.				

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.

Rx Parameter	Units	CA Bandwidth Class					
		В	С	D	E	F	
Pw in Transmission Bandwidth Configuration, per CC		REFSENS + CA Bandwidth Class spec Bm below					
			9				
NOTE 1: The transmitter shall be set to 4dB below PCMAX_L,c or PCMAX_L as defined in subclause 6.2.5A. NOTE 2: Reference measurement channel is specified in Annex A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex A.5.1.1/A.5.2.							

Table 7.6.2.1A-2: Out of band blocking

CA configuration	Parameter	Units	Frequency		
			Range 1	Range 2	Range 3
	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 $\max(8, \lceil (N_{RB} + 2 \cdot L_{CRBs})/8 \rceil)$ exceptions per assigned E-UTRA channel per sub-block of the E-UTRA CA configuration are allowed for spurious response frequencies 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								
Parameter	Unit	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz			
Pw	dBm	PR	PREFSENS + channel-bandwidth specific value below							
۲w	UDITI	22	18	16	13	z 15 MHz 20 MH ific value below 14 16 -55 -55 5 7.7025 10.207 plink configuration 5.	16			
Puw (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	MHz								
NOTE 1: The transmitter shall be set a 4 dB below PCMAX_L at the minimum uplink configuration specified in Table 7.3.1-2 with PCMAX_L as defined in subclause 6.2.5.										
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 7.6.3.1-1: Narrow-band blocking

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.

Demonster	1114	CA Bandwidth Class					
Parameter	Unit	В	С	D	E	F	
Pw in Transmission Bandwidth	alDura	REF	SENS + CA Bandy	width Class	specific value	e below	
Configuration, per CC	dBm		16 ⁴				
P _{uw} (CW)	dBm		-55				
Fuw (offset for			- F _{offset} - 0.2				
$\Delta f = 15 \text{ kHz}$	MHz		/				
$\Delta l = 15 \text{ KHz})$			+ F _{offset} + 0.2				
Fuw (offset for	MHz						
⊿f = 7.5 kHz)	IVITIZ						
NOTE 1: The transmitter shall be s	et to 4dB below F	CMAX_L,c Or	PCMAX_L as defined	in subclause	e 6.2.5A.		
NOTE 2: Reference measurement	channel is specif	ied in Annex	A.3.2 with one sid	ed dynamic	OCNG Patte	ern OP.1	
FDD/TDD as described ir	n Annex A.5.1.1/A	.5.2.1.					
NOTE 3: The Fuw (offset) is the free	3: The F _{uw} (offset) is the frequency separation of the center frequency of the carrier closest to the interferer and						
the center frequency of the	the center frequency of the interfererand shall be further adjusted to $ F_{interferer} /0.015+0.5 0.015+0.0075$ MH						
to be offset from the sub-	carrier raster.				-		
NOTE 4: The requirement is applie	d for the band co	mbinations	whose component	carriers' BW	/>5 MHz.		

Table 7.6.3.1A-1: Narrow-band blocking

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 $\ge 95\%$ 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 Tables 7.7.1-1 and 7.7.1-2.

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	UDIII	6	6	6	6	7	9							
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 OF	P.1 FDD/TDD	as describ	ed in Anne	x A.5.1.1/A.	5.2.1.	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

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	Units CA Bandwidth Class					
		В	С	D	E	F	
Pw in Transmission Bandwidth	dBm	REFSENS + CA Bandwidth Class specific value below					
Configuration, per CC	ubm		9				
NOTE 1: The transmitter shall b	1: The transmitter shall be set to 4dB below PCMAX_L,c or PCMAX_L as defined in subclause 6.2.5A.						
NOTE 2: Reference measurem	: 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

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 \geq 95% of the maximum throughput of the reference measurement channels as specified in Annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table 7.8.1.1 for the specified wanted signal mean power in the presence of two interfering signals

Rx Parameter	Units	Channel bandwidth						
		1.4 MHz 3 MHz		5 MHz	10 MHz	15 MHz	20 MHz	
Power in		REFSENS + channel bandwidth specific value below						
Transmission Bandwidth Configuration	dBm	12		8	6	6 6 7		9
PInterferer 1 (CW)	dBm	-46						
P _{Interferer 2} (Modulated)	dBm	-46						
BW Interferer 2		1.4 3 5						
FInterferer 1 (Offset)	MHz	-BW/2 -2.1 -BW/2 -4.5 -BW/2 - 7.5 / +BW/2 + 2.1 +BW/2 + 4.5 +BW/2 + 7.5						
F _{Interferer 2} (Offset)	MHz	2*Finterferer 1						
		all be set to 4dB below PCMAX_L at the minimum uplink configuration specified in PCMAX_L as defined in subclause 6.2.5.						
		urement channel is specified in Annex A.3.2 with one sided dynamic OCNG D/TDD as described in Annex A.5.1.1/A.5.2.1.						
A.3.2 wi	th one side	terferer consists of the Reference measurement channel specified in Annex led dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex th set-up according to Annex C.3.1The interfering modulated signal is 5MHz E-						
UTRA s	ignal as de	scribed in Annex	x D for	channel l	bandwidth ≥	≥5MHz		

 Table 7.8.1.1-1: Wide band intermodulation

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 para	meter	Units		CA	CA Bandwidth Class						
			В	С	D	E	F				
Pw in			REFSENS + CA Bandwidth Class specific value below								
Transmiss											
Bandwidth	-	dBm		12							
Configura	tion, per										
CC		10									
PInterferer 1 (CW)		dBm			-46						
P _{Interferer 2} (Modulate	d)	dBm			-46						
BWInterferer	2	MHz		5							
FInterferer 1		MHz		-Foffset-7.5							
(Offset)				/							
				+ F _{offset} +7.5							
F _{Interferer 2} (Offset)		MHz	2*FInterferer 1								
				B below PCMAX_L,c							
NOTE 2:				is specified in Ar		one sided dynan	nic OCNG				
				ed in Annex A.5.							
NOTE 3:				of the Reference							
			ed dynamic OCNG Pattern OP.1 FDD/TDD as described in Annex								
NOTE 4:			th set-up according to Annex C.3.1.								
NOTE 4.		h≥5MHz.	odulated signal is 5MHz E-UTRA signal as described in Annex D for channel								
NOTE 5:			t) is the freque	ncy separation of	the center free	wency of the car	rier closest to				
NOTE 5.				ency of the CW in							
				of the carrier clo							
		odulated in									

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 ≤ f < 1GHz	100 kHz	-57 dBm				
1GHz ≤ f ≤ 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 given by PDCCH_RA/RB as defined in Annex C.3.1.						

7.9.1A Minimum requirements

For E-UTRA CA configurations including an operating band without uplink band (as noted in Table 5.5-1), the power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.1A-1.

Frequency band	Measurement bandwidth	Maximum level	Note			
30MHz ≤ f < 1GHz	100 kHz	-57 dBm				
1GHz ≤ f ≤ 12.75 GHz	1 MHz	-47 dBm				
 NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in Annex C.3.1. NOTE 2: The requirements apply when the UE is configured for carrier aggregation but is not 						
transmitting.		ie eenigarea i				

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.

	CA bandwidth class						
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 Definition of CA capability

The definition with respect to CA capabilities for 2CCs is given as in Table 8.1.2.2-1.

CA Capability	CA Capability Description
CA2_C	Intra-band contiguous CA
CA2_A2	Inter-band CA
C2A_N2	Intra-band non-contiguous CA
CA: CA: CA: CA:	2_C corresponds to E-UTRA CA configurations and bandwidth nbination sets defined in Table 5.6A.1-1 for 2 DL CCs. 2_A2 corresponds to E-UTRA CA configurations and bandwidth nbination sets defined in Table 5.6A.1-2 for 2 DL CCs. 2_N2 corresponds to E-UTRA CA configurations and bandwidth nbination sets defined in Table 5.6A.1-3 for 2 DL CCs.

Table 8.1.2.2-1: Definition of CA capability with 2DL CCs

The supported testable aggregated CA bandwidth combinations for 2CCs for each CA capability are listed in Table 8.1.2.2-2.

Table 8.1.2.2-2: Supported testable aggregated CA bandwidth combinations for different CA capability with 2DL CCs

CA Capability	Bandwidth combination for FDD CA	Bandwidth combination for TDD CA			
CA2_C	20+20MHz	20+20MHz			
CA2_A2	10+10MHz, 10+15MHz,	NA			
	10+20MHz, 15+20MHz,				
	20+20MHz				
CA2_N2	10+10MHz	20+20MHz			
Note 1: This table is only for information and applicability and test rules of CA performance requirements are specified in 8.1.2.3 and 9.1.1.2.					

For test cases with more than one component carrier, "Fraction of Maximum Throughput" in the performance requirement refers to the ratio of the sum of throughput values of all component carriers to the sum of the nominal maximum throughput values of all component carriers, unless otherwise stated.

8.1.2.3 Applicability and test rules for different CA configurations and bandwidth combination sets

The performance requirement for CA UE demodulation tests in Clause 8 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.6A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL CCs in Table 8.1.2.3-1. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set.

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order				
CA tests with 2CCs in Clause 8.2.1.1.1, 8.2.1.4.3	Any one of the supported CA capabilities	Any one of the supported FDD CA configurations	10+10 MHz, 20+20 MHz				
CA tests with 2CCs in Clause 8.2.1.3.1	Each supported CA capability	Any one of the supported FDD CA configurations in each CA capability	10+10 MHz, 20+20 MHz				
CA tests with 2CCs in Clause 8.2.1.3.1A, 8.7.1	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported FDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination				
CA tests with 2CCs in Clause 8.2.1.7.1	CA2_C	Supported FDD intra-band contiguous CA configurations covering the lowest and highest operating bands	Largest aggregated CA bandwidth combinations				
CA tests with 2CCs in Clause 8.2.2.1.1, 8.2.2.4.3	Any one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination				
CA tests with 2CCs in Clause 8.2.2.3.1	Each supported CA capability	Any one of the supported TDD CA configurations in each CA capability with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination				
CA tests with 2CCs in Clause 8.2.2.3.1A, 8.7.2	Any one of the supported CA capabilities with largest aggregated CA bandwidth	Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination				
CA tests with 2CCs in 8.2.2.7.1	CA2_C	Supported TDD intra-band contiguous CA configurations covering the lowest and highest operating bands	Largest aggregated CA bandwidth combinations				
CA tests with 2CCs in Clause 8.2.1.8.1	CA2_N2	CA_3A-3A defined in Table 5.6A.1-3	10+10 MHz				
Note 1:The applicability and test rules are specified in this table, unless otherwise stated.Note 2:Number of the supported bandwidth combinations to be tested from each selected CA configuration is one.							

8.1.2.4 Test coverage for different number of component carriers

For FDD tests specified in 8.2.1.1.1, 8.2.1.3.1, 8.2.1.4.3, and 8.7.1, if corresponding CA tests are tested, the test coverage can be considered fulfilled without executing single carrier tests.

For TDD tests specified in 8.2.2.1.1, 8.2.2.3.1, 8.2.2.4.3, and 8.7.2, if corresponding CA tests are tested, the test coverage can be considered fulfilled without executing single carrier tests.

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	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.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Parame	eter	Unit	Test 1- 5	Test 6-8	Test 9- 15	Test 16- 18	Test 19
Deverlink news	$ ho_{\scriptscriptstyle A}$	dB	0	0	0	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)				
	σ	dB	0	0	0	0	0
$N_{_{oc}}$ at anter	nna port	dBm/15kHz	-98	-98	-98	-98	-98
Symbols for un	used PRBs		OCNG (Note 2)				
Modulat	ion		QPSK	16QAM	64QAM	16QAM	QPSK
PDSCH transmi	ssion mode		1	1	1	1	1
Note 1: $P_B = 0$).						
Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.							
Note 3: Void.	ote 3: Void.						
Note 4: Void.							

Table 8.2.1.1.1-1: Test Parameters

				_	• • • •	Reference	value	
Test num.	Band- width	Reference channel	OCNG pattern	Propa- gation condi- tion	Correlation 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
<u> </u>	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
/	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
40	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
4.4	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
40	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
40	10 MHz	R.7 FDD	OP.1 FDD	EVA5	1x2 High	70	19.1	≥2
13	10 MHz	R.7-1 FDD	OP.1 FDD	EVA5	1x2 High	70	17.8	1
14	15 MHz	R.8 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.7	≥2
14	15 MHz	R.8-1 FDD	OP.1 FDD	EVA5	1x2 Low	70	16.8	1
	20 MHz	R.9 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.6	≥3
15	20 MHz	R.9-2 FDD	OP.1 FDD	EVA5	1x2 Low	70	17.3	2
ĺ	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: Note 2: Note 3:	Void.							

Table 8.2.1.1.1-2: Minimum performance (FRC)

	Parameter		Test 1-2			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)			
allocation	σ	dB	0			
N _{oc}	N_{oc} at antenna port		-98			
Symbol	s for unused PRBs		OCNG (Note 2)			
	Modulation		QPSK			
PDSCH	transmission mode		1			
Note 1: P	Note 1: $P_{R} = 0$.					
wi	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.					
	PUCCH format 1b with channel selection is used to feedback ACK/NACK.					
Note 4: Th	e same PDSCH transmis	ssion mode is appli	ed to each component carrier.			

Table 8.2.1.1.1-4: Minimum performance (FR	C) for CA

				Brono	Correlation	Reference	Reference value		
Test num.	Band- width	Reference channel	OCNG pattern	Propa- gation condi- tion	matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	UE cate- gory	
1	2x10 MHz	R.2 FDD	OP.1 FDD (Note 1)	EVA5	1x2 Low	70	-1.1	≥3 (Note 2)	
2	2x20 MHz	R.42 FDD	OP.1 FDD (Note 1)	EVA5	1x2 Low	70	-1.3	≥5	
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	: The applic	ability of requiren	nents for diff	erent CA co	onfigurations a	nd bandwidth c	ombination se	ts 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			
	k power $\rho_{\scriptscriptstyle B}$		dB	0 (Note 1)			
		σ	dB	0			
N_{o}	$_{c}$ at antenna	port	dBm/15kHz	-98			
	for MBSFN I subframes			OCNG (Note 3)			
PDSCH	I transmissio	on mode		1			
Note 1: Note 2:	Note 2: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the						
first slot. Note 3: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN subframes, QPSK modulated MBSFN data is used instead.							

 Table 8.2.1.1.4-1: Test Parameters for Testing 1 PRB allocation

Table 8.2.1.1.4-2: Minimum performance 1PRB (FRC)	Table 8.2.1.1.4-2	Minimum I	performance	1PRB (FRC)
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ſ	Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	value	UE
	number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
	1	10 MHz	R.29 FDD	OP.3 FDD	ETU70	1x2 Low	30	2.0	≥1

8.2.1.2 Transmit diversity performance

8.2.1.2.1 Minimum Requirement 2 Tx Antenna Port

The requirements are specified in Table 8.2.1.2.1-2, with the addition of the parameters in Table 8.2.1.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmitter antennas.

Table 8.2.1.2.1-1: Test Parameters for Transmit divers	ty Performance (FRC)
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Parameter		Unit	Test 1-2
	$ 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
PDSCH transmission	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 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

Table 8.2.1.2.1-2: Minimum performance Transmit Diversity (FRC)

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)
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Parameter		Unit	Test 1-2
	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	0
$N_{\it oc}$ at antenna	port	dBm/15kHz	-98
PDSCH transmission	on mode		2
Note 1: $P_B = 1$.			

Table 8.2.1.2.2-2: Minimum	performance Transmit Diversity (FRC)
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Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	1.4 MHz	R.12 FDD	OP.1 FDD	EPA5	4x2 Medium	70	0.6	≥1
2	10 MHz	R.13 FDD	OP.1 FDD	ETU70	4x2 Low	70	-0.9	≥1

8.2.1.2.3 Minimum Requirement 2 Tx Antenna Ports (demodulation subframe overlaps with aggressor cell ABS)

The requirements are specified in Table 8.2.1.2.3-2, with the addition of parameters in Table 8.2.1.2.3-1 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell. In Table 8.2.1.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

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	tion		Non-MBSFN	Non-MBSFN
Time Offset between	Cells	μs	2.5 (synchron	ious cells)
Cell Id			0	1
ABS pattern (Note	5)		N/A	11000100 11000000 11000000 11000000 11000000
RLM/RRM Measurement Pattern (Note 6)	Subframe		1000000 1000000 1000000 1000000 1000000 1000000	N/A
C _{CSI,0}			11000100 11000000 11000000 11000000 11000000	N/A
CSI Subframe Sets (Note7)	C _{CSI,1}		00111011 00111111 00111111 00111111 00111111	N/A
Number of control OFDM			2	2
PDSCH transmission	mode		2	N/A
Cyclic prefix			Normal	Normal
overlapping with the Note 3: This noise is applied ABS. Note 4: This noise is applied Note 5: ABS pattern as de Note 6: Time-domain mea	ne aggressor / ed in OFDM s ed in all OFDM fined in [9]. surement reso	ymbols #1, #2, #3, #5, #6, ABS. ymbols #0, #4, #7, #11 of a M symbols of a subframe o purce restriction pattern for ime-domain measurement	a subframe overlapping overlapping with aggresso r PCell measurements as	with the aggresso or non-ABS s defined in [7]
measurements de	fined in [7].	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		NG tern	Con	agation ditions ote 1)	Correlation Matrix and Antenna	Reference Value		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:	SNR corresponds to \hat{E}_s / N_{oc2} of cell 1. 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	Through	put is cal	culated f	rom the tot	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	1	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 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					-100
Cell Id			0	126	1
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)	Ccsi,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
subframe ov Note 3: This noise is aggressor A Note 4: This noise is Note 5: ABS pattern Note 6: Time-domai [7] Note 7: As configure measureme Note 8: The number indicated by Note 9: Downlink ph	verlapping v s applied in BS. s applied in as defined n measurer ed accordin nts defined of control ("0" of ABS sysical char	vith the aggresso OFDM symbols all OFDM symbol in [9]. ment resource re g to the time-dor in [7]. OFDM symbols i pattern. anel setup in Cell	#0, #4, #7, #11 of a ols of a subframe ov estriction pattern for l nain measurement r s not available for A 2 and Cell 3 in acco	subframe overlap erlapping with age PCell measureme esource restriction BS and is 2 for the	pping with the gressor non-ABS nts as defined in n pattern for CSI e subframe
OCNG patte Note 10: The number Note 11: SIB-1 will no	of the CRS		Cell 2 and Cell 3 is t	the same.	

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

Test Number	Reference Channel	OC	NG Patte	ern	Propaga	ation Cor (Note1)	ditions	Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configuration (Note 2)	Fraction of Maximum Throughput (%) Note 5	SNR (dB) (Note 3)	gory
1	R.11-4 FDD Note 4	OP.1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	EVA5	2x2 Medium	70	3.4	≥2
Note 1: Note 2: Note 3:	The propagation The correlation SNR correspo	n matrix a	and anten	na config	guration ap			y independent. 2 and Cell 3.			
Note 4:	Cell 1 Referen	ice chann the servir	nel is mod ng cell sul	ified: PD oframe v	SCH othe	ubframe i	s overlap	and its associate ped with the ABS			l and

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
BWChannel		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	al	ms	5	N/A	N/A
Reporting mode			PUCCH 1-0	N/A	N/A
Physical channel for CQI	reporting		PUSCH(Note 5)	N/A	N/A
cqi-pmi-Configuration	Index		2	N/A	N/A
Note 1: $P_{R} = 1$		•		•	•
Note 2: The respective red	aived power	nantral danaity	of anoth interfering	coll relative to M	in defined by
its associated DIP					
Note 3: Cell 1 is the servir					ion io deleved
Note 4: Cell 2 transmissio with respect to Ce			en i by 0.33 ms an	u Cell 3 transmiss	sion is delayed
Note 5: To avoid collisions instead of PUCCH periodic CQI to mu	between CQI	reports and HA format 0 shall b	e transmitted in do	wnlink SF#1 and	#6 to allow

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		opagat onditio		Correlation Matrix and	Reference Value		UE Cate	
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	gory	
1	R.46 FDD	OP. 1 FD D	N/A	N/A	EV A70	EV A70	EV A70	2x2 Low	70	-1.1	≥1	
								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.		

8.2.1.3 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.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Parameter		Unit	Test 1-2
Deventintener	$ ho_{\scriptscriptstyle A}$	dB	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)
	σ	dB	dB -3 dB -3 (Note 1) dB 0
$N_{_{oc}}$ at antenna	port	dBm/15kHz	-98
PDSCH transmission	on mode		3
Note 1: $P_B = 1$.			
Note 2: Void			
Note 3: Void			

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

Table 8.2.1.3.1-2: Minimum performance Large Delay CDD (FRC)

Test num	Bandwidth	Reference channel	OCNG pattern	Propa- gation condi-	Correlation matrix and antenna	Reference Fraction of maximum	SNR	UE category
			-	tion	config.	Throughput (%)	(dB)	
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
3	10 MHz	R.35-4 FDD	OP.1 FDD	ETU300	2x2 Low	70	19.7	≥2
Note 1: Note 2:	Void. Test 1 may no	ot be executed	d for UE-s for	which Test 1	or 2 in Table 8.2.	1.3.1-4 is applic	able.	

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

	Parameter		Unit	Test 1-3			
Davualia	Downlink power		dB	-3			
	allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)			
		σ	dB	0			
No	at antenna	port	dBm/15kHz -98				
PDSCH	l 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 componen		Insmission mode is	applied to each			

		Propa- Correlation Reference value					
Te: nui		 OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)	UE cate- gory

1	2x10 MHz	R.11 FDD	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.7	≥3								
2	2x20 MHz	R.30 FDD	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.2	≥5								
Note 1	: The OCNO	G pattern applies f	or each CC.													
Note 2	: Void.															
Note 3	Note 3: The applicability of requirements for different CA configurations and bandwidth combination sets is defined															
	in 8.1.2.3.							11 y 1 y								

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.

Parameter			Unit	Test 1-7	
Develielenev		$ ho_{\scriptscriptstyle A}$	dB	-3	
Downlink pow allocation		$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	
		σ	dB	0	
$N_{\scriptscriptstyle oc}$ at an	$N_{\scriptscriptstyle oc}$ at antenna port			-98	
PDSCH transmission mode				3	
Note 1: $P_B =$	$P_{\rm B}=1$.				
	For CA test cases, PUCCH format 1b with channel selection is used to feedback ACK/NACK.				
Note 3: For 0	For CA test cases, the same PDSCH transmission mode				
is applied to each component carrier.					

				Brong		Reference value	
Test num	Bandwi dth	Reference channel	OCNG pattern	Propa- gation condi- tion	Correlation matrix and antenna config.	Fraction of maximum Throughput (%)	SNR (dB)
1	2x20 MHz	R.30 FDD	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.2
2	15MHz +	R.35-2 FDD for 15MHz CC	OP.1 FDD (Note 1)	EVA5	2x2 Low	70	15.1
2	10MHz	R.35-3 FDD for 10MHz CC	OP.1 FDD (Note 1)		ZXZ LOW	70	15.1
3	20MHz +	R.30 FDD for 20MHz CC	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.5
5	10MHz	R.11 FDD for 10MHz CC	OP.1 FDD (Note 1)			70	13.5
4	20MHz +	R.30 FDD for 20MHz CC	OP.1 FDD (Note 1)	EVA70	2x2 Low	70	13.5
4	15MHz	R.30-1 FDD for 15MHz CC	OP.1 FDD (Note 1)			70	13.5
5	2x20 MHz	R.35-1 FDD	OP.1 FDD (Note 1)	EVA5	2x2 Low	70	15.8
6	6 20MHz + 10MHz	R.35-1 FDD for 20MHz CC	OP.1 FDD (Note 1)	EVA5	2x2 Low	70	15.9
0		R.35-3 FDD for 10MHz CC	OP.1 FDD (Note 1)			70	15.9
7	_ 20MHz +	R.35-1 FDD for 20MHz CC	OP.1 FDD (Note 1)			70	15.9
/ 15MHz	R.35-2 FDD for 15MHz CC	OP.1 FDD (Note 1)	EVA5	2x2 Low	70	15.9	
Note 1:For CA test cases, the OCNG pattern applies for each CC.Note 2:For Test 2, 3, 4, 6, 7 the Fraction of maximum Throughput applies to each CC.Note 3:The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.							

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

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

LIE optogony	Bandwidth combination with maximum aggregated bandwidth (Note 1)					
UE category	2x20MHz	15MHz+10MHz	20MHz+10MHz	20MHz+15MHz		
3	1	2	3	4		
4	5	N/A	6	7		
Note 1: Maximum over all supported CA configurations and bandwidth combination sets according to Table 5.6A.1-						
1and Table 5.6A.1-2.						

8.2.1.3.2 Minimum Requirement 4 Tx Antenna Port

The requirements are specified in Table 8.2.1.3.2-2, with the addition of the parameters in Table 8.2.1.3.2-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of large delay CDD with 4 transmitter antennas.

Table 8.2.1.3.2-1: Tes	t Parameters for Large	Delay CDD (FRC)
------------------------	------------------------	-----------------

Parameter		Unit	Test 1	
Develieksever	$ 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: $P_B = 1$				

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

Table 8.2.1.3.2-2: Minimum performance Large Delay CDD (FRC)

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	ρ_{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	95)		N/A	11000100, 11000000, 11000000, 11000000, 11000000,				
RLM/RRM Measurement Pattern(Note 6)			10000000 10000000 10000000 10000000 1000000	N/A				
CSI Subframe Sets (Note	Ccsi,0		11000100 11000000 11000000 11000000 11000000	N/A				
7)	C _{CSI,1}		00111011 00111111 00111111 00111111 00111111	N/A				
Number of control OFDN	I symbols		2	2				
PDSCH transmission			3	N/A				
Cyclic prefix			Normal	Normal				
 Note 1: P_B = 1. Note 2: This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS. Note 3: This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS. Note 4: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS Note 5: ABS pattern as defined in [9]. Note 6: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI 								
 Note 7: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 8: Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same. Note 9: SIB-1 will not be transmitted in Cell2 in this test. 								

Table 8.2.1.3.3-1: 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		Reference Value		UE Category	
		Cell 1	Cell 2	Cell 1	Cell 2	Configuration	Fraction of Maximum Throughput (%) (Note 5)	SNR (dB) (Note 2)				
1	R.11 FDD (Note 4)	OP.1 FDD	OP.1 FDD	EVA 5	EVA 5	2x2 Low	70	13.3	≥2			
Note 1:	The propagati	ion condit	ions for C	ell 1 and	Cell2 are	statistically indepe	endent.					
Note 2:	SNR correspo	onds to \widehat{E}	N_{oc2}	of cell 1.								
Note 3: Note 4:	Cell 1 Referen are transmitte	nce chanr d in the s	el is mod erving cel	ified: PDS	SCH other e when th	pply for Cell 1 and than SIB1/paging subframe is over definition of the ref	g and its associa rlapped with the	ABS sub				
Note 5:						al Payload in 9 su			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	: 5)		N/A	0001000000 010000010 0000001000 00000000			
RLM/RRM Measurement Pattern (Note 6			0001000000 010000010 0000001000 00000000	N/A			
CSI Subframe Sets (Note	Ccsi,0		0001000000 010000010 0000001000 00000000	N/A			
7)	Ccsi,1		1110111111 1011111101 1111110111 1111110111 111111	N/A			
MBSFN Subframe Allocatio	on (Note 10)		N/A	001000 100001 000100 000000			
Number of control OFDN			2	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 							
	mber of uplink	HARQ transmission is ≤ 2 otected by MBSFN ABS ir		nannel			

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:					Cell2 are	statistically indepe	ndent.	•		
Note 2:	SNR correspo	onds to \widehat{E}	$_{s}/N_{oc2}$ c	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:	00					al Payload in 4 su		ed over 4	Oms.	

 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.

Para	meter		Unit	Cell 1	Cell 2	Cell 3	
		$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3	
Downlink pov allocation		$\rho_{\scriptscriptstyle B}$	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	a 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 shi	ft betwe	een Cells	Hz	N/A	300	-100	
Ce	ell Id			0	1	126	
ABS pattern (Note 5)				N/A	11000000 11000000 11000000 11000000 11000000	11000000 11000000 11000000 11000000 11000000	
RLM/RRM Measurement Subframe Pattern (Note 6)				1000000 1000000 1000000 1000000 1000000 1000000	N/A	N/A	
CSI Subframe	Sets	Ccsi,0		11000000 11000000 11000000 11000000 11000000	N/A	N/A	
(Note7)	0010	Ccsi,1		00111111 00111111 00111111 00111111 00111111	N/A	N/A	
Number of o	control nbols	OFDM		2	Note 8	Note 8	
PDSCH trans		n mode		3	Note 9	Note 9	
CycliaNote 1: $P_B =$ Note 2:ThisoverloverlNote 3:ThisaggreaggreNote 4:This	c prefix 1. noise is apping noise is essor A noise is	s applied in with the ag s applied in BS. s applied in	gressor ÅBS. OFDM symbols all OFDM symbo	Normal #1, #2, #3, #5, #6, #8, # #0, #4, #7, #11 of a sub bls of a subframe overla	oframe overlappi	Normal 3 of a subframe ing with the	
 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 r indica Note 9: Down OCN	number ated by nlink ph G patte	of control ("0" of ABS hysical chan ern as define	OFDM symbols is pattern. Inel setup in Cell ed in Annex A.5.		ance with Annex		
Note 10: The r	numbei	of the CRS	S ports in Cell 1,	Cell 2 and Cell 3 is the	same.		

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

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.

ETSI

Test Numb	Refer ence	$\widehat{E}_{s}/2$	N _{oc2}	00	OCNG Pattern Propagation Correlatio Refe Conditions (Note1) n Matrix			Reference	e Value	UE Cate			
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: Note 3:						•	n apply f	or Cell 1,	Cell 2 ai	nd Cell 3.			
Note 4:	Cell 1 transm	The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3. NR corresponds to \hat{E}_s/N_{oc2} of cell 1. The correspond to \hat{E}_s/N_{oc2} of cell 1.											
Note 5:	The m	aximun	n Throu	ighput is	calculate	d from th	e total Pa	ayload in	9 subfra	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 power	$ 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-	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.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.

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

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 on bitmap	estricti		000000000000000000000000000000000000000			
on binnap			000000000000000000000000000000000000000			
			111111111111111111			
PDSCH transmiss mode	sion		4			
Note 1: $P_{R} = 1$.						
Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).						

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

Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	alue	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	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		Antenna ports 0,1	Antenna ports 0,1	Antenna ports 0,1	
N_{oc} at antenna po	rt	dBm/15kHz	-98	N/A	N/A
DIP (Note 2)		dB	N/A	-1.73	-8.66
BW _{Channel}		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	2
Number of control OFDM	symbols		2	2	2
PDSCH transmission	mode		6	N/A	N/A
Interference mode	el		N/A	As specified in clause B.5.3	As specified in clause B.5.3
Probability of occurrence of	Rank 1	%	N/A	80	80
transmission rank in interfering cells	Rank 2	%	N/A	20	20
Precoding granular	ity	PRB	50	6	6
PMI delay (Note 4)	ms	8	N/A	N/A
Reporting interva	I	ms	5	N/A	N/A
Reporting mode			PUCCH 1-1	N/A	N/A
CodeBookSubsetRestriction			1111	N/A	N/A
Physical channel for CQI	reporting		PUSCH(Note 6)	N/A	N/A
cqi-pmi-Configuration	Index		2	N/A	N/A
Note 1: $P_B = 1$ Note 2:The respective recits associated DIPNote 3:Cell 1 is the servinNote 4:If the UE reports in at a downlink SF n	value as spe g cell. Cell 2, an available	cified in clause B 3 are the interfer uplink reporting	5.1. ring cells. instance at subrar	ne SF#n based or	PMI estimation

Table 8.2.1.4.1B-1: Test Parameters for Single-Layer Spatial Multiplexing (FRC) with TM4 interference model

before SF#(n+4). Note 5: All cells are time-synchronous.

Note 6: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1 and #6 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5 and #0.

Table 8.2.1.4.1B-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model

Test Number	Reference Channel	OCNG Pattern		Propagation Conditions		Correlation Matrix and	Reference Value		UE Cate		
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	gory
1	R.47 FDD	OP. 1 FD D	N/A	N/A	EV A5	EV A5	EV A5	2x2 Low	70	0.8	≥1
Note 1:	Note 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.										
Note 2:	2: SINR corresponds to \widehat{E}_s/N_{oc} of Cell 1 as defined in clause 8.1.1.										
Note 3:	Correlation ma	trix and	anten	na conf	iguratio	n para	meters	apply for each o	of 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.

Parameter		Unit	Cell 1	Cell 2	Cell 3
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
Downlink power allocation	$\rho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)
anocation	σ	dB	0	-3 -3 I) -3 (Note 1) -3 (Note 1) N/A N/A N/A 2) N/A N/A 3) N/A N/A 4) N/A N/A 10 12 10 10 10 10 FN Non-MBSFN Non-M 300 -10 100 110 1100 1100 126 1 1100000 11000000 11000 11000 11000000 11000 11000 0 N/A N/A 0 N/A N/A 0 N/A N/A 1 N/A 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
	Noc3 dBm/15kHz -93 (Note 4) N/A		N/A		
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.1.4.1C-2	12	10
BW _{Channel}		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift betwe	en Cells	Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (Not	ABS pattern (Note 5)		N/A	11000000 11000000 11000000	11000000 11000000 11000000 11000000 11000000
	RLM/RRM Measurement Subframe Pattern (Note 6)		10000000 10000000 10000000 10000000 1000000	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		11000000 11000000 11000000 11000000 11000000	N/A	N/A
(Note7)	Ccsi,1		00111111 00111111 00111111 00111111 00111111	N/A	N/A
Number of control symbols	OFDM		2	Note 8	Note 8
PDSCH transmission mode			6	Note 9	Note 9
Precoding granularity		PRB	50	N/A	N/A
PMI delay (Note 10)		ms	8	N/A	N/A
Reporting interval		ms	1	N/A	N/A
Peporting mod			PUSCH 3-1	N/A	N/A
CodeBookSubsetRestriction bitmap			1111	N/A	N/A
Cyclic prefix			Normal	Normal	Normal

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	5.	

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	L.	Unit	Test 1-2		
Downlink nower	$ ho_{\scriptscriptstyle A}$	dB	-3		
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)		
	σ	dB	0		
$N_{_{oc}}$ at antenna	port	dBm/15kHz	-98		
Precoding granu	Ilarity	PRB	50		
PMI delay (Not	e 2)	ms	8		
Reporting inte	rval	ms	1		
Reporting mo	de		PUSCH 3-1		
CodeBookSubsetRo bitmap	estriction		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	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.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.1.4.3-1: Tes	Parameters for	Multi-Layer	Spatial	Multiplexing	(FRC)
------------------------	----------------	-------------	---------	--------------	-------

Paramete	r	Unit	Test 1
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	-6
	$ 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 3: Void.						
Note 4: Void.							
Note 5: Void.							

				Propa-	Correlation	Reference v			
Test num.	Band- width	Referencechannel	OCNG pattern	gation condi- tion	matrix and antenna config.	Fraction of maximum SNR throughput (dB) (%)		UE cate- gory	
1	10 MHz	R.36 FDD	OP.1 FDD	EPA5	4x2 Low	70	14.7	≥2	
Note 1	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				
Deverliek zewer	$ ho_{\scriptscriptstyle A}$	dB	-6	-6				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)	-6 (Note 1)				
	σ	dB	3	3				
$N_{\it oc}$ 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	000000000000000000				
bitmap			0000000000000000000	0000000000000000000				
			0000001111111	0000001111111				
			1111111110000	1111111110000				
			000000000000	000000000000				
CSI request field (Note 3)		'1	0'				
PDSCH transmission	on mode		4	1				
Note 1: $P_B = 1$.								
based on I	PMI estimat	tion at a downlink S	porting instance at s F not later than SF# IB downlink before \$	^t (n-4), this				
Note 3: Multiple Collayers.	te 3: Multiple CC-s under test are configured as the 1 st set of serving cells by higher							
Note 4: ACK/NACK bits are transmitted using PUSCH with PUCCH format 1b with channel selection configured.								
Note 5: The same	PDSCH tra	insmission mode is	applied to each con	nponent carrier.				

				Dropo	Correlation	Reference	e value				
Test Band- num. width		Referencechannel	OCNG pattern	Propa- gation condi- tion	Correlation matrix and antenna config.	Fraction of maximum throughput (%)	SNR (dB)	UE cate- gory			
1	2x10 MHz	R.14 FDD	OP.1 FDD (Note 1)	EVA5	4x2 Low	70	10.8	≥3			
2	2x20 MHz	R.14-3 FDD	OP.1 FDD (Note 1)	EVA5	4x2 Low	70	10.9	≥5			
Note 1:	Note 1: The OCNG pattern applies for each CC.										
Note 2											
	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.

Paramete	er	Unit	Test 1			
Devertieten er	$ 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	nna 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 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 8.2.1.7.1-1: Test Parameters for CA

Test Number	Band- width	Reference Channel		OCNG Pattern			gation itions	Correlation Matrix and Antenna		Fract Maxi	ce value ion of mum ıput (%)	UE Category
		PCell	SCell	PCell	SCell	PCell	SCell	PCell	SCell	PCell	SCell	
1	2x20M Hz	R.49 FDD	NA	OP.1 FDD	OP.5 FDD	Clause B.1	Clause B.1	1x2	2x2	85%	NA	≥5
Note 1: Note 2:	the cor	ntrol char	nel and	PDSCH.						pattern for width comb		sed to fill s is defined

8.2.1.8 Intra-band non-contiguous carrier aggregation with timing offset

The requirements in this section verify the ability of an intraband non-contiguous carrier aggregation UE to demodulate the signal transmitted by the PCell and SCell in the presence of timing offset between the cells. Throughput is measured on both cells.

8.2.1.8.1 Minimum Requirement

For CA the requirements are specified in Table 8.2.1.8.1-2, with the addition of the parameters in Table 8.2.1.8.1-1 and the downlink physical channel setup according to Annex C.3.2.

Paramete	r	Unit	Test 1				
Downlink nowor	$ 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				
Modulatio	n		64 QAM				
Maximum number	of HARQ		4				
transmissio	on						
Redundancy version	on coding		{0,0,1,2}				
sequence	;						
PDSCH transmiss	ion mode		3				
of PCell							
PDSCH tramsmiss of SCell	ion mode		3				
Note 1: $P_{B} = 1$.							
Note 2: The OCNG pattern is used to fill unused control channel and PDSCH.							

Table 8.2.1.8.1-1: Test Parameters for CA

Test	Test Cell Band- Referen		Referenc	OCNG	Propagati	Correlati	Refence va	alue	Timing	UE	
Numbe r		width	e Channel	Patter n	on Condition s	on Matrix and Antenna	Fraction of Maximum Throughput (%)	SNR (dB)	relative to PCell (µs)	Catego ry	
4	PCell	10MH z	R.60 FDD	OP.1	EPA200	2x2 Low	70	21.15	N/A	Ś	
1	SCell	10MH z	R.35-3 FDD	FDD	EPA200	2x2 Low	60	15.18	-30.26	≥3	
Note 1: Note 2:	z FDD ET A200 ZZ Low oo Tot										

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						

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.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Parameter		Unit	Test 1- 5	Test 6- 8	Test 9- 15	Test 16- 18	Test 19
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0	0	0	0	0
power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	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				
00	N_{oc} at antenna port		-98	-98	-98	-98	-98				
Symbo	ols for		OCNG	OCNG	OCNG	OCNG	OCNG				
unused	l PRBs		(Note 2)								
Modul	lation		QPSK	16QAM	64QAM	16QAM	QPSK				
ACK/N	NACK		Multiplexing	Multiplexing	Multiplexing	Multiplexing	Multiplexing				
feedbac	k mode										
PDS	SCH		1	1	1	1	1				
transmiss	ion mode										
Note 1:	$P_B = 0$										
Note 2:											
Note 3: Note 4:											

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

Table 8.2.2.1.1-2: Minimum performance (FRC)

1415 MHzR.8 TDDOP.1 TDDEVA51x2 Low7017.8≥215 MHzR.8-1 TDDOP.1 TDDEVA51x2 Low7017.811520 MHzR.9 TDDOP.1 TDDEVA51x2 Low7017.7≥320 MHzR.9-2 TDDOP.1 TDDEVA51x2 Low7017.7220 MHzR.9-2 TDDOP.1 TDDEVA51x2 Low7017.7220 MHzR.9-1 TDDOP.1 TDDEVA51x2 Low7017.72163 MHzR.0 TDDOP.1 TDDETU701x2 Low302.1≥11710 MHzR.1 TDDOP.1 TDDETU701x2 Low302.0≥11820 MHzR.1 TDDOP.1 TDDETU701x2 Low302.1≥11910 MHzR.41 TDDOP.1 TDDEVA51x2 Low70-5.3≥1Note 1:VoidVoidOP.1 TDDEVA51x2 Low70-5.3≥1									
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	14	15 MHz	R.8 TDD	-	EVA5	1x2 Low	70	17.8	≥2
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$									
15 1520 MHzR.9 TDD R.9 TDDOP.1 TDDEVA5 EVA51x2 Low7017.7 17.7≥320 MHzR.9-2 TDD R.9-1 TDDOP.1 TDDEVA51x2 Low7017.7220 MHzR.9-1 TDD TDDOP.1 TDDEVA51x2 Low7017.71163 MHzR.0 TDD R.0 TDDOP.1 TDDETU70 TDD1x2 Low302.1≥11710 MHzR.1 TDD TDDOP.1 TDDETU70 TDD1x2 Low302.0≥11820 MHzR.1 TDD R.41 TDDOP.1 TDDETU70 TDD1x2 Low302.1≥11910 MHzR.41 TDD TDDOP.1 TDDEVA51x2 Low70-5.3≥1		15 MHz	R.8-1 TDD	OP.1	EVA5	1x2 Low	70	17.8	1
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				TDD					
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	15	20 MHz	R.9 TDD	-	EVA5	1x2 Low	70	17.7	≥3
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$				TDD					
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		20 MHz	R.9-2 TDD	OP.1	EVA5	1x2 Low	70	17.7	2
IntermsIntermsIntermsIntermsIntermsInterms163 MHzR.0 TDDOP.1 TDDETU701x2 Low302.1 ≥ 1 1710 MHzR.1 TDDOP.1 TDDETU701x2 Low302.0 ≥ 1 1820 MHzR.1 TDDOP.1 TDDETU701x2 Low302.1 ≥ 1 1910 MHzR.41 TDDOP.1 TDDEVA51x2 Low70-5.3 ≥ 1				-					_
IntermsIntermsIntermsIntermsIntermsInterms163 MHzR.0 TDDOP.1 TDDETU701x2 Low302.1 ≥ 1 1710 MHzR.1 TDDOP.1 TDDETU701x2 Low302.0 ≥ 1 1820 MHzR.1 TDDOP.1 TDDETU701x2 Low302.1 ≥ 1 1910 MHzR.41 TDDOP.1 TDDEVA51x2 Low70-5.3 ≥ 1		20 MHz	R 9-1 TDD	OP 1	EVA5	1x21ow	70	177	1
TDDTDDTDDTDD1710 MHzR.1 TDDOP.1 TDDETU701x2 Low302.0 ≥ 1 1820 MHzR.1 TDDOP.1 TDDETU701x2 Low302.1 ≥ 1 1910 MHzR.41 TDDOP.1 TDDEVA51x2 Low70-5.3 ≥ 1		20 11112		-	21710				•
1710 MHzR.1 TDDOP.1 TDDETU701x2 Low302.0≥11820 MHzR.1 TDDOP.1 TDDETU701x2 Low302.1≥11910 MHzR.41 TDDOP.1 TDDEVA51x2 Low70-5.3≥1	16	3 MHz	R.0 TDD	OP.1	ETU70	1x2 Low	30	2.1	≥1
TDD TDD TDD 18 20 MHz R.1 TDD OP.1 TDD ETU70 TDD 1x2 Low 30 2.1 ≥1 19 10 MHz R.41 TDD OP.1 TDD EVA5 1x2 Low 70 -5.3 ≥1	_	-	_	TDD		-			
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	17	10 MHz	R.1 TDD	OP.1	ETU70	1x2 Low	30	2.0	≥1
TDD TDD TDD TDD TDD 19 10 MHz R.41 TDD OP.1 EVA5 1x2 Low 70 -5.3 ≥1				TDD					
19 10 MHz R.41 TDD OP.1 EVA5 1x2 Low 70 -5.3 ≥1	18	20 MHz	R.1 TDD	OP.1	ETU70	1x2 Low	30	2.1	≥1
TDD				TDD					
	19	10 MHz	R.41 TDD	OP.1	EVA5	1x2 Low	70	-5.3	≥1
Note 1: Void				TDD		-			
	Note 1:	Void							

Table 8.2.2.1.1-3: Test Parameters for CA

	Parameter	Unit	Test 1			
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0			
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)			
	σ	dB	0			
N_{oc} at antenna port		dBm/15kHz	-98			
Symbols for unused PRBs			OCNG (Note 2)			
	Modulation		QPSK			
ACK/N	ACK feedback mode		PUCCH format 1b with channel selection			
PDSCH	I transmission mode		1			
Note 1:	$P_B = 0$					
Note 2: T	hese 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					
p	seudo random data, which	is QPSK modu	lated.			
Note 3: T	he same PDSCH transmis	sion mode is ap	pplied to each component carrier.			

Table 8.2.2.1.1-4: Minimum performance (FRC) for CA

					Correlation	Reference		
Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	UE Category
1	2x20MHz	R.42 TDD	OP.1 TDD (Note 1)	EVA5	1x2 Low	70	-1.2	≥5
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.							

- 8.2.2.1.2 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		
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)		
ACK/NACK feedbac	ck mode		Multiplexing		
PDSCH transmission	on mode		1		
Note 1: $P_B = 0$ Note 2:The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the first slot.Note 3:The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN					
		ulated MBSFN data			

 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	Test Bandwidth Reference OCNG		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 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	$N_{_{oc}}$ at antenna port		-98
ACK/NACK feedba	ACK/NACK feedback mode		Multiplexing
PDSCH transmission mode			2
Note 1: $P_B = 1$		•	•

Test	Bandw	Reference	OCNG	Propagation	Correlation	Reference value		UE	
number	idth	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category	
1	10 MHz	R.11 TDD	OP.1 TDD	EVA5	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

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
$N_{\scriptscriptstyle oc}$ at antenna port		dBm/15kHz	-98
ACK/NACK feedback mode			Multiplexing
PDSCH transmission mode			2
Note 1: $P_B = 1$			

Table 8.2.2.2-2: Minimum	performance	Transmit	Diversity (F	RC)
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Test	Band-	Reference	OCNG	Propagation	Correlation	Reference v	/alue	UE
number	width	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	1.4 MHz	R.12 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 8.2.2.2.3-1 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell. In Table 8.2.2.2.3-1, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

	Parameter		Unit	Cell 1	Cell 2
Uplin	k downlink confi	iguration		1	1
	al subframe con			4	4
		$\rho_{\scriptscriptstyle A}$	dB	-3	-3
	link power ocation	$ 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 a	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
Su	bframe Configu	ration		Non-MBSFN	Non-MBSFN
Time Offset between Cells			μs	2.5 (synch	ronous cells)
Cell Id				0	1
А	BS pattern (Not	te 5)		N/A	0000010001 0000000001
RLM/RR	M Measuremer Pattern (Note			0000000001 0000000001	N/A
CSI Sul	bframe Sets	C _{CSI,0}		0000010001 0000000001	N/A
(N	lote 7)	C _{CSI,1}		1100101000 1100111000	N/A
Number	r of control OFD	M symbols		2	2
ACK	/NACK feedbac	k mode		Multiplexing	N/A
PDS	CH transmissio	n mode		2	N/A
	Cyclic prefix			Normal	Normal
Note 1: Note 2: Note 3:	subframe overl This noise is a	apping with th	M symbols #1, #2, #3, #5, e aggressor ABS. M symbols #0, #4, #7, #1 ²		
Note 4:	the aggressor This noise is ap non-ABS.		DM symbols of a subfrar	ne overlapping v	vith aggressor
Note 5:	ABS pattern as	defined in [9]			
Note 6:	•		esource restriction patter	n for PCell meas	urements as
	defined in [7].				
Note 7:	As configured a for CSI measured		e time-domain measuren ed in [7].	nent resource re	striction pattern
Note 8:		rving cell. Cell	2 is the aggressor cell. T	he number of the	e CRS ports in
Note 9:			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	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.11-4 TDD (Note 4)	OP.1 TDD	OP.1 TDD	EVA5	EVA5	2x2 Medium	70	3.8	≥2
Note 1:					Cell2 are s	statistically indepe	ndent.		
Note 2: 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, averaç	ged over 2	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 con			4	4	4			
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)			
	σ	dB	0	N/A	N/A			
	N _{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A			
N_{oc} at antenna port	N _{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A			
	N _{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A			
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.2.2.2.3A-2	12	10			
BW _{Channel}		MHz	10	10	10			
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN			
Time Offset betwee	n Cells	μs	N/A	3	-1			
Frequency shift betwee	een Cells	Hz	N/A	300	-100			
Cell Id			0	126	1			
ABS pattern (No	te 5)		N/A	0000000001 0000000001	0000000001 0000000001			
RLM/RRM Measur Subframe Pattern (0000000001 0000000001	N/A	N/A			
CSI Subframe Sets	Ccsi,0		0000000001 0000000001	N/A	N/A			
(Note7)	Ccsi,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			2	Note 9	Note 9			
Cyclic prefix			Normal	Normal	Normal			
Note 1: $P_B = 1$.Note 2:This noise is subframe or	s applied in /erlapping v	vith the aggresso	#1, #2, #3, #5, #6, # or ABS.	#8, #9, #10, #12, #	13 of a			
aggressor A Note 4: This noise is Note 5: ABS patterr	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							
Note 7: As configure measureme Note 8: The number	nts defined	in [7]. OFDM symbols i	nain measurement r s not available for A					
OCNG patte	nysical char ern as defin	nel setup in Cell ed in Annex A.5.	2 and Cell 3 in according to the cell 2 and Cell 3 is the		ex C.3.3 applying			
Note 11: SIB-1 will no	ot be transm	nitted in Cell 2 ar	nd Cell 3 in this test.					

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

Test Number	Reference Channel	00	NG Patt	ern		ropagati itions (N		Correlation Matrix and	Reference Value		UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configuration (Note 2)	Fraction of Maximum Throughput (%) Note 5	SNR (dB) (Note 3)	gory
1	R.11-4 TDD Note	OP.1 TDD	OP.1 TDD	OP.1 TDD	EVA5	EVA5	EVA5	2x2 Medium	70	3.5	≥2
Note 1.	4 The propertie		ana fan C					llu in den en de st			
Note 1: Note 2:	1 1 0			,				Ily independent. Il 2 and Cell 3			
Note 3:	SNR correspon	nds to \widehat{E}_s	$/N_{oc2}$ of	cell 1.							
Note 4:		he servir	ng cell su	bframe w	hen the s	subframe	is overla	ng and its associat pped with the AB			ell and
Note 5:	The maximum	Through	put is cal	culated fr	om the to	otal Paylo	bad in 2 s	ubframes, averag	ed over 20ms.		

8.2.2.2.4 Enhanced Performance Requirement Type A – 2 Tx Antenna Ports with TM3 interference model

The requirements are specified in Table 8.2.2.2.4-2, with the addition of parameters in Table 8.2.2.2.4-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the performance of transmit diversity (SFBC) with 2 transmit antennas when the PDSCH transmission in the serving cell is interfered by PDSCH of two dominant interfering cells applying transmission mode 3 interference model defined in clause B.5.2. In Table 8.2.2.2.4-1, Cell 1 is the serving cell, and Cell 2, 3 are interfering cells. The downlink physical channel setup is according to Annex C.3.2 for each of Cell 1, Cell 2 and Cell 3, respectively.

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	al	ms	5	N/A	N/A
Reporting mode			PUCCH 1-0	N/A	N/A
ACK/NACK feedback			Multiplexing	N/A	N/A
Physical channel for CQI	reporting		PUSCH(Note 5)	N/A	N/A
cqi-pmi-Configuration	Index		4	N/A	N/A
Note 1: $P_{B} = 1$		•	•	•	•
Note 2: The respective rec	ceived power s	spectral density of	of each interfering	cell relative to N_a	$_{pc}$ is defined by
its associated DIP Note 3: Cell 1 is the servir Note 4: All cells are time-s Note 5: To avoid collisions instead of PUCCH periodic CQI to mu	ig cell. Cell 2, ynchronous. between CQI I. PDCCH DC	3 are the interfer reports and HA format 0 shall b	ring cells. RQ-ACK it is nece e transmitted in do	ownlink SF#4 and	#9 to allow

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		opagat onditio		Correlation Matrix and	Reference Value		UE Cate	
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 3)	Fraction of Maximum Throughput (%)	SINR (dB) (Note 2)	gory	
1	R.46 TDD	OP. 1 TD D	N/A	N/A	EV A70	EV A70	EV A70	2x2 Low	70	-1.4	≥1	
								e statistically inc	dependent.			
Note 2:	SINR correspo	nds to	\widehat{E}_{s}/N	o_{c} of (Cell 1 a	s define	ed in cla	ause 8.1.1.				
Note 3:	Correlation matrix and antenna configuration parameters apply for each of Cell 1, Cell 2 and Cell 3.											

8.2.2.3 Open-loop spatial multiplexing performance

8.2.2.3.1 Minimum Requirement 2 Tx Antenna Port

For single carrier the requirements are specified in Table 8.2.2.3.1-2, with the addition of the parameters in Table 8.2.2.3.1-1 and the downlink physical channel setup according to Annex C.3.2. For CA 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. The test coverage for different number of component carriers is defined in 8.1.2.4.

Table 8.2.2.3.1-1: Test Parameters for Large Delay CDD	(FRC)
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Parameter	r	Unit	Test 1-2
Deverliek eewer	$ 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	ick mode		Bundling
PDSCH transmissi	on mode		3
Note 1: $P_B = 1$			
Note 2: Void.			
Note 3: Void.			

Test num ber	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference v Fraction of Maximum Throughput (%)	/alue SNR (dB)	UE Cate gory
1	10 MHz	R.11-1 TDD	OP.1 TDD	EVA70	2x2 Low	70	13.1	≥2
2	10 MHz	R.35 TDD	OP.1 TDD	EVA200	2x2 Low	70	20.3	≥2
3	10 MHz	R.35-2 TDD	OP.1 TDD	ETU300	2x2 Low	70	20.3	≥2
Note 1:	: Void			•	•	•		

Parameter		Unit	Test 1
–	$ 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		PUCCH format 1b with channel selection
PDSCH transmission	on mode		3
Note 1: $P_B = 1$			
Note 2: The same	PDSCH tra	Insmission mode is	applied to each component carrier.

Table 8.2.2.3.1-4: Minimum performance Large Delay CDD (FRC) for CA

				Correlation	Referenc			
Te: nui be	n Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	UE Category

1	2x20 MHz R.30-1 TDD OP.1 TDD EVA70 2x2 Low 70 13.7 ≥5									
Note 1: The OCNG pattern applies for each CC. Note 2: The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 8.1.2.3.										

8.2.2.3.1A Soft buffer management test

For CA the requirements are specified in Table 8.2.2.3.1A-2, with the addition of the parameters in Table 8.2.2.3.1A-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify UE performance with proper instantaneous buffer implementation.

Table 8.2.2.3.1A-1: Test Parameters for soft buffer management test (FRC) for CA

Parameter		Unit	Test 1-2	
Downlink power	$ 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 transmission	on mode		3	
Note 1: $P_B = 1$				
	st cases, the		is used to feedback ACK/NACK. Insmission mode is applied to each	

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference v	value	UE		
numb er		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Categ ory		
1	2x20 MHz	R.30-2 TDD	OP.1 TDD (Note 1)	EVA70	2x2 Low	70	13.2	3		
2	2x20 MHz	R.35-1 TDD	OP.1 TDD (Note 1)	EVA5	2x2 Low	70	15.7	4		
Note 1:	Note 1: For CA test cases, the OCNG pattern applies for each CC.									
Note 2:	The applicabil 8.1.2.3.	ity of requireme	nts for differer	nt CA configuration	ns and bandwidth c	ombination sets is	defined i	n		

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
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	-6
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)
	σ	dB	3
$N_{_{oc}}$ at antenna	port	dBm/15kHz	-98
ACK/NACK feedba	ck mode		Bundling
PDSCH transmission	on mode		3
Note 1: $P_B = 1$.			

Table 8.2.2.3.2-1: Test Parameters for Large Delay CDD (FRC)

Table 8.2.2.3.2-2: Minimum performance Large Delay CDD (FRC)
--

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference value		UE
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.14 TDD	OP.1 TDD	EVA70	4x2 Low	70	14.2	≥2

8.2.2.3.3 Minimum Requirement 2Tx antenna port (demodulation subframe overlaps with aggressor cell ABS)

The requirements for non-MBSFN ABS are specified in Table 8.2.2.3.3-2, with the addition of parameters in Table 8.2.2.3.3-1 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

The requirements for MBSFN ABS are specified in Table 8.2.2.3.3-4, with the addition of parameters in Table 8.2.2.3.3-3 and the downlink physical channel setup according to Annex C.3.2 and Annex C.3.3.

The purpose is to verify the performance of large delay CDD with 2 transmitter antennas if the PDSCH transmission in the serving cell takes place in subframes that overlap with ABS [9] of the aggressor cell. In Tables 8.2.2.3.3-1 and 8.2.2.3.3-3, Cell 1 is the serving cell, and Cell 2 is the aggressor cell. The downlink physical channel setup for Cell 1 is according to Annex C.3.2 and for Cell 2 is according to Annex C.3.3, respectively.

Para	ameter		Unit	Cell 1	Cell 2			
Uplink downli		guration		1	1			
	sial subframe configuration 4 4							
		$ ho_{\scriptscriptstyle A}$	dB	-3	-3			
Downlink pow allocation	N_{oc} at antenna port \widehat{E}_s/N_{oc2} BW _{Channel} Subframe Configu Cell Id Time Offset betwee ABS pattern (No	$ 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	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 8.2.2.3.3-2	6			
BW	Channel		MHz	10	10			
Subframe	Configur	ation		Non-MBSFN	Non-MBSFN			
C	ell Id			0	1			
Time Offset	betweer	n Cells	μs	2.5 (synchro	nous cells)			
ABS patte	ABS pattern (Note 5)			N/A	0000010001, 0000000001			
RLM/RRM Measurement Subframe Pattern (Note 6)				0000000001, 0000000001	N/A			
CSI Subframe	CSI Subframe Sets (Note 7)			0000010001, 0000000001	N/A			
(Note 7)				1100101000 1100111000	N/A			
Number of cont	rol OFDI	A symbols		2	2			
ACK/NACK				Multiplexing	N/A			
PDSCH tran	smissior	n mode		3	N/A			
Cycli	c 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 								
	ll2 is the vill not be		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	Reference Value Cat			
		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	endent.				
Note 2:	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.										
Note 5:	The maximur	n Through	put is cal	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	-					
ABS pattern (Note	,		N/A	0000000001 0000000001					
RLM/RRM Measurement Pattern (Note 6			0000000001 0000000001	N/A					
CSI Subframe Sets	Ccsi,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	2					
ACK/NACK feedback	< mode		Multiplexing	N/A					
PDSCH transmission	n mode		3	N/A					
Cyclic prefix			Normal	Normal					
Note 1: $P_B = 1$. Note 2: This noise is ap			0 HA HE HO HZ HO HO	#10 #11 #10					
#13 of a subfrai	me overlappir	ng with the aggresso	3, #4, #5, #6, #7, #8, #9 or ABS. bframe overlapping with						
	plied in all OF	DM symbols of a si	ubframe overlapping wit	th aggressor non-					
Note 5: ABS pattern as		. The 10 th and 20 th s	subframes indicated by	ABS pattern are					
	MBSFN ABS subframes. Time-domain measurement resource restriction pattern for PCell measurements as defined								
Note 7: As configured a									
	ving cell. Cell		cell. The number of the	CRS ports in Cell1					
	e transmitted me Allocation	in Cell2 in this test. as defined in [7], or	ne frame with 6 bits is cl	hosen for MBSFN					

Table 8.2.2.3.3-3: Test Parameters for Large Delay CDD (FRC) – 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	12.2	≥2
Note 1:					Cell2 are s	statistically indepe	ndent.		
Note 2:	SNR correspo	onds to \widehat{E}	\hat{E}_s / N_{oc2} of	of cell 1.					
Note 3: Note 4:	5								
Note 5:		00				al Payload in 2 sul			

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 confi			1	1	1			
Special subframe con	figuration		4	4	4			
	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3			
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3 (Note 1)	-3 (Note 1)	-3 (Note 1)			
	σ	dB	0	N/A	N/A			
	N _{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A			
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A			
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A			
\widehat{E}_{s}/N_{oc2}		dB	Reference Value in Table 8.2.2.3.4-2	Reference Value in Table 8.2.2.3.4-2	Reference Value in Table 8.2.2.3.4-2			
BW _{Channel}		MHz	10	10	10			
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN			
Time Offset betwee	n Cells	μs	N/A	3	-1			
Frequency shift betwe	en Cells	Hz	N/A	300	-100			
Cell Id			0	1	126			
ABS pattern (Not	-		N/A	0000000001 0000000001	0000000001 0000000001			
RLM/RRM Measur Subframe Pattern (I			0000000001 0000000001	N/A	N/A			
CSI Subframe Sets	Ccsi,0		0000000001 0000000001	N/A	N/A			
(Note7)	Ccsi,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 prefixNote 1: $P_{\rm p} = 1$.			Normal	Normal	Normal			
 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 10: The number	of the CRS		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	$\widehat{E}_{s}/2$	N _{oc2}	00	NG Patt	ern		ropagatio		Correlation Matrix and			UE Cate
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:										pendent.			
Note 2:						•	apply to	or Cell 1,	Cell 2 and	a Cell 3.			
	Note 3: SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.												
	Note 4: Cell 1 Reference channel is modified: PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.												
Note 5:	The n	naximun	n Throu	ghput is c	alculated	from the	e total Pa	yload in 2	2 subfram	es, averaged ov	/er 20ms.		

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	l	ms	ms 1 or 4 (Note 3) 1 o					
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.

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	92)	ms	10 or 11				
Reporting inter	/al	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: $P_{R} = 1$.							
Note 2: If the UE	5						
	at subrame SF#n based on PMI estimation at a downlink						
SF not la	SF not later than SF#(n-4), this reported PMI cannot be						
	applied at the eNB downlink before SF#(n+4).						
			1 the reporting interval				
		ween 1ms and 4m					

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Reference	Reference value	
number		Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	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-

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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
$N_{\it oc}$ at antenna po	ort	dBm/15kHz	-98	N/A	N/A
DIP (Note 2)		dB	N/A	-1.73	-8.66
BWChannel		MHz	10	10	10
Cyclic Prefix			Normal	Normal	Normal
Cell Id			0	1	2
Number of control OFDM	symbols		2	2	2
PDSCH transmission	mode		6	N/A	N/A
Interference mode	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	ity	PRB	50	6	6
PMI delay (Note 4	l)	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		1111	N/A	N/A	
ACK/NACK feedback		Multiplexing	N/A	N/A	
Physical channel for CQI	reporting		PUSCH(Note 6)	N/A	N/A
cqi-pmi-Configuration	Index		4	N/A	N/A
Note 1: $P_B = 1$					

Note 2: The respective received power spectral density of each interfering cell relative to N_{ac} is defined by its associated DIP value as specified in clause B.5.1.

Cell 1 is the serving cell. Cell 2, 3 are the interfering cells. Note 3:

If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation Note 4: at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).

All cells are time-synchronous. Note 5:

To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH Note 6: instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.

Table 8.2.2.4.1B-2: Enhanced Performance Requirement Type A, Single-Layer Spatial Multiplexing (FRC) with TM4 interference model

Test Number	Reference Channel	OCI	NG Pat	tern	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 1: The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.										
Note 2:	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.

Parameter		Unit	Cell 1	Cell 2	Cell 3			
Uplink downlink cont			1	1	1			
Special subframe cor			4	4	4			
Downlink power	$\rho_{\scriptscriptstyle A}$	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 Configu	uration		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	,		N/A	0000000001 0000000001	0000000001 0000000001			
RLM/RRM Measu Subframe Pattern (0000000001 0000000001	N/A	N/A			
CSI Subframe Sets	Ccsi,0		0000000001 0000000001	N/A	N/A			
(Note7)	Ccsi,1		1100111000 1100111000	N/A	N/A			
Number of control symbols	OFDM		2	Note 8	Note 8			
ACK/NACK feebac	k mode		Multiplexing	N/A	N/A			
PDSCH transmission			6	Note 9	Note 9			
Precoding granu		PRB	50	N/A	N/A			
PMI delay (Note	1	ms	10 or 11	N/A	N/A			
Reporting inter		ms	1 or 4 (Note 11)	N/A	N/A			
Peporting mo			PUSCH 3-1	N/A	N/A			
CodeBookSubsetRe bitmap	estriction		1111	N/A	N/A			
Cyclic prefix	(Normal	Normal	Normal			
overlapping Note 3: This noise i	with the ag s applied in	gressor ABS.	#1, #2, #3, #5, #6, #8, ; #0, #4, #7, #11 of a sul					
Note 5: ABS pattern Note 6: Time-doma [7]	s applied in n as defined in measurer	in [9]. ment resource re	ols of a subframe overla	ell measurement	s as defined in			
Note 8: The numbe	ents defined r of control (in [7]. OFDM symbols i	nain measurement resc s not available for ABS					
	nysical chan	nel 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								
		e SF#(n+4). onfiguration 1 the	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	00	NG Patt	ern	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:								lly independent.			
Note 2:	The correlation			-	juration a	pply for (Cell 1, Ce	Il 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			
CodeBookSubsetRe	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 v	value	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.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Parameter	r	Unit	Test 1				
Downlink power	ρ_A		-6				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-6 (Note 1)				
	σ	dB	3				
$N_{\scriptscriptstyle oc}$ at antenna	a port	dBm/15kHz	-98				
Precoding gran	ularity	PRB	6				
PMI delay (No	te 2)	ms	10 or 11				
Reporting inte	rval	ms	1 or 4 (Note 3)				
Reporting mo	de		PUSCH 1-2				
ACK/NACK feedba			Bundling				
CodeBookSubsetR	estriction		000000000000000000000000000000000000000				
bitmap			0000011111111111111111000000				
			000000000				
PDSCH transmissi	on mode		4				
Note 1: $P_B = 1$.							
based on							
Note 3: For Uplin							
Note 4: Void.							
Note 5: Void.							
Note 6: Void.							

Table 8.2.2.4.3-2: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test	Band-	Reference	OCNG	Propagatio	Correlation	Reference v	/alue	UE
number	width	Channel	Pattern	n Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
1	10 MHz	R.36 TDD	OP.1 TDD	EPA5	4x2 Low	70	15.7	≥2
Note 1:	Void							

Table 8.2.2.4.3-3: Test Parameters for Multi-Layer Spatial Multiplexing (FRC) for CA

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

N_{oc} at antenna po	ort	dBm/15kHz	-98				
Precoding granula	rity	PRB	8				
PMI delay (Note 2	2)	ms	10 or 11				
Reporting interva	al	ms	1 or 4 (Note 3)				
Reporting mode			PUSCH 1-2				
ACK/NACK feedback	mode		PUCCH format 1b with channel selection				
CodeBookSubsetRest	riction		000000000000000000000000000000000000000				
bitmap			0000111111111111111100000000				
			0000000				
CSI request field (No	ote 4)		'10'				
PDSCH transmission	mode		4				
Note 1: $P_B = 1$.							
based on PM	- <u>B</u> -						
Note 4: Multiple CC- layers.	3						
Note 5: The same PI	DSCH tra	Insmission mode is	applied to each component carrier.				

Table 8.2.2.4.3-4: Minimum	performance Multi-Laye	r Spatial Multiplexing	g (FRC) for CA
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Test	Fest Band- Reference		OCNG Propag		Correlation	Reference	UE Cate	
number	width	Channel	Pattern	n Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	
1	2x20 MHz	R.43 TDD	OP.1 TDD (Note 1)	EVA5	4x2 Low	70	11.1	≥5
Note 1: Note 2:		pattern applies		ent CA configur	ations and bandwi	dth combination	sets is defined i	n 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.

Paramete	ər	Unit	Test 1			
	$ 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	nna port of	dBm/15kHz	-85			
\hat{E}_{s} _ $SCell$ at anter Scell	ina port of	dBm/15kHz	-79			
N_{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 transmiss of SCell			3			
Note 1: $P_{B} = 0$.		•				
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

Test Number	Band- width		Reference ChannelOCNG PatternPropagation ConditionsCorrelation Matrix and AntennaReference value Fraction of Maximum 		Conditions Matrix and		UE Category					
		PCell	SCell	PCell	SCell	PCell	SCell	PCell	SCell	PCell	SCell	
1	2x20M Hz	R.49 TDD	NA	OP.1 TDD	OP.5 TDD	Clause B.1	Clause B.1	1x2	2x2	85%	NA	≥5
Note 1: Note 2:	the cor	ntrol char	nnel and l	PDSCH.		the con				pattern for width comb		sed to fill s is defined

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: Void. Note 2: Void.		

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					
	$ 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	del		Annex B.4.1	Annex B.4.1					
Cell-specific refere	ence		Antenna ports 0,1						
CSI reference sig	nals		Antenna ports 15,,18	Antenna ports 15,,18					
CSI-RS periodicity subframe offse <i>T</i> _{CSI-RS} / Δ _{CSI-R}	et S	Subframes	5/2	5/2					
CSI reference sig configuration	inal		0	3					
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap		Subframes / bitmap	3 / 00010000000000000000	3 / 0001000000000000					
$N_{\scriptscriptstyle oc}$ at antenna p	oort	dBm/15kHz	-98	-98					
Symbols for unus PRBs	sed		OCNG (Note 4)	OCNG (Note 4)					
Number of alloca resource blocks (N		PRB	50	50					
Simultaneous transmission			No	Yes (Note 3, 5)					
PDSCH transmis mode	sion		9	9					
mode 9 9 Note 1: $P_B = 1$. Note 2: The modulation symbols of the signal under test are mapped onto antenna port 7 or 8. Note 3: 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.									
			ties $n_{\rm SCID}$ are set to 0						
	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 OCNG		OCNG	Propagation	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

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6 Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput	SNR (dB)	Category
			Comgaration	(%)		
	OP.1 FDD	EPA5	2x2 Low	70	21.9	≥2
1,	1/2	1/2	1/2	1/2	Iz R.50 FDD OP.1 FDD EPA5 2x2 Low 70	Iz R.50 FDD OP.1 FDD EPA5 2x2 Low 70 21.9

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 power	$ ho_{\scriptscriptstyle A}$	dB	0	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referer	ice signals		Antenna ports 0,1	Antenna ports 0,1
CSI reference s	-		Antenna ports 15,,18	N/A
CSI-RS periodic subframe offset T _{CSI}	-rs / Δ csi-rs	Subframes	5/2	N/A
CSI reference configuratio			0	N/A
$N_{_{oc}}$ at antenn	a port	dBm/15kH z	-98	N/A
DIP (Note :	2)	dB	N/A	-1.73
BWChannel		MHz	10	10
Cyclic Pref	ix		Normal	Normal
Cell Id			0	126
Number of contro symbols	I OFDM		2	2
PDSCH transmiss	ion mode		9	N/A
Beamforming r	nodel		As specified in clause B.4.3 (Note 4, 5)	N/A
Interference m	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 tran			No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test	N/A
Physical channel reporting			PUSCH(Note 8)	N/A
cqi-pmi-Configura			5	N/A
N_{oc} ´ is c Note 3: The mode	lefined by its	associated DI	tral density of each inter P value as specified in c al under test in Cell 1 are	lause B.5.1.

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

Note 4:	The precoder in clause B.4.3 follows UE recommended PMI.
Note 5:	If the UE reports in an available uplink reporting instance at subrame SF#n based
	on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI
	cannot be applied at the eNB downlink before SF#(n+4).
Note 6:	These physical resource blocks are assigned to an arbitrary number of virtual UEs
	with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs
	shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 7:	All cells are time-synchronous.
Note 8:	To avoid collisions between CQI reports and HARQ-ACK it is necessary to report
	both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in
	downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on
	PUSCH in uplink subframe SF#8 and #3.

Table 8.3.1.1A-2: Enhanced Performance Requirement Type A, CDM-multiplexed DM RS with TM9 interference model

Test Number	Referenc e		OCNG Propagation Correlation Pattern Conditions n Matrix				Reference Va	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:							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
	$ ho_{\scriptscriptstyle A}$	dB	0	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	-3 (Note 1)	-3 (Note 1)
anocation	σ	dB	-3	N/A	N/A
	N _{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A
N_{oc} at antenna port	N_{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A
	N_{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.3.1.1B-2	12	10
BWChannel		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
Cell-specific reference	e signals		A	ntenna ports 0,1	
CSI reference sig	Inals		Antenna ports 15,16	N/A	N/A
CSI-RS periodicity subframe offse <i>T</i> _{CSI-RS} / Δ _{CSI-R}	et	Subframes	5/2	N/A	N/A
CSI reference sig configuration	gnal		8	N/A	N/A
Zero-power CSI- configuration ICSI-RS / ZeroPow bitmap		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)	Ccsi,1		00111111 00111111 00111111 00111111 00111111	N/A	N/A
Number of control of 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:	$P_{\rm B}=1$.
Note 2:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a
	subframe overlapping with the aggressor ABS.
Note 3:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the
	aggressor ABS.
Note 4:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-
	ABS.
Note 5:	ABS pattern as defined in [9]. 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).
	The number of the CRS ports in Cell 1, Cell 2 and Cell 3 is the same.
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		ropagatio		Correlation Matrix and	Reference	Value	UE Cate
		Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell 3	Antenna Configurati on (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	gory
1	R.51 FDD	OP.1	OP.1	OP.1		EVA5		2x2 Low	70	7.8	≥2
		FDD	FDD	FDD							
Note 1: Note 2: Note 3:		on matrix	and ante	nna conf				ally independen 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

	motor	l Init	Tes	st 1
para	ameter	Unit	Cell 1	Cell 2
	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
power allocation	σ	dB	-3	-3
anocation	PDSCH_RA	dB	4	NA
	PDSCH_RB	dB	4	NA

Cell-specific reference		Antenna ports 0 and	Antenna ports 0 and
signals		1	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} / Δ _{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
$N_{\scriptscriptstyle oc}$ 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
virtual UEs with	one PDSCH p	ks are assigned to an arl per virtual UE; the data t prrelated pseudo random	ransmitted over the

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 3:	The propagation Correlation mat SNR correspon	rix and antenn	a configu	uration pa				and Cell 2.		

8.3.1.3 Performance requirements for DCI format 2D and non Quasi Co-located Antenna Ports

8.3.1.3.1 Minimum requirement with Same Cell ID (with single NZP CSI-RS resource)

The requirements are specified in Table 8.3.1.3.1-3, with the additional parameters in Table 8.3.1.3.1-1 and Table 8.3.1.3.1-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission point share the same Cell ID. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling defined in [6], configured according to Table

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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	er	Unit	TP 1	TP 2
	$ 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}
qcl-CSI-RS-Configl CSI-RS 0 period subframe offset Tcs	icity and ı-₨ / ∆csi-₨	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
$N_{\scriptscriptstyle oc}$ 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 Pret	fix		Normal	Normal
Cell Id			0	0
Number of contro symbols	-		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 betwo	een TPs	μs	NA	Reference point in Table 8.3.1.3.1-3
Frequency error be	tween TPs	Hz	NA	0
Beamforming	model		NA	Port 7 as specified in clause B.4.1
Symbols for unus	ed PRBs		NA	OCNG (Note 3)
Note 1: $P_B = 1$				
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

Table 8.3.1.3.1-1: Test Parameters for quasi co-location type B: same Cell ID

Table 8.3.1.3.1-2 Configurations of PQI and DL transmission hypothesis for each PQI set

PQI set index	Parameter	s in each PQI set	hypothesi	smission is for each I 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		iCN tern	Time offset between	Propa Cond (No	itions	Correlation Matrix and Antenna	Reference	/alue	UE Category
		TP 1	TP 2	TPs (μs)	TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	R.52 FDD	NA	OP.1 FDD	2	EPA5	EPA5	2x2 Low	70	12.1	≥2
2	R.52 FDD	NA	OP.1 FDD	-0.5	EPA5	EPA5	2x2 Low	70	12.6	≥2
Note 1:	The propagation	on condi	tions for	TP 1 and TF	2 are sta	atistically	independent.			
Note 2:	The correlation			0		,				
Note 3:	SNR correspo	nds to \hat{I}	\hat{E}_s / N_{oc}	of TP 2 as d	efined 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 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	er	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

Table 8.3.1.3.2-1: Test Parameters for timing offset compensation with DPS transmission

ana ports 0,1 enna ports {15,16} 5 / 2 0 N/A N/A 2/ 0000000000 N/A	(Note 2) N/A N/A N/A Antenna ports {15,16} 5 / 2 8 N/A 2/ 0000010000000000 Reference Value in
{15,16} 5 / 2 0 N/A N/A N/A 2/ 00000000000 N/A	N/A N/A Antenna ports {15,16} 5 / 2 8 N/A 2/ 000001000000000000000000000000000000
0 N/A N/A N/A 2/ 0000000000 N/A	N/A Antenna ports {15,16} 5 / 2 8 N/A 2/ 000001000000000000000000000000000000
N/A N/A N/A 2/ 0000000000000000000000000000000000	Antenna ports {15,16} 5 / 2 8 N/A 2/ 0000010000000000000000000000000000000
N/A N/A 2/ 00000000000 N/A	<u>{15,16}</u> 5 / 2 8 N/A 2/ 000001000000000000000000000000000000
N/A 2/ 000000000000000000000000000000000000	8 N/A 2/ 0000010000000000
2/ 00000000000 N/A	N/A 2/ 0000010000000000
N/A	2/ 000001000000000
	000001000000000
ence Value in	Reference Value in
8.3.1.3.2-3	Table 8.3.1.3.2-3
-98	-98
10	10
Normal	Normal
0	0
2	2
N/A	Reference Value in Table 8.3.1.3.2-3
N/A	0
50	50
10	10
30	70
IG (Noto 4)	OCNG (Note 4)
	50 10

 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	hypoth	smission esis for PQI Set	
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2
PQI set 0	CSI-RS 0	ZP CSI-RS 0	PDSCH	Blanked
PQI set 1	CSI-RS 1	ZP CSI-RS 1	Blanked	PDSCH

Table 8.3.1.3.2-2 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	OC Pat	-	Propagation Conditions		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 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:	 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. 									

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	r	Unit	TP 1	TP 2
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	0	0
	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3

Beamforming model		N/A	As specified in clause B.4.2				
Cell-specific reference signals		Antenna ports 0,1	Antenna ports 0,1				
CSI reference signals 0		N/A	Antenna ports {15,16}				
CSI-RS 0 periodicity and subframe offset $T_{CSI-RS} / \Delta_{CSI-RS}$	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				
$N_{_{oc}}$ 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 8.3.1.3.3-2 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 Value		UE Category
		TP 1	TP 2	TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	R.54 FDD	N/A	OP.1 FDD	EPA5	ETU5	2x2 Low	70	14.4	≥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.								

8.3.2 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					
Note 1:as specified in Table 4.2-2 in TS 36.211 [4]Note 2:as specified in Table 4.2-1 in TS 36.211 [4]							

8.3.2.1 Single-layer Spatial Multiplexing

For single-layer transmission on antenna port 5, the requirements are specified in Table 8.3.2.1-2, with the addition of the parameters in Table 8.3.2.1-1 and the downlink physical channel setup according to Annex C.3.2. The purpose is to verify the demodulation performance using user-specific reference signals with full RB or single RB allocation.

Parameter		Unit	Test 1	Test 2	Test 3	Test 4	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0	0	0	
Downlink power allocation	$ 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	ort	dB/15kHz	-98	-98	-98	-98	
Symbols for unused	PRBs		OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)	OCNG (Note 2)	
PDSCH transmiss mode	sion		7	7	7	7	
Note 1: $P_{R} = 0$.							
Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.							

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		
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 reference signals	e			Antenna p	port 0 and ant	enna port 1			
Beamforming mode				-	Annex B.4.1				
$N_{\scriptscriptstyle oc}$ at antenna por	t	dBm/15kHz	-98	-98	-98	-98	-98		
Symbols for unused PF	Symbols for unused PRBs			OCNG (Note 4)	OCNG (Note 4)	OCNG (Note 4)	OCNG (Note 4)		
Simultaneous transmis	sion		No	No	No	Yes (Note 3, 5)	Yes (Note 3, 5)		
PDSCH transmission m	ode		8	8	8	8	8		
Note 3: Modulation sy input signal ur	Note 1: $P_B = 1$.Note 2:The modulation symbols of the signal under test is mapped onto antenna port 7 or 8.								
per virtual UE	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	et to 0 for CDN	/I-multiplexed	DM RS with in	terfering		
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	value	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			
Develiates	$ ho_{\scriptscriptstyle A}$	dB	0	0			
Downlink power allocation			0 (Note 1)	0 (Note 1)			
	σ		-3	-3			
Cell-specific refere signals	nce		Antenna	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} / Δ _{CSI-RS}	t	Subframes	5 / 4	5 / 4			
CSI reference sign configuration	nal		1	3			
Zero-power CSI-F configuration IcsI-RS / ZeroPowerCSI-F bitmap		Subframes / bitmap	4 / 0010000100000000	4 / 0010000000000000000000000000000000000			
$N_{_{oc}}$ 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							
			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	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

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	Reference	OCNG	Propagation	Correlation	Reference value		UE
and MCS	Channel	Pattern	Condition	Matrix and Antenna Configuration	Fraction of Maximum Throughput (%)	SNR (dB)	Category
10 MHz 64QAM 1/2	R.44 TDD	OP.1 TDD	EPA5	2x2 Low	70	22.1	≥2
5	10 MHz 34QAM 1/2	10 MHz R.44 TDD 54QAM 1/2	10 MHz R.44 TDD OP.1 TDD 54QAM 1/2	10 MHz R.44 TDD OP.1 TDD EPA5 54QAM 1/2	10 MHz R.44 TDD OP.1 TDD EPA5 2x2 Low 34QAM 1/2 2 2 2 2	10 MHz R.44 TDD OP.1 TDD EPA5 2x2 Low 70	Antenna Configuration Maximum Maximum (dB) 10 MHz R.44 TDD OP.1 TDD EPA5 2x2 Low 70 22.1

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.

paramete	r	Unit	Cell 1	Cell 2
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referer	nce signals		Antenna ports 0,1	Antenna ports 0,1
CSI reference s	signals		Antenna ports 15,,18	N/A
CSI-RS periodic subframe offset T _{CSI}	-rs / Δ csi-rs	Subframes	5 / 4	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
BWChannel		MHz	10	10
Cyclic Pref	ix		Normal	Normal
Cell Id			0	126
Number of contro symbols	I OFDM		2	2
PDSCH transmiss	ion mode		9	N/A
Beamforming r	nodel		As specified in clause B.4.3 (Note 4, 5)	N/A
Interference m	nodel		N/A	As specified in clause B.5.4
Probability of occurrence of	Rank 1		N/A	70
transmission rank in interfering cells	Rank 2		N/A	30
Precoder update g	ranularity	PRB	50	6
PMI delay (No	ote 5)	ms	10 or 11	N/A
Reporting inte	erval	ms	5	N/A
Reporting m	ode		PUCCH 1-1	N/A
CodeBookSubsetF bitmap	Restriction		0000000000000000 000000000000000 000000	N/A
Symbols for unus	ed PRBs		OCNG (Note 6)	N/A
Simultaneous tran			No simultaneous transmission on the other antenna port in (7 or 8) not used for the input signal under test	N/A
Physical channel reporting			PUSCH(Note 8)	N/A
cqi-pmi-Configura	tionIndex		4	N/A
Note 1: $P_B = 1$ Note 2: The resp N_{oc} ' is c Note 3: The mode	ective receive lefined by its	associated DI	tral density of each inter P value as specified in c al under test in Cell 1 are	lause B.5.1.

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

Note 4:	The precoder in clause B.4.3 follows UE recommended PMI.
Note 5:	If the UE reports in an available uplink reporting instance at subrame SF#n based
	on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI
	cannot be applied at the eNB downlink before SF#(n+4).
Note 6:	These physical resource blocks are assigned to an arbitrary number of virtual UEs
	with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs
	shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 7:	All cells are time-synchronous.
Note 8:	To avoid collisions between CQI reports and HARQ-ACK it is necessary to report
	both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in
	downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on
	PUSCH in uplink subframe SF#8 and #3.

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

Test Number	Referenc e		NG tern		gation itions	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 TDD	OP.1 TDD	N/A	EVA5	EVA5	4x2 Low	70	-1.0	≥1
Note 1:	The propagation conditions for Cell 1 and Cell 2 are statistically independent.								
Note 2:	SINR corresponds to \widehat{E}_s/N_{oc} ´ of Cell 1 as defined in clause 8.1.1.								
Note 3:							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 8.3.2.1C-2, with the addition of parameters in Table 8.3.2.1C-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 8.3.2.1C-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.

Parameter		Unit	Cell 1	Cell 2	Cell 3
Uplink downlink Conf	iguration		1	1	1
Special subframe con	figuration		4	4	4
	$ ho_{\scriptscriptstyle A}$	dB	0	-3	-3
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	-3 (Note 1)	-3 (Note 1)
	σ	dB	-3	N/A	N/A
	N _{oc1}	dBm/15kHz	-98 (Note 2)	N/A	N/A
N_{oc} at antenna port	N _{oc2}	dBm/15kHz	-98 (Note 3)	N/A	N/A
	N _{oc3}	dBm/15kHz	-93 (Note 4)	N/A	N/A
\widehat{E}_s/N_{oc2}		dB	Reference Value in Table 8.3.2.1C-2	12	10
BW _{Channel}		MHz	10	10	10
Subframe Configu	ration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset betwee	n Cells	μs	N/A	3	-1
Frequency shift betwe	een Cells	Hz	N/A	300	-100
Cell Id			0	1	126
Cell-specific referenc	e signals		A	ntenna ports 0,1	
CSI reference sig			Antenna ports 15,16	N/A	N/A
CSI-RS periodicit subframe offs $T_{CSI-RS} / \Delta_{CSI-F}$	et Is	Subframes	5 / 4	N/A	N/A
CSI reference si configuratior			8	N/A	N/A
Zero-power CSI configuratior I _{CSI-RS} / ZeroPowe bitmap	1	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	Ccsi,0		0000000001 0000000001	N/A	N/A
(Note7)	Ccsi,1		1100111000 1100111000	N/A	N/A
Number of control OFDM symbols			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 m			Annex B.4.1	N/A	N/A
Cyclic prefix			Normal	Normal	Normal

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

Nata 4.	
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 8.3.2.1C-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 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 TDD	OP.1 TDD	OP.1 TDD	OP.1 TDD		EVA5		2x2 Low	70	8.5	≥2
Note 1: Note 2: Note 3:		on matrix	and ante	for Cell 1, Cell 2 and Cell 3 are statistically independent. antenna configuration apply for Cell 1, Cell 2 and Cell 3.							

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.

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Parame	ter	Unit	Test 1	Test 2				
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0	0				
power	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0 (Note 1)				
allocation	σ	dB	-3	-3				
Cell-spe referend symbol	ce		Antenna port 0 and antenna p 1					
Beamforn mode			Annex	B.4.2				
$N_{_{oc}}$ at ant port	enna	dBm/15kHz	-98	-98				
Symbols unused P			OCNG (Note 2)	OCNG (Note 2)				
Number allocate resource b	ed	PRB	50	50				
PDSCI transmiss mode	sion		8	8				
Note 1:	$P_{B} = 1$							
Note 1: $T_B = 1$. Note 2: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.								

Table 8.3.2.2-1: 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

	parameter		Test 1		
para			Cell 1	Cell 2	
	$ ho_{\scriptscriptstyle A}$	dB	0	0	
Downlink	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0	
power allocation	σ	dB	-3	-3	
anocation	PDSCH_RA	dB	4	NA	
	PDSCH_RB	dB	4	NA	

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 <i>T</i> _{CSI-RS} / Δ _{CSI-RS}	Subframes	5 / 4	NA				
CSI reference signal configuration		8	NA				
Zero-power CSI-RS configuration <i>I</i> _{CSI-RS} / <i>ZeroPowerCSI-RS</i> bitmap	Subframes / bitmap	4 / 0010000000000000000000000000000000000	NA				
$N_{_{oc}}$ at antenna port	dBm/15kHz	-98	-98				
\widehat{E}_s/N_{oc}		Reference Value in Table 8.3.2.3-2	Test specific, 7.25dB				
Symbols for unused PRBs		OCNG (Note 2)	NA				
Number of allocated resource blocks (Note 2)	PRB	50	NA				
Simultaneous transmission		No	NA				
PDSCH transmission mode		9	Blanked				
Note 1: $P_{\scriptscriptstyle B} = 1$ Note 2:These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.							

Table 8.3.2.3-2: Minimum performance for CDM-multiplexed DM RS (FRC) with multiple CSI-RS configurations

Test number	Bandwidth and MCS	Reference Channel		NG tern		gation dition	Correlation Matrix and	Reference	value	UE Cate
			Cell 1	Cell 2	Cell 1	Cell 2	Antenna Configurati on	Fraction of Maximum Throughput (%)	SNR (dB)	gory
1	10 MHz	R.51 TDD	OP.1	N/A	ETU5	ETU5	2x2 Low	70	14.8	2-8
	16QAM 1/2		TDD							
Note 1: The propagation conditions for Cell 1 and Cell 2 are statistically independent. Note 2: Correlation matrix and antenna configuration parameters apply for each of Cell 1 and Cell 2. Note 3: SNR corresponds to \hat{E}_s/N_{oc} of Cell 1.										
Note 3:	SNR correspond	is to E_s/N_{oc}	of Cell 1							

8.3.2.4 Performance requirements for DCI format 2D and non Quasi Co-located Antenna Ports

8.3.2.4.1 Minimum requirement with Same Cell ID (with single NZP CSI-RS resource)

The requirements are specified in Table 8.3.2.4.1-3, with the additional parameters in Table 8.3.2.4.1-1 and Table 8.3.2.4.1-2. The purpose of this test is to verify the UE capability of supporting non quasi-colocated antenna ports when the UE receives DCI format 2D in a scenario where the two transmission point share the same Cell ID. In particular the test verifies that the UE, configured with quasi co-location type B, performs correct tracking and compensation of the timing difference between two transmission points, channel parameters estimation and rate matching according to the 'PDSCH RE Mapping and Quasi-Co-Location Indicator' (PQI) signalling defined in [6], configured according to Table

8.3.2.4.1-2. In 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.

Parameter		Unit	TP 1	TP 2
Downlink power ρ_A		dB	0	0
allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Cell-specific referen	nce signals		Antenna ports 0,1	(Note 2)
CSI-RS 0 anteni	na ports		NA	Port {15,16}
<i>qcl-CSI-RS-Configu</i> CSI-RS 0 period subframe offset <i>T</i> _{CS}	icity and ι-Rs / Δcsι-Rs	Subframes	NA	5/4
qcl-CSI-RS-Config CSI-RS 0 config			NA	8
csi-RS-ConfigZPId power CSI-RS 0 co Icsi-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 Pre	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 betw	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	Port 7 as specified in clause B.4.1
Symbols for unused PRBs			NA	OCNG (Note 3)
Note 3: These ph	ysical resou	rce blocks are	zero transmission powe assigned to an arbitrary data transmitted over th	number of virtual UEs

Table 8.3.2.4.1-1: Test Parameters for quasi co-location type B: same Cell ID

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.

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PQI set index	Parameter	DL transmission hypothesis for each PQI Set		
	NZP CSI-RS Index (For quasi co-location)	ZP CSI-RS configuration	TP 1	TP 2
PQI set 0	CSI-RS 0	ZP CSI-RS 0	Blanked	PDSCH

Table 8.3.2.4.1-2 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		iCN tern	Time offset between	offset Conditions		Correlation Matrix and Antenna	Reference Value		UE Category
		TP 1	TP 2	TPs (μs)	TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	R.52 TDD	NA	OP.1 TDD	2	EPA5	EPA5	2x2 Low	70	12	≥2
2	R.52 TDD	NA	OP.1 TDD	-0.5	EPA5	EPA5	2x2 Low	70	12.4	≥2
Note 1:	The propagation	on condi	tions for	TP 1 and TF	2 are sta	atistically	independent.			
Note 2:										
Note 3:	SNR correspo	nds to \hat{I}	\dot{E}_s / N_{oc}	of TP 2 as d	efined in	clause 8.	1.1.			

8.3.2.4.2 Minimum requirements with Same Cell ID (with multiple NZP CSI-RS resources)

The requirements are specified in Table 8.3.2.4.2-3, with the additional parameters in 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.

parameter		Unit	TP 1	TP 2
Deverliek newer	$ ho_{\scriptscriptstyle A}$	dB	0	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)	0
	σ	dB	-3	-3
Beamforming mode	əl		As specified in clause B.4.1	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 periodicit subframe offset T _{CS}	SI-RS / Δ CSI-RS	Subframes	5 / 4	N/A
CSI reference signation	al O		0	N/A
CSI reference signa	als 1		N/A	Antenna ports {15,16}
CSI-RS 1 periodicit subframe offset Tcs	SI-RS / Δ CSI-RS	Subframes	N/A	5 / 4
CSI reference signa configuration	al 1		N/A	8
Zero-power CSI-RS configuration <i>I</i> _{CSI-RS} / <i>ZeroPower CSI-RS</i>	bitmap	Subframes /bitmap	4/ 0010000000000000000000000000000000000	N/A
Zero-power CSI-RS configuration I _{CSI-RS} / ZeroPower CSI-RS		Subframes /bitmap	N/A	4/ 0000010000000000
\widehat{E}_{s}/N_{oc}	•	dB	Reference Value in Table 8.3.2.4.2-3	Reference Value in Table 8.3.2.4.2-3
$N_{_{oc}}$ at antenna por	ť	dBm/15kH z	-98	-98
BW _{Channel}		MHz	10	10
Cyclic Prefix			Normal	Normal
Cell Id			0	0
Number of control (symbols	OFDM		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 transmission	on mode		10	10
Probability of occurrence of PDSCH transmission(Note 3)		%	30	70
Symbols for unused PRBs			OCNG (Note 4)	OCNG (Note 4)
Note 1: $P_B = 1$ Note 2: REs for a	antenna ports	0 and 1 have	zero transmission powe	er.

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

PDSCH transmission from TPs shall be randomly determined independently for Note 3: each subframe. Probabilities of occurrence of PDSCH transmission from TPs are specified. Note 4: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.

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 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

Test Number	Timing offset(us)	Reference Channel		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: 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.									

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 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 / 4			
CSI reference signal 0 configuration		N/A	0			
Zero-power CSI-RS 0 configuration <i>I</i> _{CSI-RS} / <i>ZeroPower CSI-RS</i> 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			
$N_{_{oc}}$ 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 8.3.2.4.3-2 Performance Requirements for quasi co-location type B with different Cell ID and Colliding CRS

Test Number	Reference Channel	OCNG Pattern		Propagation Conditions (Note1)		Correlation Matrix and Antenna	Reference Value		UE Category
		TP 1	TP 2	TP 1	TP 2	Configuration (Note 2)	Fraction of Maximum Throughput (%)	SNR (dB) (Note 3)	
1	R.54 TDD	N/A	OP.1 TDD	EPA5	ETU5	2x2 Low	70	14.7	≥2
Note 1: 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		
PHICH Ng (Note 1)		1	1		
PHICH du	ration		Normal	Normal		
Unused RE-s a	and PRB-s		OCNG	OCNG		
Cell II	D		0	0		
Dowplink power	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 antenna port		dBm/15kHz	-98	-98		
Cyclic pi	refix		Normal	Normal		
Note 1: According to Clause 6.9 in TS 36.211 [4].						

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

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

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.

Paramete	r	Unit	Cell 1	Cell 2			
Deurslinker	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			
BWChannel		MHz	10	10			
Subframe Config	uration		Non-MBSFN	Non-MBSFN			
Time Offset betwe	en Cells	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			
CSI Subframe Sets	C _{CSI,0}		00000100 00000100 00000100 01000100 00000100	N/A			
(Note 6)	C _{CSI,1}		11111011 11111011 11111011 11111011 10111011 11111011	N/A			
Number of control OF			3	3			
PHICH Ng (No PHICH durat			1 Extended	N/A N/A			
Unused RE-s and			OCNG	OCNG			
Cyclic prefi			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 i [7];							
measurements	 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 						
Note 7: Ocin 7 is the serving cent of a laggession cent. The number of the once points in cent of and cent of the once points in cent of the oncent of the once points in cent of the once poin							

Test Numb er	Aggregati on Level	Referen ce Channel	OCNG	G Pattern Propagation Conditions (Note 1)		Correlation Matrix and Antenna		rence lue				
			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 corresp	SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.										
Note 3:	The correlat	ion matrix ar	nd antenn	a configu	iration ap	ply for Ce	ell 1 and Cell 2.					

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

Paramet	er	Unit	Cell 1	Cell 2
Downlink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3
allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3
	N_{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A
N_{oc} at antenna port	N _{oc2}	dBm/15kHz	-98 (Note 2)	N/A
	N _{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A
\widehat{E}_{s}/N_{oc}	2	dB	Reference Value in Table 8.4.1.2.3- 4	1.5
BWChann	el	MHz	10	10
Subframe Conf	iguration		Non-MBSFN	MBSFN
Time Offset betw	veen Cells	μs	2.5 (synchro	nous cells)
Cell Id			0	126
ABS pattern (Note 4)		N/A	0001000000 010000010 0000001000 00000000
RLM/RRM Measuren Pattern (No			0001000000 0100000010 0000001000 0000000	N/A
CSI Subframe Sets	Ccsi,0		0001000000 010000010 000001000 00000000	N/A
(Note 6)	C _{CSI,1}		1110111111 1011111101 1111110111 1111110111 111111	N/A
MBSFN Subframe Allocation (Note 9)			N/A	001000 100001 000100 000000
Number of control OFDM symbols			3	3
PHICH Ng (N			1	N/A
PHICH dura			extended	N/A
Unused RE-s ar			OCNG	OCNG
Cyclic pre	TIX		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
NOLE 4.	
	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
11010 0.	measurements defined in [7].
Note 7:	
Note 7.	Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1
	and Cell2 is the same.
Note 8:	SIB-1 will not be transmitted in Cell2 in this test.
Note 9:	MBSFN Subframe Allocation as defined in [7], four frames with 24 bits is chosen for MBSFN
	subframe allocation.
Note 10:	The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel
	transmission is in a subframe protected by MBSFN ABS in this test.
Note 11:	According to Clause 6.9 in TS 36.211 [4].
11010 11.	

Table 8.4.1.2.3-4: Minimum performance PDCCH/PCHICH – MBSFN ABS

Test Numb er	Aggregati on Level	Reference Channel		NG tern	Propagation Conditions (Note 1)		Correlation Matrix and Antenna	Refere	nce Value	
			Cell 1	Cell 2	Cell 1	Cell 2	Configurati on	Pm- dsg (%)	SNR (dB) (Note 2)	
1	8 CCE	R15-1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	2x2 Low	1	-4.2	
Note 1:		ation conditions			ll2 are st	atistically	independent.			
Note 2:	SNR corres	SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.								
Note 3:	The correlat	ion matrix and	antenna	configura	tion appl	y 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.

Parameter		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	T _{oc2}	dB	Reference Value in Table 8.4.1.2.4-2	5	3
BWch	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 patterr	n (Note 4)		N/A	00000100 00000100 00000100 00000100 00000100	00000100 00000100 00000100 00000100 00000100
RLM/RRM Me Subframe Patt			00000100 00000100 00000100 00000100 00000100	N/A	N/A
CSI Subframe	Ccsi,o		00000100 00000100 00000100 00000100 00000100	N/A	N/A
Sets (Note 6)	Ccsi,1		11111011 11111011 11111011 11111011 11111011 11111011	N/A	N/A
Number of control OFDM symbols			2	Note 7	Note 7
PHICH Ng			1	N/A	N/A
PHICH d			Normal	N/A	N/A
Unused RE-s			OCNG	OCNG	OCNG
Cyclic	orefix		Normal	Normal	Normal

Table 8.4.1.2.4-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS

Note 1:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 2:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 3:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 4:	ABS pattern as defined in [9]. PDCCH/PCFICH other than that associated with SIB1/Paging are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell.
Note 5:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7];
Note 6:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7];
Note 7:	The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern.
Note 8:	The number of the CRS ports in Cell1, Cell2 and Cell 3 is the same.
Note 9:	SIB-1 will not be transmitted in Cell2 and Cell 3 in the test.
Note 10:	According to Clause 6.9 in TS 36.211 [4].

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

Test Number	Aggregati on Level	Reference Channel	OCNG Pattern		Propagation Conditions (Note 1)				Correlation Matrix and	Refere	nce Value
			Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell3	Antenna Configuration (Note 2)	Pm- dsg (%)	SNR (dB) (Note 3)
1	8 CCE	R.15-2 FDD	OP.1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	EVA5	2x2 Low	1	-2.2
Note 1: Note 2: Note 3:											

Parameter		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		dB	Reference Value in Table 8.4.1.2.4-4	5	3
BWcr	nannel	MHz	10	10	10
Subframe Co	onfiguration		Non-MBSFN	MBSFN	MBSFN
Time Offset b	etween Cells	μs	N/A	3	-1
Frequency shift	between Cells	Hz	N/A	300	-100
Cell	ld		0	126	1
ABS patter	n (Note 4)		N/A	0001000000 0100000010 0000001000 0000000	0001000000 010000010 0000001000 00000000
RLM/RRM Measu Pattern (0001000000 010000010 000001000 00000000	N/A	N/A
CSI Subframe	Ccsi,0		0001000000 010000010 000001000 00000000	N/A	N/A
Sets (Note 6)	Ccsi,1		1110111111 1011111101 1111110111 1111111	N/A	N/A
MBSFN Subframe 7			N/A	001000 100001 000100 000000	001000 100001 000100 000000
Number of contro			2	Note 8	Note 8
PHICH Ng			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 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 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. Note 12: According to Clause 6.9 in TS 36.211 [4]. 		
 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 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 	Note 1:	
 Note 3: This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS Note 4: ABS pattern as defined in [9]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 	Note 2	
 Note 4: ABS pattern as defined in [9]. The 4th, 12th, 19th and 27th subframes indicated by ABS pattern are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 		
 are MBSFN ABS subframes. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 		
 PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 	Note 4:	
 with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel. Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 		
 of the reference channel. Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 		PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped
 Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 		with the MBSFN ABS subframe of aggressor cell and the subframe is available in the definition
 [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 		of the reference channel.
 [7]. Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 	Note 5:	Time-domain measurement resource restriction pattern for PCell measurements as defined in
 Note 6: As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 		
 measurements defined in [7]. Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 	Note 6 [.]	
 Note 7: MBSFN Subframe Allocation as defined in [7], four frames with 24 bits are chosen for MBSFN subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 	11010 0.	
 subframe allocation. Note 8: The number of control OFDM symbols is not available for ABS and is 2 for the subframe indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel 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. 	Noto 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: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test. 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. 	Note 7.	
 indicated by "0" of ABS pattern. Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test. 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. 		
 Note 9: The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel transmission is in a subframe protected by MBSFN ABS in this test. 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. 	Note 8:	
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.		
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.	Note 9:	The maximum number of uplink HARQ transmission is ≤ 2 so that each PHICH channel
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.		transmission is in a subframe protected by MBSFN ABS in this test.
Note 11: SIB-1 will not be transmitted in Cell 2 and Cell 3 in this test.	Note 10:	

Table 8.4.1.2.4-4: Minimum performance PDCCH/PCFICH – MBSFN ABS

Test Number	Aggregati on Level	Reference Channel	00	NG Patte	ern	Propagation Conditions (Note 1)		Correlation Matrix and	Referer	nce Value	
			Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell3	Antenna Configuration (Note 2)	Pm- dsg (%)	SNR (dB) (Note 3)
1	8 CCE	R.15-2 FDD	OP.1 FDD	OP.1 FDD	OP.1 FDD	EVA5	EVA5	EVA5	2x2 Low	1	-2.0
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. SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.										

8.4.2 TDD

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

Parame	ter	Unit	Single antenna port	Transmit diversity		
Uplink downlink o (Note	•		0	0		
Special subframe (Note 2	•		4	4		
Number of PDC	CH symbols	symbols	2	2		
PHICH Ng (Note 3)		1	1		
PHICH du	ration		Normal	Normal		
Unused RE-s a	and PRB-s		OCNG	OCNG		
Cell II)		0	0		
Downlink nowor	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	nna port	dBm/15kHz	-98	-98		
Cyclic pr	efix		Normal	Normal		
ACK/NACK feed	lback mode		Multiplexing	Multiplexing		
Note 1:as specified in Table 4.2-2 in TS 36.211 [4].Note 2:as specified in Table 4.2-1 in TS 36.211 [4].Note 3:According to Clause 6.9 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 number	Bandwidth	Aggregation level	Reference Channel	OCNG Pattern	Propagation Condition	Antenna configuration and correlation Matrix	Reference Pm-dsg (%)	ce value 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.

Test	Bandwidth	Aggregation	Reference	OCNG	Propagation	Antenna	Reference value	
number		level	Channel	Pattern	Condition	configuration	Pm-dsg (%)	SNR (dB)
						and		
						correlation		
						Matrix		
1	10 MHz	4 CCE	R.16 TDD	OP.1 TDD	EVA70	2 x 2 Low	1	0.1

8.4.2.2.2 Minimum Requirement 4 Tx Antenna Port

For the parameters specified in Table 8.4.2-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.2.2-1. The downlink physical setup is in accordance with Annex C.3.2.

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 8.4.2.2.3-4. 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.

Paramete	er	Unit	Cell 1	Cell 2				
Uplink downlink co	onfiguration		1	1				
Special subframe c			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				
BWChanne	el	MHz	10	10				
Subframe Confi	guration		Non-MBSFN	Non-MBSFN				
Time Offset betw	een Cells	μS	2.5 (synchro	nous cells)				
Cell Id			0	1				
ABS pattern (N	Note 4)		N/A	0000010001 0000000001				
RLM/RRM Measurem Pattern(Not			0000000001 0000000001	N/A				
CSI Subframe	C _{CSI,0}		0000010001 0000000001	N/A				
Sets(Note 6)	Ccsi,1		1100101000 1100111000	N/A				
Number of control OI	DM symbols		3	3				
ACK/NACK feedb			Multiplexing	N/A				
PHICH Ng (N			1	N/A				
PHICH dura			extended	N/A				
Unused RE-s an			OCNG	OCNG				
Cyclic pre			Normal	Normal				
overlapping w Note 2: This noise is a aggressor AB Note 3: This noise is a	 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. This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS. This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS 							
are transmitte subframe of a	are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell. Time-domain measurement resource restriction pattern for PCell measurements as defined in							
Note 6: As configured	according to the t defined in [7].	ime-domain measureme	ent resource restrictio	n pattern for CSI				
Note 7: Cell 1 is the so and Cell2 is the	erving cell. Cell 2 i ie same.	is the aggressor cell. The	e number of the CRS	ports in Cell1				
	be transmitted in (Clause 6.9 in TS 3							

Table 8.4.2.2.3-1: Test Parameters for PDCCH/PCFICH – Non-MBSFN ABS

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

	Paramete	er	Unit	Cell 1	Cell 2				
Upli	nk downlink co	nfiguration		1	1				
Spec	ial subframe co			4	4				
Downl	ink power	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3				
	ocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3				
		N _{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A				
N_{oc} at a	intenna port	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A				
		N _{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A				
\widehat{E}_s/N_{oc2}			dB	Reference Value in Table 8.4.2.2.3-4	1.5				
BWChannel			MHz	10	10				
S	ubframe Config	guration		Non-MBSFN	MBSFN				
Tin	ne Offset betwe	een Cells	μS	2.5 (synchro	onous cells)				
	Cell Id			0	126				
ABS pattern (Note 4)				N/A	000000001 0000000001				
RLM/RRM Measurement Subframe Pattern(Note 5)				000000001 0000000001	N/A				
CSI S	Subframe	C _{CSI,0}		0000000001 0000000001	N/A				
Sets	(Note 6)	Ccsi,1		1100111000 1100111000	N/A				
MBSFN	Subframe Allo	cation (Note 9)		N/A	000010				
	er of control OF			3	3				
	K/NACK feedb			Multiplexing	N/A				
	PHICH Ng (No			1	N/A				
	PHICH dura			extended	N/A				
Ur	nused RE-s and			OCNG Normal	OCNG				
Note 1: Note 2:	of a subframe This noise is a	applied in OFDM s overlapping with applied in OFDM s	symbols #1, #2, #3, #4, the aggressor ABS. symbols #0 of a subfram	#5, #6, #7, #8, #9, #1 ne overlapping with th	ne aggressor ABS.				
Note 3: Note 4:	ABS pattern a MBSFN ABS are transmitte	is defined in [9]. T subframes.PDSC d in the serving c	symbols of a subframe of The 10 th and 20 th subfrar H other than SIB1/pagir ell subframe when the s Il and the subframe is av	mes indicated by ABS ng and its associated subframe is overlappe	S pattern are PDCCH/PCFICH ed with the MBSFN				
Note 5:		measurement res	source restriction pattern	n for PCell measurem	ents as defined in				
Note 6:	As configured	according to the s defined in [7].	time-domain measurem	ent resource restriction	on pattern for CSI				
Note 7:									
Note 8:		be transmitted in	Cell2 in this test.						
Note 9:	MBSFN Subfr subframe allo		s defined in [7], one fran	ne with 6 bits is chose	en for MBSFN				
Note 10:	According to (Clause 6.9 in TS 3	36.211 [4].						

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

Test Number	Aggregati on Level			OCNG Pattern		Propagation Conditions(Note 1)		Reference 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				statistically in	ndependen	t.	I	I
Note 2:	SNR correspo	nds to \widehat{E}_s/N_a	$_{bc2}$ 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.

Para	meter	Unit	Cell 1	Cell 2	Cell 3
	k configuration		1	1	1
Special subfrar	ne 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 _{oc2}	dB	Reference Value in Table 8.4.2.2.4-2	5	3
BW	Channel	MHz	10	10	10
Subframe (Configuration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Time Offset	between Cells	μs	N/A	3	-1
Frequency shi	t between Cells	Hz	N/A	300	-100
Ce	ll Id		0	126	1
ABS patte	rn (Note 4)		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Measurement Subframe Pattern (Note 5)			0000000001 0000000001	N/A	N/A
CSI Subframe	Ccsi,0		0000000001 0000000001	N/A	N/A
Sets (Note 6)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
	ontrol OFDM		2	Note 7	Note 7
	edback mode		Multiplexing	N/A	N/A
PHICH N	g (Note 10)		1	N/A	N/A
	duration		Normal	N/A	N/A
	s and PRB-s		OCNG	OCNG	OCNG
	c prefix		Normal	Normal	Normal
		OFDM symbols #1, #	#2, #3, #5, #6, #8,	#9, #10, #12, #13	s of a subframe
	pping with the agg		44 #7 #11 of o ou	hfromo ovorlonnir	a with the
	ssor ABS.	OFDM symbols #0, #	4, #7, #11 01 a Su	birame overlappir	ig with the
		all OFDM symbols o	f a subframe overl	anning with aggre	ssor non-ABS
		n [9]. PDCCH/PCFI			
transi	nitted in the serving	g cell subframe whe			
Note 5: Time-	ame of aggressor o domain measurem	ell. ent resource restric	tion pattern for PC	ell measurements	s as defined in
[7]; Note 6: As co	nfigured according	to the time-domain	measurement res	ource restriction p	attern for CSI
meas Note 7: The n	urements defined i	n [7]; FDM symbols is not			
Note 8: The n Note 9: SIB-1	umber of the CRS	ports in Cell1, Cell2 tted in Cell2 and Ce		ame.	
NULE IU. ALLUI	ung to Clause 0.9	III 10 JU.Z I I [4].			

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
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. SNR corresponds to \hat{E}_s/N_{oc2} of cell 1.										

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

Param	eter	Unit	Cell 1	Cell 2	Cell 3			
Uplink downlink	configuration		1	1	1			
Special subframe			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/Λ	l oc2	dB	Reference Value in Table 8.4.2.2.4-4	5	3			
BWch	annel	MHz	10	10	10			
Subframe Co	onfiguration		Non-MBSFN	MBSFN	MBSFN			
Time Offset be	etween Cells	μs	N/A	3	-1			
Frequency shift	between Cells	Hz	N/A	300	-100			
Cell	ld		0	126	1			
ABS patterr			N/A	0000000001 0000000001	0000000001 0000000001			
RLM/RRM Me Subframe Patt			0000000001 0000000001	N/A	N/A			
CSI Subframe	Ccsi,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 control	/		2	Note 8	Note 8			
ACK/NACK fee			Multiplexing	N/A	N/A			
PHICH Ng			1	N/A	N/A			
PHICH d	uration		Normal	N/A	N/A			
Unused RE-s	and PRB-s		OCNG	OCNG	OCNG			
Cyclic	orefix		Normal	Normal	Normal			
Cyclic prefix Normal Nor Not								
[7].	omain measureme	ent resource restricti						
measur Note 7: MBSFN	ements defined in Subframe Alloca	o the time-domain n [7]. tion as defined in [7]						
Note 8: The nur		DM symbols is not	available for ABS a	and is 2 for the su	ubframe			
Note 9: Cell 1 is Cell2 is	the same.	Cell 2 is the aggress		er of the CRS por	rts in Cell1 and			
	ill not be transmiting to Clause 6.9 i	ted in Cell2 in this te n TS 36.211 [4].	est.					

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

Test Number	Aggregati on Level	Reference Channel	OCNG Pattern			Propagation Conditions (Note 1)			Correlation Matrix and	Refere	nce Value
			Cell 1	Cell 2	Cell 3	Cell 1	Cell 2	Cell3	Antenna Configuration (Note 2)	Pm- dsg (%)	SNR (dB) (Note 3)
1	8 CCE	R.15-2 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 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.										

 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 allocation	PDCCH_RA PHICH_RA OCNG_RA	dB	0	-3
	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	0	-3
PHICH du	uration		Normal	Normal
PHICH Ng	(Note 1)		Ng = 1	Ng = 1
PDCCH C	Content			be included with the aligned with A.3.6.
Unused RE-s	and PRB-s		OCNG	OCNG
Cell	ID		0	0
N_{oc} at ante	enna port	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	Reference 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	Reference value	
number		Channel	Pattern	Condition	configuration and correlation Matrix	Pm-an (%)	SNR (dB)
1	10 MHz	R.19	OP.1 FDD	EVA70	2 x 2 Low	0.1	4.4

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	Reference 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		Unit	Cell 1	Cell 2			
Downlink power allocation	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3			
	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3			
N_{oc} at antenna port	N_{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A			
	N _{oc2}	dBm/15kHz	-98 (Note 2)	N/A			
	N _{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A			
\widehat{E}_{s}/N_{oc2}		dB	Reference Value in Table 8.5.1.2.3- 2	1.5			
BW _{Channe}	I	MHz	10	10			
Subframe Config	guration		Non-MBSFN	Non-MBSFN			
Time Offset betwe	een Cells	μs	2.5 (synchron	ious 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)	Ccsi,0		00000100 00000100 00000100 01000100 00000100	N/A			
	C _{CSI,1}		11111011 11111011 11111011 11111011 10111011 11111011	N/A			
Number of control OF			3	3			
PHICH Ng (No	,		1	N/A			
PHICH dura Unused RE-s and			extended OCNG	N/A OCNG			
Cyclic pref			Normal	Normal			
Note 1:This noise is a overlapping wiNote 2:This noise is a aggressor ABSNote 3:This noise is a ABS pattern as subframe is ov indicated by th	pplied in OFDM s th the aggressor / pplied in OFDM s pplied in OFDM s s defined in [9]. Pl erlapped with the e ABS pattern.	ymbols #0, #4, #7, #11 o ymbols of a subframe ov HICH is transmitted in th ABS subframe of aggre	6, #8, #9, #10,#12, #1 of a subframe overlapp verlapping with aggres le serving cell subfram ssor cell but not in the	3 of a subframe bing with the sor non-ABS e when the 26 th subframe			
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	s defined in [7] erving cell. Cell 2 i	s the aggressor cell. The					
Note 8: SIB-1 will not b	be transmitted in C lause 6.9 in TS 3						

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 FDD	OP.1 FDD	EPA5	EPA5	2x2 Low	0.1	4.6	
Note 1:					ell 2 are s	tatistically indepen	dent.	•	
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	ell 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.

Downlink power allocation PDCCH_RA OCNG_RA PCFICH_RB PCCR_RB dB -3 -3 -3 N _{cc} at antenna port N _{cc1} dBm/15kHz -98 (Note 1) N/A N/A N _{cc} at antenna port N _{cc1} dBm/15kHz -98 (Note 2) N/A N/A N _{cc2} dBm/15kHz -98 (Note 2) N/A N/A E _i /N _{cc2} dBm/15kHz -98 (Note 2) N/A N/A E _i /N _{cc2} dBm/15kHz -98 (Note 3) N/A N/A BWChamel MHz 10 10 10 Subframe Configuration Non-MBSFN Non-MBSFN Non-MBSFN Time Offset between Cells Hz N/A 3 -1 Frequency shift between Cells Hz N/A 300 -100 Cell Id 0 126 1 1 N/A PDCCH Content N/A 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100	Parameter		Unit	Cell 1	Cell 2	Cell 3
allocation PDCCH_RB PHCH_RB PHCH_RB PHCH_RB dB 3 -3 -3 N _{ac} at antenna port N _{acl} dBm/15kHz -98 (Note 1) N/A N/A N _{ac} at antenna port N _{acl} dBm/15kHz -98 (Note 2) N/A N/A Ex/Nacc2 dBm/15kHz -93 (Note 3) N/A N/A Ex/Nacc2 dB in Table 8.5.1.2.4- 2 5 3 BWChannet MHz 10 10 10 Subframe Configuration Non-MBSFN Non-MBSFN Non-MBSFN Time Offset between Cells µs N/A 3 -1 Frequency shift between Cells Hz N/A 300 -100 Cell Id 0 126 1 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 000000100 000000100 000001	Downlink power	PHICH_RA OCNG_RA	dB	-3	-3	-3
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		PDCCH_RB PHICH_RB	dB	-3	-3	-3
$\begin{array}{ c c c c c c c c } \hline \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$		N_{oc1}	dBm/15kHz	-98 (Note 1)	N/A	N/A
			dBm/15kHz	-98 (Note 2)	N/A	N/A
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	pon	N_{oc3}	dBm/15kHz	-93 (Note 3)	N/A	N/A
Subframe Configuration Non-MBSFN Non-MBSFN Non-MBSFN Non-MBSFN Time Offset between Cells μs N/A 3 -1 Frequency shift between Cells Hz N/A 300 -100 Cell Id 0 126 1 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 00000100 00000100 00000100 RLM/RRM Measurement Subframe Pattern (Note 5) 00000100 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) Ccsi,0 11111011 Ccsi,1 N/A N/A CSI Subframe Sets (Note 6) Ccsi,1 11111011 11111011 N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 PHICH duration Normal N/A N/A VA Normal N/A N/A	\hat{E}_s/N		dB	in Table 8.5.1.2.4-	5	3
Time Offset between Cells μs N/A 3 -1 Frequency shift between Cells Hz N/A 300 -100 Cell Id 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 RLM/RRM Measurement Subframe Pattern (Note 5) 00000100 00000100 00000100 00000100 CCISI Subframe Sets (Note 6) CCISI.0 00000100 N/A N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 N/A N/A PHICH duration Normal N/A N/A N/A N/A	BWch	annel	MHz	10	10	10
Frequency shift between Cells Hz N/A 300 -100 Cell Id 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 00000100 00000100 00000100 RLM/RRM Measurement Subframe Pattern (Note 5) 00000100 00000100 N/A N/A N/A Ccsi.0 Ccsi.0 00000100 00000100 N/A N/A N/A CSI Subframe Sets (Note 6) Ccsi.1 11111011 11111011 N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 PHICH Ng (Note 10) 1 N/A N/A PHICH Muration Normal N/A N/A	Subframe Co	nfiguration		Non-MBSFN	Non-MBSFN	Non-MBSFN
Cell Id 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 00000100 00000100 00000100 00000100 RLM/RRM Measurement Subframe Pattern (Note 5) 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) Ccsl,0 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) Ccsl,1 11111011 11111011 N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 PHICH log (Note 10) 1 N/A N/A PHICH duration Normal N/A N/A	Time Offset be	etween Cells	μs	N/A	3	-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 00000100 00000100 00000100 00000100 00000100 00000100 RLM/RRM Measurement Subframe Pattern (Note 5) 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) C _{CSI,0} 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) 11111011 C _{CSI,1} N/A N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 PHICH duration Normal N/A N/A PHICH duration Normal N/A N/A	Frequency shift	between Cells	Hz	N/A	300	-100
PDCCH Content 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 00000100 00000100 00000100 00000100 00000100 RLM/RRM Measurement Subframe Pattern (Note 5) 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) C _{CSI,0} 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) 11111011 C _{CSI,1} 11111011 11111011 N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 PHICH Ng (Note 10) 1 N/A N/A PHICH Ng (Note 10) 1 N/A N/A PHICH duration Normal N/A N/A	Cell	ld		0	126	1
ABS pattern (Note 4) N/A 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 00000100 RLM/RRM Measurement Subframe Pattern (Note 5) 00000100 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) Ccsi,0 00000100 00000100 N/A N/A Ccsi,1 11111011 11111011 N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 PHICH Ng (Note 10) 1 N/A N/A PHICH Ng (Note 10) 1 N/A N/A	PDCCH (Content		be included with the proper information aligned with	N/A	N/A
RLM/RRM Measurement Subframe Pattern (Note 5) 00000100 00000100 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) Ccsi,0 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) Ccsi,1 00000100 00000100 N/A N/A N/A N/A N/A N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 PHICH Ng (Note 10) 1 N/A N/A Unused RE-s and PRB-s OCNG OCNG OCNG	ABS pattern	n (Note 4)			00000100 00000100 00000100	00000100 00000100 00000100
CSI Subframe Sets (Note 6) C _{CSI,0} 00000100 00000100 N/A N/A CSI Subframe Sets (Note 6) 11111011 C _{CSI,1} N/A N/A N/A Number of control OFDM symbols 2 Note 7 Note 7 PHICH Ng (Note 10) 1 N/A N/A PHICH duration Normal N/A N/A				00000100 00000100 00000100		
Sets (Note 6) 11111011 11111011 N/A N/A C _{CSI,1} 11111011 11111011 N/A N/A Number of control OFDM symbols 2 Note 7 PHICH Ng (Note 10) 1 N/A N/A PHICH duration Normal N/A N/A Unused RE-s and PRB-s OCNG OCNG OCNG	CSI Subframe	Ccsi,0		00000100 00000100 00000100 00000100	N/A	N/A
Number of control OFDM symbols 2 Note 7 Note 7 PHICH Ng (Note 10) 1 N/A N/A PHICH duration Normal N/A N/A Unused RE-s and PRB-s OCNG OCNG OCNG	Sets (Note 6)	Ccsi,1		11111011 11111011 11111011 11111011 11111011	N/A	N/A
PHICH duration Normal N/A N/A Unused RE-s and PRB-s OCNG OCNG OCNG				2		
Unused RE-s and PRB-s OCNG OCNG OCNG				•		
Cyclic prefix Normal Normal Normal						

Table 8.5.1.2.4-1:	Test Parameters for PHICH

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.
Note 10:	According to Clause 6.9 in TS 36.211 [4].

Table 8.5.1.2.4-2: Minimum performance PHICH

Test Number	Reference Channel	00	NG Patte	ern	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:	 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. 									

8.5.2 TDD

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

Param	ieter	Unit	Single antenna port	Transmit diversity
Uplink downlink co 1)			1	1
Special subfram (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 d	uration		Normal	Normal
PHICH Ng	(Note 3)		Ng = 1	Ng = 1
PDCCH (Content			I be included with the on aligned with A.3.6.
Unused RE-s			OCNG	OCNG
Cell	ID		0	0
N_{oc} at ante	enna port	dBm/15kHz	-98	-98
Cyclic			Normal	Normal
ACK/NACK fee			Multiplexing	Multiplexing
Note 2: as speci	fied in Table 4.2-2 fied in Table 4.2-1 ng to Clause 6.9 in	in TS 36.211 [4		

8.5.2.1 Single-antenna port performance

For the parameters specified in Table 8.5.2-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

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

Table 8.5.2.2.2-1: 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.

	Paramete	r	Unit	Cell 1	Cell 2
Uplink downlink configuration				1	1
	cial subframe co			4	4
Down	link nower	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3
	link power ocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3
		N _{oc1}	dBm/15kHz	-100.5 (Note 1)	N/A
N_{oc} at a	antenna port	N_{oc2}	dBm/15kHz	-98 (Note 2)	N/A
		N_{oc3}	dBm/15kHz	-95.3 (Note 3)	N/A
	\widehat{E}_{s}/N_{oc2}		dB	Reference Value in Table 8.5.2.2.3-2	1.5
	BWChannel	I	MHz	10	10
S	Subframe Config	guration		Non-MBSFN	Non-MBSFN
Tir	me Offset betwe	en Cells	μs	2.5 (synchronous cells)	
	Cell Id			0	1
	ABS pattern (N	ote 4)		N/A	0000010001 0000000001
RLM/R	RM Measureme Pattern (Note			000000001 0000000001	N/A
CSI Sul	bframe Sets	Ccsi,0		0000010001 0000000001	N/A
٩)	lote 6)	C _{CSI,1}		1100101000 1100111000	N/A
Numb	er of control OF	DM symbols		3	3
AC	K/NACK feedba	ack mode		Multiplexing	N/A
	PHICH Ng (No	ote 9)		1	N/A
	PHICH durat			extended	N/A
U	nused RE-s and			OCNG	OCNG
	Cyclic pref			Normal	Normal
Note 1: Note 2:	overlapping wi This noise is a	th the aggressor	ABS	#6, #8, #9, #10,#12, #1 of a subframe overlap;	
Note 2:	aggressor ABS		woohala of a subfrage -		
Note 3: This noise is applied in OFDM symbols of a subframe overlapping with aggressor non-ABS Note 4: ABS pattern as defined in [9]. PHICH is transmitted in the serving cell subframe when the					
subframe is overlapped with the ABS subframe of aggressor cell but not in subframe 5 Note 5: Time-domain measurement resource restriction pattern for PCell measurements as defined in					
Note 6:	[7]			nent resource restriction	
	measurements	s defined in [7]			
Note 7:	Cell 1 is the se Cell2 is the sa	•	is the aggressor cell. The second s	he number of the CRS p	ports in Cell1 and
Note 8: Note 9:		be transmitted in Clause 6.9 in TS 3			

Test Number	Reference Channel	OCNG Pattern Propagatio Conditions (Note 1)		itions	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.

Parar	neter	Unit	Cell 1	Cell 2	Cell 3
Uplink downlin	< configuration		1	1	1
Special subfram			4	4	4
Downlink nower	PDCCH_RA PHICH_RA OCNG_RA	dB	-3	-3	-3
Downlink power allocation	PCFICH_RB PDCCH_RB PHICH_RB OCNG_RB	dB	-3	-3	-3
	N _{oc1}	dBm/15kHz	-98 (Note 1)	N/A	N/A
N_{oc} at antenna	N _{oc2}	dBm/15kHz	-98 (Note 2)	N/A	N/A
port	N_{oc3}	dBm/15kHz	-93 (Note 3)	N/A	N/A
\widehat{E}_s/i	N _{oc2}	dB	Reference Value in Table 8.5.2.2.4-2	5	3
BWc	hannel	MHz	10	10	10
Subframe C	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
Cel	l ld		0	126	1
PDCCH	Content		UL Grant should be included with the proper information aligned with A.3.6.	N/A	N/A
ABS patter	m (Note 4)		N/A	0000000001 0000000001	0000000001
RLM/RRM Measu Pattern			0000000001 0000000001	N/A	0000000001 N/A
CSI Subframe	Ccsi,0		0000000001 0000000001	N/A	N/A
Sets (Note 6)	Ccsi,1		1100111000 1100111000	N/A	N/A
Number of contro	I OFDM symbols		2	Note 7	Note 7
ACK/NACK fe			Multiplexing	N/A	N/A
PHICH Ng	(Note 10)		1	N/A	N/A
PHICH			Normal	N/A	N/A
Unused RE-			OCNG	OCNG	OCNG
Cyclic			Normal	Normal	Normal
overlap Note 2: This no aggress Note 3: This no Note 4: ABS pa subfran	ping with the aggre ise is applied in OF sor ABS ise is applied in OF ttern as defined in ne is overlapped wi	essor ABS DM symbols #0, # DM symbols of a [9]. PHICH is tran th the ABS subfra	#2, #3, #5, #6, #8, #9 #4, #7, #11 of a subf subframe overlappir smitted in the servin me of aggressor cel	rame overlapping ng with aggressor g cell subframe w l but not in subfra	y with the non-ABS /hen the me 5
Note 5: Time-de [7]	omain measuremer	nt resource restric	tion pattern for PCel	I measurements a	as defined in
measur	ements defined in	[7]	measurement resount available for ABS a		
indicate Note 8: The nu Note 9: SIB-1 w	ed by "0" of ABS pa	ttern. orts in Cell 1, Cell ed in Cell 2 and Ce	2 and Cell 3 is the s		

Table 8.5.2.2.4-1:	Test Parameters	for PHICH
	rest r urumeters	

Test Number	Reference Channel	00	OCNG Pattern			Propagation Antenna Conditions (Note 1) Configuration		Antenna Configuration	Refere	ence 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 TDD	OP.1 TDD	OP.1 TDD	EPA5	EVA5	EVA5	2x2 Low	0.1	5.7
Note 1: Note 2: Note 3:	The propagation The correlation SNR correspon	matrix an	d antenn	a configu						

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	Downlink power PBCH_RA allocation PBCH_RB		0	-3
allocation			0	-3
N_{oc} at anter	na port	dBm/15kHz	-98	-98
Cyclic pr	efix		Normal	Normal
Cell II)		0	0
Note 1: as speci	fied in Table 4.2	2-2 in TS 36.211 [4]	
Note 2: as speci	fied in Table 4.2	2-1 in TS 36.211 [4]	

8.6.1.1 Single-antenna port performance

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detecting PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Table 8.6.1.1-1: Minimum performance PBCH

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value	
number		Channel	Condition	configuration	Pm-bch (%)	SNR (dB)	
				and			
				correlation			
				Matrix			
1	1.4 MHz	R.21	ETU70	1 x 2 Low	1	-6.1	

8.6.1.2 Transmit diversity performance

8.6.1.2.1 Minimum Requirement 2 Tx Antenna Port

For the parameters specified in Table 8.6.1-1 the average probability of a miss-detected PBCH (Pm-bch) shall be below the specified value in Table 8.6.1.2.1-1. The downlink physical setup is in accordance with Annex C.3.2.

Test	Bandwidth	Reference	Propagation	Antenna	Referen	ce value
number		Channel	Condition	configuration	Pm-bch (%)	SNR (dB)
				and		
				correlation		
				Matrix		
1	1 / MH-	P 22	EDA5	2 x 2 L 0.W	1	-18

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.

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

Para	neter	Unit	Cell 1	Cell 2	Cell 3	
Downlink power			-3	-3	-3	
allocation PBCH_RB OCNG_RB		dB	-3	-3	-3	
N_{oc} at an	tenna port	dBm/15kHz	-98	N/A	N/A	
<u>É</u> <u>N</u>	5	dB	Reference Value in Table 8.6.1.2.3-2	4	2	
BWc	hannel	MHz	1.4	1.4	1.4	
Time Offset b	etween Cells	μs	N/A	3	-1	
Frequency shift	between Cells	Hz	N/A	300	-100	
Ce	l ld		0	126	1	
ABS Patte	rn (Note 4)		N/A	01000000 01000000 01000000 01000000 01000000	01000000 01000000 01000000 01000000 01000000	
Unused RE-	s and PRB-s		OCNG	OCNG	OCNG	
Cyclic			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: Minim	um 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:	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.							

8.6.2 TDD

Parame	ter	Unit	Single antenna port	Transmit diversity				
Uplink downlink o (Note			1	1				
Special subframe (Note 2	0		4	4				
Downlink power allocation	PBCH_RA PBCH RB	dB dB	0 0	-3 -3				
N_{oc} at anter	N_{oc} at antenna port		-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].							

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.

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Referen Pm-bch (%)	ce value SNR (dB)
1	1.4 MHz	R.21	ETU70	1 x 2 Low	1	-6.4

Table 8.6.2.1-1: Minimum performance PBCH

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	Bandwidth	Reference	Propagation	Antenna		ce value
number		Channel	Condition	configuration and correlation Matrix	Pm-bch (%)	SNR (dB)
1	1.4 MHz	R.22	EPA5	2 x 2 Low	1	-4.8

8.6.2.2.2 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.

	Param	eter	Unit	Cell 1	Cell 2	Cell 3
Downlink power OCNG_RA			dB	-3	-3	-3
allocati	allocation PBCH_RB OCNG_RB		dB	-3	-3	-3
No	$_{pc}$ at ante	enna port	dBm/15kHz	-98	N/A	N/A
$\frac{\widehat{E}_s}{N_{os}}$			dB	Reference Value in Table 8.6.2.2.3-2	4	2
	BWCha	annel	MHz	1.4	1.4	1.4
Time C	Offset be	tween Cells	μs	N/A	3	-1
Frequen	ncy shift b	petween 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	Reference Value			
Number	Channel	Cell 1	Cell 2	Cell 3	and Correlation Matrix (Note 2)	Pm-bch (%)	SNR (dB) (Note 3)		
1	R.22	ETU30	ETU30	ETU30	2x2 Low	1	-3.0		
Note 1:	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.								
Note 2:	The correlation matrix and antenna configuration apply for Cell 1, Cell 2 and Cell 3.								
Note 3:	SNR correspo	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.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Test	Bandwidth	Transmission	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	nnel selection	is used t	to feedb	ack ACK	/NACK.	

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

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		
	the number of newly transmitted DL transport		nsmitted 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	ЗA	ЗA	-	-	
Single carrier	15	-	-	3C	4B	-	-	
Camer	20	-	-	3	4	6	6	
	10+10	-	-	3B	4A	4A	4A	
C A	10+15	-			4A	6B	6B	
CA with	10+20	-	-	3B	4A	6C	6C	
2CCs	15+20	-	-	3B	4A	6D	6D	
2003	20+20	-	-	3B or 3 (Note 4)	4A or 4 (Note 4)	6A	6A	
Note 1:	Void.							
Note 2:	For non-CA UE, tes	st is selected for	or maximum su	upported bandw	/idth.			
Note 3:	Void.							
Note 4:								
Note 5:	The applicability of in 8.1.2.3.	requirements f	or different CA	configurations	and bandwidth	n 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 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.

The test coverage for different number of component carriers is defined in 8.1.2.4.

Test	Bandwidth (MHz)	Transmission mode	Antenna configuration	Codebook subset restriction		Downlink power allocation (dB)		power allocation		power allocation		power allocation		\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:	Note 1: PUCCH format 1b with channel selection is used to feedback ACK/NACK.															

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

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	
lote 2: 71112 b	ver transmissions, 2 transport blocks are its for sub-frame 5.			

Note 3: The TB success rate is defined as TB success rate = 100%*N_{DL_correct_rx}/ (N_{DL_newtx} + N_{DL_retx}), where N_{DL_newtx} is the number of newly transmitted DL transport blocks, N_{DL_retx} is the number of retransmitted DL transport blocks, and N_{DL_correct_rx} is the number of correctly received DL transport blocks.

CA config		Bandwidth/ Bandwidth combination (MHz)	Category 1	Category 2	Category 3	Category 4	ry 4 Category 6	Category 7		
		10	1	2	-	-	-	-		
Single ca	arrier	15	-	-	ЗA	ЗA	-	-		
-		20	-	-	3	4	6	6		
CA with 2	2CCs	20+20		-	3 (Note 4)	4 (Note 4)	6A	6A		
Note 2: Note 3:	Note 1: Void. Note 2: For non-CA UE, test is selected for maximum supported bandwidth. Note 3: Void.									
Note 5:	selected. The applicability of requirements for different CA configurations and bandwidth combination sets is defined in 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.

Parameter	Unit	Value
Cyclic prefix		Normal
Cell ID		0
Inter-TTI Distance		1
Number of HARQ		
processes per	Processes	8
component carrier		
Maximum number of		4
HARQ transmission		4
Redundancy version		(0.0.1.2) for 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		
sets		1
EPDCCH transmission		La collisio d
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 nprB = 70, 71
allocation		20MHz BW: Resource blocks n _{PRB} = 98, 99
EPDCCH Starting		Derived from CEL (i.e. default behaviour)
Symbol		Derived from CFI (i.e. default behaviour)
ECCE Aggregation		2 5005-
Level		2 ECCEs
Number of EREGs per		4
ECCE		4
		EPDCCH candidate is randomly assigned
EPDCCH scheduling		in each subframe
EPDCCH precoder		Fixed PMI 0
(Note 1)		
EPDCCH monitoring SF		111111111 000000000
pattern		111111111 000000000
Timing advance	μs	100
-		Static propagation condition
Propagation condition		No external noise sources are applied
Note 1: EPDCCH prece	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.

Table 8.7.3-2: Test parameters for SDR test for PDSCH scheduled by	<pre>r EPDCCH (</pre>	(FDD)
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Test	Bandwidth	Transmission	Antenna	Codebook subset restriction	Downlink power allocation (dB)				\hat{E}_{s} at	Symbols for
Test	(MHz)	mode	configuration		$ 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:	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 NDL_correct_rx is the number of correct							
Note 5:	52752 bits for sub-frame 5.							

Table 8.7.3-3:	Minimum red	uirement (FDD)

Table 8.7.3-4: Test points	s for 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:	Note 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.

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 0000000000 UL-DL configuration 5: 1100111001 0000000000
Timing advance	μs	100
Propagation condition		Static propagation condition No external noise sources are applied
	Table 4.2-1 in TS 36 oder parameters are	211 [4]. defined for tests with 2 x 2 antenna

Table 8.7.4-1: Common test parameters (1	IDD)
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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	Codebook subset	debook allocation (dB) subset		Downlink power allocation (dB)				allocation (dB) <i>E_s</i> at antenna poi		$\hat{E}_{_{s}}$ at antenna port	Symbols for unused	ACK/NACK feedback	
	(11172)	mode	configu ration	restriction			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)

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	R.31E-1 TDD	95					
2	25456/0	R.31E-2 TDD	95					
3	51024/0	R.31E-3 TDD	95					
3A	51024/0	R.31E-3A TDD	85					
4	75376/0 (Note 2)	R.31E-4 TDD	85					
6	75376/0 (Note 2)	R.31E-4 TDD	85					
Note 1: For 2 layer transmissions, 2 transport blocks are received within a TTI. Note 2: 71112 bits for sub-frame 5. Note 3: The TB success rate is defined as TB success rate = 100%*NDL_correct_rx/ (NDL_newtx + NDL_retx), where NDL_newtx is the number of newly transmitted DL transport blocks, NDL_retx is the number of retransmitted DL transport blocks, and NDL_correct_rx is the number of correctly received DL transport blocks.								

Table 8.7.4-4: 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 carrier	15	-	-	ЗA	ЗA	-	-				
	20	-	-	3	4	6	6				
Note 1	The test is selected	The test is selected for maximum supported bandwidth									

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

8.8 Demodulation of EPDCCH

The receiver characteristics of the EPDCCH are determined by the probability of miss-detection of the Downlink Scheduling Grant (Pm-dsg). For the distributed transmission tests in 8.8.1, EPDCCH and PCFICH are tested jointly, i.e. a miss detection of PCFICH implies a miss detection of EPDCCH. For other tests, EPDCCH and PCFICH are not tested jointly.

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.

	Parame		Unit	Value		
Number of	PDCCH syn	nbols	symbols	2 (Note 1)		
PHICH dur	ation			Normal		
Unused RE	E-s and PRB	-S		OCNG		
Cell ID			0			
		$ ho_{\scriptscriptstyle A}$	dB	-3		
Downlink p	ower	$ ho_{\scriptscriptstyle B}$	dB	-3		
allocation		σ	dB	0		
		δ	dB	3		
$N_{\scriptscriptstyle oc}$ at ant	enna port	dBm/15 kHz	-98			
Cyclic pref	ix		Normal			
Subframe	Configuration		Non-MBSFN			
Precoder Update Granularity			PRB	1		
Flecodel C	puale Gran	ms	1			
Beamformi	ing Pre-Code	er		Annex B. 4.4		
	ic Reference			Port 0 and 1		
Number of	EPDCCH S	ets Configured		2 (Note 2)		
Number of	PRB per EP	DCCH Set		4 (1 st Set) 8 (2 nd Set)		
EPDCCH S	Subframe Mo	onitoring		NA		
PDSCH TN	Л	•		TM3		
DCI Forma	ıt			2A		
 Note 1: The starting symbol for EPDCCH is derived from the PCFICH. RRC signalling <i>epdcch-StartSymbol-r11</i> is not configured. Note 2: The two sets are distributed EPDCCH sets and non-overlapping with PRB = {3, 17, 31, 45} for the first set and PRB = {0, 7, 14, 21, 28, 35, 42, 49} for the second set. EPDCCH is scheduled in the first set for Test 1 and 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	Referenc	e 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 of F		symbols	2 (Note 1)			
PHICH dura			Normal			
Unused RE-	s and PRB		OCNG			
Cell ID				0		
Downlink power allocation	$ ho_{\scriptscriptstyle A}$	dB	-3			
	$ ho_{\scriptscriptstyle B}$	dB	-3			
anocation		σ	dB	0		
		δ	dB	3		
$N_{\scriptscriptstyle oc}$ at anter	nna port	dBm/15 kHz	-98			
Cyclic prefix				Normal		
Subframe C	onfiguratio		Non-MBSFN			
Bragadar Lindata Cranularity			PRB	1		
Precoder Update Granularity			ms	1		
Beamformin	g Pre-Code		Annex B. 4.4			
Cell Specific Reference Signal				Port 0 and 1		
Number of EPDCCH Sets Configured				2 (Note 2)		
Number of F	PRB per EF	DCCH Set		4 (1 st Set) 8 (2 nd Set)		
EPDCCH St	ubframe Mo	onitoring		NA		
PDSCH TM		0		TM3		
DCI Format				2A		
TDD UL/DL	Configurat	on		0		
TDD Specia	I Subframe			1 (Note 3)		
P Cr Note 2: T O P E Sr Note 3: [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 8.8.1.2-1: 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.

Param	eter	Unit	Value
Number of PDCCH sy	mbols	symbols	1 (Note 1)
EPDCCH starting symbol		symbols	2 (Note 1)
PHICH duration			Normal
Unused RE-s and PR	B-s		OCNG
Cell ID			0
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0
allocation	σ	dB	-3
	δ	dB	0
$N_{\scriptscriptstyle oc}$ at antenna port		dBm/15 kHz	-98
Cyclic prefix			Normal
Subframe Configuration	on		Non-MBSFN
		PRB	1
Precoder Update Granularity		ms	1
Beamforming Pre-Co	der		Annex B.4.5
Cell Specific Reference	ce Signal		Port 0 and 1
CSI-RS Reference Signal			Port 15 and 16
CSI-RS reference sig	nal resource		0
configuration			0
CSI reference signal s	subframe		2
configuration I _{CSI-RS}			_
ZP-CSI-RS configurat			00000100000000
ZP-CSI-RS subframe	configuration I _{ZP-}		2
CSI-RS	. .		
Number of EPDCCH			2 (Note 2)
EPDCCH Subframe N			111111110 11111101 111111011 11111110111 (Nets 2)
subframePatternConf	Ig-r11		111110111 (Note 3) TM9
Note 1: The starting set to 1.	y symbol for EPDCC	JH IS SIGNAIIE	d with epdcch-StartSymbol-r11. However, CFI is
Note 2: The first se transmission	on with $PRB = \{0, 7,$		PRB = {0, 49} and the second set is localized 5, 42, 49}. ePDCCH is scheduled in the second set
	s scheduled in every		equired to monitor ePDCCH for UE-specific search atternConfig-r11. Legacy PDCCH is not scheduled.

For the parameters specified in Table 8.8.2.1-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.8.2.1-2. EPDCCH subframe monitoring is configured and the subframe monitoring requirement in EPDCCH restricted subframes is statDTX of 99.9%.

The downlink physical setup is in accordance with Annex C.3.2.

Test	Bandwidt	Aggregatio	Reference	OCNG	Propagatio	Antenna	Referenc	e value
numbo	er 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 syr	nbols	symbols	1 (Note 1)			
EPDCCH starting sym	bol	symbols	2 (Note 1)			
PHICH duration			Normal			
Unused RE-s and PRE	3-s		OCNG			
Cell ID			0			
	$ ho_{\scriptscriptstyle A}$	dB	0			
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB	-3			
	δ	dB	0			
N et entenne nert	Ŭ	dBm/15	-98			
$N_{\scriptscriptstyle oc}$ at antenna port		kHz				
Cyclic prefix			Normal			
Subframe Configuratio	n		Non-MBSFN			
Dresseder Lindete Oren	ula nitu i	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			Port 15 and 16			
CSI-RS reference signal resource			0			
configuration			`			
CSI reference signal s	ubframe		0			
configuration I _{CSI-RS}			-			
ZP-CSI-RS configurati			000001000000000			
ZP-CSI-RS subframe of CSI-RS	configuration I _{ZP-}		0			
Number of EPDCCH S	ets		2 (Note 2)			
EPDCCH Subframe M subframePatternConfig	onitoring pattern		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			
set to 1.	Symbol for Er Doc	in is signalic				
Note 2: The first set	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					
Note 3: EPDCCH is space only i	n SFs configured by	y subframeP	equired to monitor ePDCCH for UE-specific search PatternConfig-r11. Legacy PDCCH is not scheduled.			
Note 4: Demodulation	on performance is a	veraged ove	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)
	1	10 MHz	2 ECCE	R.57 TDD	OP.7 TDD	EVA5	2 x 2 Low	1	12.8
	2	10 MHZ	8 ECCE	R.58 TDD	OP.7 TDD	EVA5	2 x 2 Low	1	2.0

8.8.2.2.1 Void

Table 8.8.2.2.1-1: Void

8.8.2.2.2 Void

Table 8.8.2.2.2-1: Void

Table 8.8.2.2.2-2: 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

			Τe	est 1	Tes	st 2
Parameter PHICH duration		Unit	TP 1	TP 2	TP 1	TP 2
PHICH durat	ion				ormal	
Downlink	$ ho_{\scriptscriptstyle A}$	dB			0	
power	$ ho_{\scriptscriptstyle B}$	dB		0		
allocation	σ	dB			-3	
	δ	dB		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	na 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-PR (setConfigId)			0	1	0	1
(setConfigId) Transmission type of EPDCCH- PRB-set			Localized	Localized	Localized	Localized
Number of PRB pair per EPDCCH-PRB-set		PRB	8	8	8	8
EPDCCH-PRB-set EPDCCH beamforming model			Annex B.4.5	Annex B.4.5	Annex B.4.5	Annex B.4.5
PDSCH trans	PDSCH transmission mode PDSCH transmission		TM10 Blanked in all	TM10 Transmit in all	TM10 Probability of occurrence of PDSCH	TM10 Probability of occurrence of PDSCH
scheduling	scheduling		the subframes	the subframes	transmission is 30% (Note 3)	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>I</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 IcsI-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	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>I</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 (N	ote 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 offse	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: Resource blocks n _{PRB} =0, 7, 14, 21, 28, 35, 42, 49 are allocated for both the first set and the second set. Note 2: The starting OFDM symbol for EPDCCH is determined from the higher layer signalling pdsch-Start-r11. And CFL is set to 1.								
Note 3:								
Note 4:	For PQI set 0, PDSCH transmitted from TP1.					and EPDCCH are		

Table 8.8.3.1-2: Minimum Performance	Table 8.8.3.1	1-2: Minimum	Performance
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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

D		L Incid	Te	est 1	Te	st 2				
Parameter		Unit	TP 1	TP 2	TP 1	TP 2				
PHICH durat				Normal						
Downlink	$ ho_{\scriptscriptstyle A}$	dB			0					
power	$ ho_{\scriptscriptstyle B}$	dB	0							
allocation σ		dB	-3							
	δ	dB			0					
\hat{E}_s/N_{oc}			0dB power 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	na port	dBm/ 15kH z		-	98					
Bandwidth		MHz	10	10	10	10				
	PDCCH Sets			lote 1)		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	IS		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>I</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 IcsI-RS		N/A	N/A	0	N/A				
Zero power CSI	CSI-RS Configuration list (ZeroPowerCSI- RS bitmap)	Bitma p	N/A	0000010000000 000	N/A	100001000000 000				
reference 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>I</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		
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 nPRB	= 0, 7, 14	= 0, 7, 14, 21, 28, 35, 42, 49 are allocated for both the first set and the second set.					
Note 2:	The starting OFDM sy	mbol for I	EPDCCH is deterr	nined from the high	er layer signalling p	dsch-Start-r11.		
And CFI is set to 1.								
Note 3:								
	Probabilities of occurre							
Note 4:	For PQI set 0, PDSCH					and EPDCCH are		
	transmitted from TP1. EPDCCH and PDSCH are transmitted from same TP.							

Table 8.8.3.2-2: Minimum Performance

	Test	Aggregation	Reference	OCNG	Propagation	Antenna	Reference	e value
n	umber	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 SI

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

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 and test rules for different CA configurations and bandwidth combination sets

The performance requirement for CA CQI tests in Clause 9 are defined independent of CA configurations and bandwidth combination sets specified in Clause 5.6A.1. For UEs supporting different CA configurations and bandwidth combination sets, the applicability and test rules are defined for the tests for 2 DL CCs in Table 9.1.1.2-1. For simplicity, CA configuration below refers to combination of CA configuration and bandwidth combination set. The definition of CA capability is specified in 8.1.2.2.

Table 9.1.1.2-1: Applicability and test rules for CA UE CQI tests with 2 DL CCs

Tests	CA capability where the tests apply	CA configuration from the selected CA capbility where the tests apply	CA Bandwidth combination to be tested in priority order					
CA tests with 2CCs in Clause 9.6.1.1	Any of one of the supported CA capabilities	Any one of the supported FDD CA configurations	10+10 MHz, 20+20 MHz					
CA tests with 2CCs in Clause 9.6.1.2	Any of one of the supported CA capabilities with largest aggregated CA bandwidth combination	Any one of the supported TDD CA configurations with largest aggregated CA bandwidth combination	Largest aggregated CA bandwidth combination					
Note 2: Numbe	Note 1: The applicability and test rules are specified in this table, unless otherwise stated.							

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	Tes	Test 1 Test		est 2	
Bandwidth		MHz 10					
PDSCH transmissio	on mode		1				
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	0				
allocation	$ ho_{\scriptscriptstyle B}$	dB			0		
	σ	dB			0		
Propagation condit antenna configur			AWGN (1 x 2)				
SNR (Note 2	2)	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	Format 2		
PUCCH Report	Туре				4		
Reporting period	dicity	ms		Np	d = 5		
cqi-pmi-Configurati					6		
Note 1: Reference measurement channel RC.1 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, except for category 1 UE use RC.4 FDD with two sided dynamic OCNG Pattern OP.2 FDD as described in Annex A.5.1.2. Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.							

Table 9.2.1.1-1: 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.

Parameter		Unit	Te	Test 1 Test 2		
Bandwidth		MHz			10	
PDSCH transmission mode					1	
Uplink downlink cont	figuration		2			
Special subfra	me				4	
configuration	<u>1</u>				4	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB			0	
allocation	$ ho_{\scriptscriptstyle B}$	dB			0	
	σ	dB			0	
Propagation condit antenna configu				AWGI	N (1 x 2)	
SNR (Note 2		dB	0	1	6	7
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-97	-92	-91
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98			98
Max number of H transmission			1			
Physical channel f reporting	or CQI		PUSCH (Note 3)			
PUCCH Report	Type		4			
Reporting period		ms	$N_{\rm pd} = 5$			
cqi-pmi-Configurati	onIndex			•	3	
ACK/NACK feedbac	ck mode			Multi	plexing	
OCNG Pat TDD with t	ttern OP.1	ent channel RC.1 T TDD as described ir ynamic OCNG Patte	n Annex A.5.2 ern OP.2 TDI	2.1, except for D as described	[.] category 1 UI d in Annex A.5	E use RC.4 5.2.2.
 Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level. Note 3: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on 					both on	
		JCCH. PDCCH DCI QI to multiplex with				

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 (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 $C_{CSI,1}$ shall be larger than or equal to 2 and less than or equal to 5 in Test 1 and shall be larger than or equal to 0 and less than or equal to 1 in Test 2.

Parameter		Unit		Tes				st 2
		MHz	Ce		Cell 2	Ce	ell 1	Cell 2
	Bandwidth			1(-			0 Note 10
PDSCH transmission		JD	2-3		Note 10			
Downlink power	$ ho_{\scriptscriptstyle A}$	dB						3
allocation	$ ho_{\scriptscriptstyle B}$	dB		-3			-	3
	σ	dB		0				0
Propagation condit antenna configu	ration		0	Clause B	3.1 (2x2)		Clause I	3.1 (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	lote 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 (N	Note 9)	N/A	-98(N	lote 9)	N/A
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-93	-92	-94	-93	-110
Subframe Config	uration		Non-M	BSFN	Non-MBSFN	Non-N	/ BSFN	Non-MBSFN
Cell Id			C		1		0	1
Time Offset betwee	en Cells	μs	2.5	(synchro	nous cells)	2.5	5 (synchr	onous cells)
ABS pattern (No	ote 2)		N/A		01010101 01010101 01010101 01010101 01010101 01010101	010 N/A 010 010		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	Ccsi,0	CSI,0 0 0 0 1 CSI,1 1 1 1		0101 0101 0101 0101 0101 0101	N/A	01010101 01010101 01010101 01010101 01010101 10101010 10101010 10101010 10101010 10101010		N/A
(Note 3)	Ccsi,1			10101010 10101010 10101010 10101010 10101010				N/A
Number of control symbols	OFDM			3	6		:	3
Max number of H transmissior				1				1
Physical channel for C _{CSI,0} CQI reporting			P	UCCH F	Format 2		PUCCH	Format 2
Physical channel for C _{CSI,1} CQI reporting			Р	USCH (Note 12)		PUSCH	(Note 12)
PUCCH Report	Туре			4	-			4
Reporting perio	dicity	Ms		N _{pd}			Npd	= 5
cqi-pmi-Configurati Ccsi,0 (Note 1			6		N/A		6	N/A
cqi-pmi-Configuratio C _{CSI,1} (Note 1	onIndex2		5		N/A		5	N/A

Note 1:	For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.
Note 2:	ABS pattern as defined in [9].
Note 3:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 4:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
Note 5:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 6:	Cell 1 is the serving cell. Cell 2 is the aggressor cell. The number of the CRS ports in Cell1 and Cell2 is the same.
Note 7:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 8:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 9:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 10:	Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.1.5
Note 11:	Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 for UE Cateogry 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1, and RC.6 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP. 1/2 FDD as described in Annex A.5.1.1 and A.5.1.2.
Note 12:	To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
Note 13:	cqi-pmi-ConfigurationIndex is applied for Ccsi,o.
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 (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} 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.

Parameter				Tes	st 1		Те	st 2
Parameter		Unit	Ce		Cell 2	Ce	ll 1	Cell 2
Bandwidth		MHz	1(•			0
PDSCH transmissio			2		Note 10		2	Note 10
Uplink downlink con					1			1
Special subfra configuration				2	4			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	3.1 (2x2)		Clause	B.1 (2x2)
\widehat{E}_{s}/N_{oc2} (Not		dB	4	5	6	4	5	-12
(.)	$N_{oc1}^{(j)}$	dBm/15kHz	-102 (1	Note 7)	N/A	-98 (N	lote 7)	N/A
$N_{\scriptscriptstyle oc}^{(j)}$ 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 (l	Note 9)	N/A	-98 (N	lote 9)	N/A
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-93	-92	-94	-93	-110
Subframe Configu	uration		Non-M	IBSFN	Non-MBSFN	Non-M	IBSFN	Non-MBSFN
Cell Id			()	1	(0	1
Time Offset betwee	en Cells	μs	2.5 (synchr		2.5 (synchronous cells)		i (synchr	onous cells)
ABS pattern (No	ote 2)		N/A		0100010001 0100010001	N/A		0100010001 0100010001
RLM/RRM Measu			000000001		N/A	000000001		N/A
Subframe Pattern	Note 4)		00000				00001	
CSI Subframe Sets	Ccsi,0		0100010001 0100010001		N/A		10001	N.A
(Note 3)	C _{CSI.1}		10001	01000	N/A	1000101000		N/A
Number of control	/		1000101000		14/7	10001	01000	10/7
Number of control symbols	OFDM			3	3		3	
Max number of H	IARQ				1			1
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					(Noto 12)	1		
reporting					(Note 12)			SCH
PUCCH Report Type					4			4
Reporting period		ms		$N_{\rm pd} = 5$ $N_{\rm p}$		Npd	= 5	
cqi-pmi-Configurati C _{CSI,0} (Note 1	3)		3	3	N/A	:	3	N/A
cqi-pmi-Configuratio			2	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
Note 7:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping
	with the aggressor ABS.
Note 8:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 9:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 10:	Downlink physical channel setup in Cell 2 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.2.5
Note 11:	Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 for UE Category ≥2 with one
	sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1, and RC.6 TDD according to Table
	A.4-1 for Category 1 with one/two sided dynami OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1
	and Annex A.5.2.2.
Note 12:	To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH
	instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic
	CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
Note 13:	cqi-pmi-ConfigurationIndex is applied for Ccsi.0.
Note 14:	cqi-pmi-ConfigurationIndex2 is applied for Ccsi,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.

Parameter		Unit		st 1	Te	st 2	
			Cell 1	Cell 2 and 3	Cell 1	Cell 2 and 3	
Bandwidth		MHz		0		0	
PDSCH transmission			2	Note 10	2	Note 10	
Downlink power ρ_A		dB		3		3	
allocation	$ ho_{\scriptscriptstyle B}$	dB		3		3	
	σ	dB	()	(0	
Propagation condit antenna configu			Clause E	3.1 (2x2)	Clause I	3.1 (2x2)	
$\widehat{E}_{s} ig / N_{oc2}$ (Not	e 1)	dB	4 5	Cell 2: 12 Cell 3: 10	13 14	Cell 2: 12 Cell 3: 10	
$\mathbf{r}(i)$	$N_{oc1}^{(j)}$	dBm/15kHz	-98 (Note 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-MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN	
Cell Id			0	Cell 2: 6 Cell 3: 1	0	Cell 2: 6 Cell 3: 1	
T : 0% (1)	0."		Cell 2:	3 usec	Cell 2:	3 usec	
Time Offset betwee	en Cells	μs	Cell 3:	-1usec	Cell 3:	-1usec	
Frequency Shift betw	een Cells	Hz		300Hz		300Hz	
			Cell 3:	-100Hz	Cell 3:	-100Hz	
ABS pattern (Note 2)			N/A	01010101 01010101 01010101 01010101 01010101 01010101	N/A	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	Ccsi,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 H transmission				1		1	
Physical channel for C _{CSI,0} CQI reporting			PUCCH	Format 2	PUCCH	Format 2	
Physical channel for reporting	C _{CSI,1} CQI		PUSCH	(Note 12)	PUSCH	(Note 12)	
PUCCH Report				4		4	
Reporting perior	dicity	Ms	Npd	= 5	Npd	= 5	
cqi-pmi-Configurati Ccsi,0 (Note 1	3)		6	N/A	6	N/A	
cqi-pmi-Configuratio Ccsi,1 (Note 1			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:	Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.1.5
Note 11:	Reference measurement channel in Cell 1 RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.
Note 12:	To avoid collisions between HARQ-ACK and wideband CQI it is necessary to report both on PUSCH
	instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic
	CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
Note 13:	cqi-pmi-ConfigurationIndex is applied for C _{CSI.0}
Note 14:	cqi-pmi-ConfigurationIndex2 is applied for Ccsi,1.

9.2.1.6 TDD (CSI measurements in case two CSI subframe sets are configured and with CRS assistance information)

The following requirements apply to UE Category ≥ 2 . For the parameters specified in Table 9.2.1.6-1, and using the downlink physical channels specified in tables C.3.2-1 for Cell 1, C3.3-2 for Cell 2 and Cell 3, and C.3.2-2, the reported CQI value according to RC.2 TDD in Table A.4-1 in subframes overlapping with aggressor cell ABS and non-ABS subframes shall be in the range of ± 1 of the reported median more than 90% of the time.

For test 1 and test 2, if the PDSCH BLER in ABS subframes using the transport format indicated by median CQI obtained by reports in CSI subframe sets $C_{CSI,0}$ 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 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.

Deremeter		l Init		Tes	st 1		Test 2		
Parameter		Unit	Ce	ll 1	Cell 2 and 3	Ce	ll 1	Cell 2 and 3	
Bandwidth		MHz		1	0		1	0	
PDSCH transmission			2	2	Note 10	:	2	Note 10	
Uplink downlink con	0				1			1	
Special subframe configuration				2	1			4	
Downlink power ρ_A allocation ρ_B		dB		-:	3		-	3	
		dB		-3			-	3	
	σ	dB		()			0	
Propagation condit antenna configu				Clause E	3.1 (2x2)		Clause I	B.1 (2x2)	
\widehat{E}_{s}/N_{oc2} (Not		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 (Note 9)		N/A		lote 9)	N/A	
Subframe Configu	uration		Non-MBSFN		Non-MBSFN	Non-MBSFN		Non-MBSFN	
Cell Id			0		Cell 2: 6 Cell 3: 1	0		Cell 2: 6 Cell 3: 1	
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 (No	ote 2)		N	/A	0100010001 0100010001	N	/A	0100010001 0100010001	
RLM/RRM Measu Subframe Pattern (00000		N/A		000001	N/A	
CSI Subframe Sets	Ccsi,0		01000		N/A)10001)10001	N.A	
(Note 3)	C _{CSI,1}		10001	01000 01000	N/A	10001	01000 01000	N/A	
Number of control symbols	OFDM		3		3				
Max number of H transmission			1		1				
Physical channel for C _{CSI,0} CQI reporting			PUCCH Format 2			PUCCH	Format 2		
Physical channel for C _{CSI,1} CQI reporting				PUSCH	(Note 12)		PUSCH	(Note 12)	
PUCCH Report Type				4	1			4	
Reporting periodicity		ms		N _{pd}	= 5			= 5	
cqi-pmi-Configurati Ccsi,0 (Note 1	onIndex		3	3	N/A		3	N/A	
cqi-pmi-Configuratio	onIndex2		4	1	N/A		4	N/A	
ACK/NACK feedba				Multip	lexing		Multin	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
	CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#8 and #3.
Note 13:	cqi-pmi-ConfigurationIndex is applied for Ccsi,0.
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 , 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 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	Te	st 2	
Bandwidth		MHz			10		
PDSCH transmission mode			4				
Deventiale a surray	$ ho_{\scriptscriptstyle A}$	dB	-3				
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB			-3		
	σ	dB			0		
Propagation condit antenna configur				Clause	B.1 (2 x 2)		
CodeBookSubsetRe bitmap	estriction			01	0000		
SNR (Note 2	2)	dB	10	11	16	17	
$\hat{I}^{(j)}_{or}$		dB[mW/15kHz]	-88	-87	-82	-81	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98				
Max number of H transmission			1				
Physical channel for reporting	CQI/PMI		PUCCH Format 2				
PUCCH Report Ty CQI/PMI	/pe for		2				
PUCCH Report Typ	e for RI				3		
Reporting period	dicity	ms		Np	_{od} = 5		
cqi-pmi-Configurati	onIndex				6		
ri-ConfigIndex					lote 3)		
Note 1: Reference measurement channel RC.2 FDD according to Table A.4-1 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1. Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.					-		
Note 3: It is intende	ed to have	UL collisions betwee he eNB in this test.		and HARQ-A	CK, since the	RI reports	

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 , 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 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	Те	st 1	Те	st 2
	Bandwidth		MHz			10	
PDSCH	l transmissic	on mode				4	
Uplink de	ownlink conf	iguration				2	
	ecial subfra					4	
Downlir	nk power	$ ho_{\scriptscriptstyle A}$	dB			-3	
	cation	$ ho_{\scriptscriptstyle B}$	dB			-3	
		σ	dB			0	
	gation condit nna configur				Clause I	3.1 (2 x 2)	
	ookSubsetRe bitmap				010	0000	
5	SNR (Note 2	<u>'</u>)	dB	10	11	16	17
	$\hat{I}_{or}^{(j)}$	/	dB[mW/15kHz]	-88	-87	-82	-81
	$N_{oc}^{(j)}$		dB[mW/15kHz]	-98 -98			98
	number of H ransmission					1	
-	channel for reporting	-			PUSCH	I (Note 3)	
PUC	CH Report	Туре				2	
Rep	orting period	dicity	ms		Npd	d = 5	
	i-Configurati					3	
	ri-ConfigInde				805 (Note 4)	
	ACK feedbac					olexing	
Note 1: Note 2:	OCNG Pattern OP.1 TDD as described in Annex A.5.2.1. For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s)						
Note 3:	 and the respective wanted signal input level. te 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2. 						
Note 4:					collide, it is nultiplexed. At		

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, 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 transmission mode					9		
	$ ho_{\scriptscriptstyle A}$	dB	0				
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0		
allocation	P_c	dB			-3		
	σ	dB			-3		
Cell-specific referen	ce signals			Antenna	ports 0, 1		
CSI reference s	gnals				orts 15,,18		
CSI-RS periodicity an	d subframe						
offset				Ę	5/1		
$T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	RS						
CSI reference signal c	onfiguration				0		
Propagation condition				Clause	B.1 (4 x 2)		
configuratio			As specified in Section B.4.3				
CodeBookSubsetRestr			0x0000 0000 0100 0000				
SNR (Note 2		dB	7	8	13	14	
$\hat{I}_{or}^{(j)}$	$\hat{I}_{or}^{(j)}$		-91	-90	-85	-84	
$N_{oc}^{(j)}$			-98 -98			8	
Max number of HARQ t	ransmissions				1		
Physical channel for							
reporting				PUSCI	H (Note3)		
PUCCH Report Type	for CQI/PMI				2		
Physical channel for I	RI reporting		PUCCH Format 2				
PUCCH Report Ty					3		
Reporting perio	dicity	ms	$N_{\rm pd} = 5$				
CQI delay		ms	8				
cqi-pmi-Configurat			2				
ri-ConfigInd					1		
		annel RC.7 TDD ac	cording to Ta	ble A.4-1 with	n one sided dyr	namic OCNG	
Pattern OP.1 FDD as described in Annex A.5.1.1.							
Note 2: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the							
respective wa	respective wanted signal input level.						
Note 3: To avoid colli	sions between	CQI/PMI reports an					
		PDCCH DCI forma					
allow periodic	CQI/PMI to m	ultiplex with the HA	RQ-ACK on F	VSCH in upl	ink SF#0 and #	±5.	

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 , 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 less than or equal to 0.1.

Parameter		Unit	Tes	st 1	Tes	st 2
Bandwidth		MHz			10	
PDSCH transmissi	PDSCH transmission mode				9	
Uplink downlink con	figuration				2	
Special subframe co	nfiguration		4			
	$ ho_{\scriptscriptstyle A}$	dB			0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0	
allocation	P_c	dB			-6	
	σ	dB			-3	
CRS reference s				Antenna	i ports 0, 1	
CSI reference si				Antenna p	orts 15,,22	
CSI-RS periodicity an offset				5	5/ 3	
$T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$					0	
CSI reference signal c					0	
Propagation condition a configuratio				Clause	B.1 (8 x 2)	
Beamforming N					n Section B.4.	
CodeBookSubsetRestr			0x0000 0000 0020 0000 0000 0001 0000			01 0000
SNR (Note 2	2)	dB	4	5	10	11
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-94	-93	-88	-87
$N_{oc}^{(j)}$	$N_{oc}^{(j)}$		-98 -98		98	
Max number of HARQ t					1	
Physical channel for reporting	CQI/PMI		PUSCH (Note 3)			
PUCCH Report Type fo PMI	r CQI/second		2b			
Physical channel for F	RI reporting		PUSCH			
PUCCH Report Type for RI/ first PMI			5			
Reporting perio	dicity	ms	$N_{\rm pd} = 5$			
CQI delay		ms		10	or 11	
cqi-pmi-Configurat	ionIndex				3	
ri-ConfigInde			805 (Note 4)			
ACK/NACK feedba					plexing	
		annel RC.7 TDD ac		ble A.4-1 with	n one sided dyi	namic OCNG
		ibed in Annex A.5.2				
		requirements shall I	be fulfilled for	at least one of	of the two SNR	R(s) and the
	anted signal inp			<i></i>		
		CQI/PMI reports an				
		PDCCH DCI forma				
		ultiplex with the HA				
RI, CQI/PMI a	and HARQ-AC	the maximum allow K reports. In the cas	se when all th	ree reports co	ollide, it is expe	ected that
		pped, while RI and H			xea. At ENB, C	i report
collection sha	ili be skipped e	every 160ms during	periormance	verification.		

9.2.4 Minimum requirement PUCCH 1-1 (With Single CSI Process)

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband CQI value for codeword #1, and their BLER performance using the transport format indicated by the reported CQI median of codeword #0 and codeword #1. The precoding used at the transmitter is a fixed precoding matrix specified by the bitmap parameter *codebookSubsetRestriction*. The propagation condition assumed for the minimum performance requirement is defined in subclause B.1.

9.2.4.1 FDD

The following requirements apply to UE Category ≥ 2 . For the parameters specified in table 9.2.4.1-1, and using the downlink physical channels specified in tables C.3.4-1 and C.3.4-2, the reported offset level of the wideband spatial

differential CQI for codeword #1 (Table 7.2-2 in TS 36.213 [6]) shall be used to determine the wideband CQI index for codeword #1 as

wideband CQI_1 = wideband CQI_0 – Codeword 1 offset level

The wideband CQI₁ shall be within the set {median CQI₁ -1, median CQI₁, 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 CQI₀ + 1 and median CQI₁ + 1 shall be greater than or equal to 0.1.

2 TP1 10 10 0 0 -3 -3 -3 2) Antenna por 0, 1 Antenna por 15 18	TP2 0 0 -3 N/A 0 rts (Note 2)		
10 0 0 -3 -3 2) Antenna por 0, 1 Antenna por	0 -3 N/A 0		
0 0 -3 -3 2) Antenna por 0, 1 Antenna por	0 -3 N/A 0		
0 3 3 2) Antenna por 0, 1 Antenna por	0 -3 N/A 0		
2) Antenna por 0, 1 Antenna por	-3 N/A 0		
2) Antenna por 0, 1 Antenna por	0 rtc		
2) Antenna por 0, 1 Antenna por	0 rtc		
2) 0, 1 Antenna por	rte		
2) 0, 1 Antenna por	rts (Note 2)		
-			
15,,18	N/A		
5/1	N/A		
0	N/A		
1 / 00000 0010000000 0 0000	000 1 / 100000000 00000		
1 / 0010000000 0000	000 N/A		
CSI-RS/CSI-IM/PUCCH 1-1 CSI-RS/CSI-IM			
B.1 Clause B.1 2) (4 x 2)	(2 x 2)		
100000 0x0000 0000 0100 0000			
7 20	14 1		
-91 -78	-84 -8		
	-98		
4392 (Note4)	QPSK / 439		
. 1	N/A		
PUSCH (Note5)	N/A		
2	N/A		
3	N/A		
$N_{\rm pd} = 5$	N/A		
8	N/A		
	N/A N/A		
······································	<u> </u>		
1 with one sided dyna	0 amic OCNG Patte		
`	1 1,2		

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 , 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 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	TP		TP1	TF	2
Bandwidt		MHz				10		
PDSCH transmission mode Uplink downlink configuration						10 2		
Special subframe c					4			
		dB	0	0		0	()
Deverlight gewen	$ ho_{\scriptscriptstyle A}$		_	-				
Downlink power allocation (Note 1)	$\rho_{\scriptscriptstyle B}$	dB	0	0 0)
, FC		dB	-6	-6		-6	-	
	σ	dB	-3	N/.	A	-3		/A
Cell ID			C			C)	
Cell-specific refere	nce signals		Antenna ports 0, 1	(Note	e 2)	Antenna ports 0, 1	(Not	te 2)
CSI reference	signals		Antenna ports 15,,22	N/	Ą	Antenna ports 15,,22	N	/A
CSI-RS periodi subframe offset Tc:			5/3	N/.	Ą	5/3	N	/A
CSI-RS config			0	N/	Ą	0	N	/A
Zero-Power C configurati I _{CSI-RS} / ZeroPow bitmap	ion		3 / 00100000000 0000	3 / 10000100000 00000				/ 100000 000
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-IM/PUCCH 1-1		
Propagation condition and antenna configuration			Clause B.1 (8 x 2)	(2 x 2) (8 x 2)			Clause B.1 (2 x 2)	
CodeBookSubsetRestriction bitmap			0x0000 0000 0020 0000 0000 0001 0000	1000	000	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]	-98		-98		•	
Modulation / Infor payload			(Note4)	QPSK	4392	(Note4)	QPSK	/ 4392
Max number of transmissio	ons		1	N/.	A	1	N	/A
Physical channel for CQI/PMI reporting			PUSCH (Note5)	N/.	A	PUSCH (Note5)	N	/A
PUCCH Report Type for CQI/second PMI			2b	N/		2b		/A
Physical channel for RI reporting			PUSCH	N/A PUS		PUSCH	N	/A
PUCCH Report Type for RI/ first PMI			5	N/.		5		/A
Reporting periodicity		ms	$N_{\rm pd} = 5$	N/		$N_{\rm pd} = 5$		/A
CQI Delay cqi-pmi-ConfigurationIndex		ms	10 or 11 3	N/. 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 bet		US	0, 1,			0, 1,		
Frequency offset be		Hz	C			C		

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

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			
Ban	dwidth	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	
	$\hat{f}(j)$ or	dB[mW/15kHz]	-89	-88	-84	-83	
Λ	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	8	-6	98	
			Clause	B.2.4 wi	th $\tau_d = 0$).45 <i>μ</i> s,	
Propagation channel			$a = 1, f_D = 5 \text{ Hz}$				
Antenna o	configuration		1 x 2				
Reporti	ng interval	ms	5				
CQ	delay	ms	8				
	ing mode		PUSCH 3-0				
	and size	RB	6 (full size)				
	per of HARQ		1				
	nissions				•		
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					than		
Note 2: R w	the eNB downlink before SF#(n+4) Reference measurement channel RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described i 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 re	equirement	(FDD)
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	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		
Transmission mode			1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
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	oc (j)	dB[mW/15kHz]	-98 -98			8
			Clause B.2.4 with			
Propagatio	on channel		$ au_{d} = 0.45 \mu { m s}, a$ = 1,			
			$f_D = 5 \text{ Hz}$ 1 x 2			
Antenna co	onfiguration		1 x 2			
	g interval	ms	5			
	delay	ms	10 or 11			
	ng mode		PUSCH 3-0			
	and size	RB	6 (full size)			
	er of HARQ			1		
	issions				-	
	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						
Note 3: For each test, the minimum requirements shall be fulfilled for a one of the two SNR(s) and the respective wanted signal input						

 Table 9.3.1.1.2-1 Sub-band test for single antenna transmission (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		Test 2		
			Cell		Cell 2 and 3	Cell 1	Cell 2 and 3	
Bandwidth PDSCH transmissio	on mode	MHz	1	10	Note 10	1	10 Note 10	
		dB	1	0		0		
Downlink power ρ_A		dB		0				
allocation	$ ho_{\scriptscriptstyle B}$	-	0		0			
	σ	dB	Clause	-		Clause B.2.4	0	
Propagation condition			Clause B.2.4 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	te 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 (Not	te 7)	N/A	-98 (Note 7)	N/A	
$N_{oc}^{(j)}$ at antenna port	$N_{oc2}^{(j)}$	dBm/15kHz	-98 (Not	te 8)	N/A	-98 (Note 8)	N/A	
·	$N_{oc3}^{(j)}$	dBm/15kHz	-93 (Not	,	N/A	-93 (Note 9)	N/A	
Subframe Config	uration		Non-MB	SFN	Non-MBSFN	Non-MBSFN	Non-MBSFN	
Cell Id			0		Cell 2: 6	0	Cell 2: 6	
			(2011 21 1	Cell 3: 1	Cell 3: 1 Cell 2: 3 usec		
Time Offset betwee	en Cells	μs	Cell 2: 3 usec 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)			N/A 01010101 01010101 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	100 100 100	N/A	00000100 00000100 00000100 00000100 00000100	N/A	
Ccsi,0			01010 ⁴ 01010 ⁴ 01010 ⁴ 01010 ⁴ 01010 ⁴ 01010 ⁴	101 101 101 101	N/A	01010101 01010101 01010101 01010101 01010101 01010101	N/A	
(Note 3)	C _{CSI,1}		10101010 10101010		N/A	10101010 10101010 10101010 10101010 10101010 10101010	N/A	
Number of control OFDM symbols				3		3		
Max number of H transmission				1			1	
CQI delay		ms			3	3		
Reporting interval (ms			1			
Reporting mo	de		PUSCH 3-0					
Sub-band siz	ze	RB			6 (full	size)		

Table 9.3.1.1.3-1 Sub-band test for single antenna transmission (FDD))
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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]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 3:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 4:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7]
Note 5:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 6:	Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell1, Cell2, and Cell3 are the same.
Note 7:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 8:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 9:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 10:	Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.1.5
Note 11:	Reference measurement channel in Cell 1 RC.3 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.
Note 12:	If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 12:	
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	Test 1			Test 2		
			Cel		Cell 2 and 3	Ce		Cell 2 and 3
Bandwidth		MHz		1			1	0
PDSCH transmission mode			1		Note 10		1	Note 10
Uplink downlink conf	iguration				1	1		
Special subframe			4				4	
configuration	1							
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		()			0
allocation	$ ho_{\scriptscriptstyle B}$	dB		()		(C
	σ	dB)			0
Propagation condition			Clause with Td us, a = 5 H	= 0.45 1, fd =	EVA5 Low antenna correlation	with To us, a =	e B.2.4 I = 0.45 1, fd = Hz	EVA5 Low antenna correlation
Antenna configuratio	n			1)	<2		1:	x2
\widehat{E}_{s}/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	ote 7)	N/A	-98 (N	lote 7)	N/A
$N_{_{oc}}^{(j)}$ at antenna	$N_{oc2}^{(j)}$	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	00001	N/A
CSI Subframe Sets	Ccsi,0		01000 ² 01000 ²		N/A	01000 01000		N.A
(Note 3)	C _{CSI,1}		1000101000 1000101000		N/A	1000101000 1000101000		N/A
Number of control OFDM symbols			3		3			
Max number of HARQ transmissions			1 1			1		
CQI delay		ms				0		
Reporting interval (N	ote 13)	ms				0		
Reporting mode						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]. PDSCH other than SIB1/paging and its associated PDCCH/PCFICH are transmitted in the serving cell subframe when the subframe is overlapped with the ABS subframe of aggressor cell and the subframe is available in the definition of the reference channel.
Note 3:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 4:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].
Note 5:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 6:	Cell 1 is the serving cell. Cell 2 and Cell 3 are the aggressor cells. The number of the CRS ports in Cell1, Cell2, and Cell3 is the same.
Note 7:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 8:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS
Note 9:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS.
Note 10:	Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying OCNG pattern as defined in Annex A.5.2.5
Note 11:	Reference measurement channel in Cell 1 RC.3 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.
Note 12:	If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4).
Note 13:	The CSI reporting is such that reference subframes belong to C _{csi,0} .

 Table 9.3.1.1.4-2 Minimum requirement (TDD)

Test 1	Test 2
2	2
55	55
1.1	1.1
0.01	0.01
≥1	≥1
	2 55 1.1

9.3.1.2 Minimum requirement PUSCH 3-1 (CSI Reference Symbol)

9.3.1.2.1 FDD

For the parameters specified in Table 9.3.1.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.1.2.1-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band;
- b) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;
- c) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.05.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

Para	meter	Unit			st 2	
Band	lwidth	MHz	10 MHz			
Transmis	Transmission mode		9			
	$ ho_{\scriptscriptstyle A}$	dB			0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0	
allocation	P_c	dB			0	
	σ	dB			0	
SNR (Note 3)	dB	4	5	11	12
Î	(j) pr	dB[mW/15kHz]	-94	-93	-87	86
N	(j) oc	dB[mW/15kHz]	-:	98	-6	98
Droneseti			Clause	e B.2.4 wi	th $ au_d = 0$).45 <i>μ</i> s,
Propagatio	on channel			$a = 1, f_D = 5 \text{ Hz}$		
Antenna co	onfiguration		2x2			
	ning Model		As specified in Section B.4.3		B.4.3	
CRS reference signals			Antenna ports 0			
	nce signals		Antenna ports 15, 16		16	
	and subframe offset		5/ 1			
	/ Δ csi-rs		5/ 1			
	signal configuration		4			
	Restriction bitmap		000001			
	erval (Note 4)	ms	5			
	delay	ms	8			
	ng mode		PUSCH 3-1			
	ind size	RB	6 (full size)			
Max number of HARQ transmissions 1						
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)						
	Note 2: Reference measurement channel RC.8 FDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.				ťwo	
Note 3: For each SNR(s) a	test, the minimum req	uirements shall be full ted signal input level.	filled for	at least o	ne of the	
	OCI format 0 with a trig #6 to allow aperiodic					

	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.

Par	ameter	Unit	Те	st 1	Te	st 2			
Bar	Bandwidth		10 MHz						
Transmi	ssion mode		9						
Uplink downl	ink configuration				2				
Special subfra	Special subframe configuration				4				
	$ ho_{\scriptscriptstyle A}$	dB			0				
Downlink power	$ ho_{\scriptscriptstyle B}$	dB			0				
allocation	P_c	dB			0				
	σ	dB			0				
SNR	(Note 3)	dB	4	5	11	12			
	$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-94	-93	-87	-86			
1	$V_{oc}^{(j)}$	dB[mW/15kHz]	-{	98	-9	98			
			Clause	B.2.4 wi	th $\tau_d = 0$).45 μs,			
Propaga	tion channel		$a = 1, f_D = 5 \text{ Hz}$						
Antenna	configuration		2x2						
Beamforming Model			As specified in Section B.4.3		B.4.3				
CRS refe	rence signals		Antenna port 0						
	ence signals		Antenna port 15,16		6				
CSI-RS periodicity	/ and subframe offset		5/ 3						
$I_{CSI-RS} / \Delta_{CSI-RS}$									
CSI-RS reference	e signal configuration				4				
CodeBookSubse	etRestriction bitmap		000001						
Reporting interval (Note 4)		ms	5						
CQ	l delay								
Reporting mode			PUSCH 3-1						
Sub-band size RB		6 (full size)							
Max number of H	IARQ transmissions				1				
	ACK/NACK feedback mode Multiplexing								
Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on									
CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband									
or wideband CQI cannot be applied at the eNB downlink before SF#(n+4)									
Note 2: Reference measurement channel RC.8 TDD according to Table A.4-1 with one/two									
	namic OCNG Pattern C								
	n 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	SF#3 and #8 to allow aperiodic CQI/PMI/RI to be transmitted on uplink SF#2 and #7.			

Table 9.3.1.2.2-1	Sub-band test for TDD

	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

r			1			
	meter	Unit	Tes	st 1	Tes	st 2
	dwidth	MHz	10 MHz			
Transmis	sion mode		1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	σ	dB		()	
	Note 3)	dB	6	7	12	13
Í	c(j) or	dB[mW/15kHz]	-92	-91	-86	-85
Λ	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	98	-9	8
	on channel			EP	A5	
	ation and			High ((1 x 2)	
Antenna c	onfiguration ng mode				H 1-0	
	periodicity	ms			= 2	
	delay	ms			3	
	channel for					
CQI reporting			PUSCH (Note 4)			
PUCCH Report Type			4			
	-pmi-		1			
ConfigurationIndex Max number of HARQ			'			
	nissions			1	I	
		rts in an available u	inlink ren	ortina ins	tance at	
 Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4) Note 2: Reference measurement channel RC.1 FDD according to Table 						
A.4-1 for Category 2-8 with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1 and RC.4 FDD according to Table A.4-1 for Category 1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as described in Annex A.5.1.1/2.						
Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						
Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#1, #3, #7 and #9 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#5, #7, #1 and #3.				CCH Ind #9		

Table 9.3.2.1.1-1 Fa	ading test for	single antenna ((FDD)

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

9.3.2.1.2 TDD

For the parameters specified in Table 9.3.2.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.2.1.2-2 and by the following

a) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least α % of the time;

b) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index and that obtained when transmitting a fixed transport format configured according to the wideband CQI median shall be $\geq \gamma$;

c) when transmitting the transport format indicated by each reported wideband CQI index, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

			n		1	
Parameter		Unit	Tes	st 1		st 2
Bandwidth		MHz		10 N		
Transmi	ssion mode			1 (po	ort 0)	
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power	$ ho_{\scriptscriptstyle B}$	dB		()	
allocation	σ	dB		()	
confi	downlink guration			2	2	
	l subframe guration			2	1	
	(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]	-9	98	-9	98
	tion channel			EP	A5	
	ation and			High ((1 x 2)	
	configuration					
	ting mode			PUCCH 1-0		
	g periodicity	ms	N _{pd} = 5 10 or 11			
	l delay channel for	ms		10 0	0111	
CQI r	eporting		PUSCH (Note 4)			
	Report Type			4	1	
	i-pmi- rationIndex			3	3	
	ber of HARQ					
	missions				1	
	CK feedback					
	node			Multip	lexing	
Note 1:	If the UE repo	orts in an available u	plink rep	orting ins	tance at	
		n based on CQI es				ot later
	than SF#(n-4)	, this reported wide	band CQ	l cannot l	be applie	d at the
		before SF#(n+4).				
Note 2:		easurement channel				
		egory 2-8 with one s				
		ibed in Annex A.5.2				
		or Category 1 with o				IG
Pattern OP.1/2 TDD as described in Annex A.5.2.1/2.					r. 0.t	
Note 3:	least one of the two SNR(s) and the respective wanted signal input					
Note 4	level. Note 4: To avoid collisions between CQI reports and HARQ-ACK it is					_
Note 4:		report both on PUS				
	DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink					
	subframe SF#				0001111	upiirik

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.

Parar	Unit	Tes	st 1	Tes	st 2	
Band	width	MHz		10	MHz	
Transmiss	sion mode			Ç	9	
	$ ho_{\scriptscriptstyle A}$	dB		(C	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0			
allocation	P_c	dB		-	3	
	σ	dB	-3			
SNR (1	Note 3)	dB	2	3	7	8
\hat{I}_{a}^{0}	(j) pr	dB[mW/15kHz]	-96	-95	-91	-90
N	(j) oc	dB[mW/15kHz]	-9	-98 -98		
Propagatio	on channel			EP	A5	
Correlation and an	tenna configuration			ULA Hig	Jh (4 x 2)	
Beamform	ning Model		As sp	ecified in	Section	B.4.3
Cell-specific re	ference signals			Antenna	ports 0,1	
CSI referen	nce signals		An	tenna po	rts 15,	,18
CSI-RS periodicity a	and subframe offset			5	/1	
	$\Delta_{\text{CSI-RS}}$			5/	/ 1	
CSI-RS reference s	signal configuration			2		
CodeBookSubset	Restriction bitmap		0x0		0 0000 0	001
Reportir				PUCC	CH 1-1	
	periodicity	ms		$N_{\rm pd}$	= 5	
	delay	ms		8	3	
Physical chanr repo	nel for CQI/ PMI			PUSCH	(Note 4)	
	Type for CQI/PMI				2	
	I for RI reporting			-	<u>-</u> Format 2	
	ort type for RI				3	
	gurationIndex				2	
	igIndex				<u>~</u> 1	
Max number of HARQ transmissions 1 Note 1: If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI estimation at a downlink SF not later than SF#(n-4), this reported wideband CQI cannot be applied at the eNB downlink before SF#(n+4)						
	Note 2: Reference measurement channel RC.7 FDD according to Table A.4-1 with one					ne
Note 3: For each SNR(s) a	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	≥2	≥2

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
	Band	width	MHz		10 I	MHz	
Tra	ansmiss	sion mode			ļ	9	
Uplink	downlin	k configuration				2	
		ne configuration				4	
		$ ho_{\scriptscriptstyle A}$	dB			0	
Downlink p		$ ho_{\scriptscriptstyle B}$	dB	0			
allocatio	n	P_c	dB		-	6	
		σ	dB		-	3	
	SNR (N	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
Pro	pagatio	on channel			EF	PA5	
		tenna configuration			XP Higl	h (8 x 2)	
		ing Model		As sp		Section	B.4.3
		nce signals			Antenna	ports 0, 1	
		nce signals		An	tenna po	orts 15,	,22
CSI-RS peri		and subframe offset $\Delta_{\text{CSI-RS}}$			5/	3	
CSI-RS refe		signal configuration				2	
CodeBookSubsetRestriction bitmap			0x000	0x0000 0000 0000 0020 0000 0000 0001		0000 0	
F	Reportir	ng mode		PUC		Sub-mod	le: 2)
		periodicity	ms			= 5	,
CQI delay		ms		1	0		
Physica	al chanr repo	nel for CQI/ PMI rting			PUSCH	(Note 4)	
PUCCH F		ype for CQI/ PMI			2	2c	
		I for RI reporting			PUCCH	Format 2	
PUC	CH repo	ort type for RI				3	
cqi-pn	ni-Confi	gurationIndex				3	
		igIndex			805 (1	Vote 5)	
Max number	er of HA	RQ transmissions				1	
		edback mode				lexing	
		reports in an availabl stimation at a downlir					
		not be applied at the e					
Note 2: R	eferenc	e measurement chan	nel RC.7 TDD acco	ording to 7	Table A.4		ne
Note 3: F						the two	
Note 4: To						y to	
tra	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 th					with the	
	HARQ-ACK on PUSCH in uplink subframe SF#2 and #7.					minc	
CC	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						
		ollide, it is expected the					
	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						
		dropping) is available	applied in downlink	subframe	es until a	new CQ	aner
	CQI/PMI dropping) is available.						

Table 9.3.2.2.2-1	Fading test for TDD

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

9.3.3 Frequency-selective interference

The accuracy of sub-band channel quality indicator (CQI) reporting under frequency selective interference conditions is determined by a percentile of the reported differential CQI offset level +2 for a preferred sub-band, and the relative increase of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest reported differential CQI offset level the corresponding transport format compared to the case for which a fixed format is transmitted on any sub-band in set *S* of TS 36.213 [6]. The purpose is to verify that preferred sub-bands are used for frequently-selective scheduling under frequency-selective interference conditions.

9.3.3.1 Minimum requirement PUSCH 3-0 (Cell-Specific Reference Symbol)

9.3.3.1.1 FDD

For the parameters specified in Table 9.3.3.1.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.3.1.1-2 and by the following

a) a sub-band differential CQI offset level of +2 shall be reported at least 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.

Parameter		Unit	Test 1	Test 2
Bandwidth		MHz	10 MHz	10 MHz
Transmission 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
$I_{\scriptscriptstyle ot}^{(j)}$ for	RB 641	dB[mW/15kHz]	-93	-93
$I_{\mathit{ot}}^{(j)}$ for RB 4249		dB[mW/15kHz]	-93	-102
Î	or	dB[mW/15kHz]	-94	-94
Max number of HARQ transmissions			1	
			Clause B.2.4 with $\tau_{d}=0.45\mu\mathrm{s}$	
Propagati	on channel		$a = 1, f_D = 5 \text{ Hz}$	
Reportir	ig interval	ms	5	
Antenna c	onfiguration		1 x 2	
CQI	delay	ms		8
	ng mode		PUSC	CH 3-0
	and size	RB	6 (full size)	
	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) Reference measurement channel RC.3 FDD according to Table			
	A.4-1 with one	e/two sided dynamic 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 Minimu	m requirement (FDD)
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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.

Parameter		Unit	Test 1	Test 2
Ban	dwidth	MHz	10 MHz	10 MHz
Transmission 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
config	downlink guration		2	
	subframe guration		4	
$I_{\mathit{ot}}^{(j)}$ for	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
ĺ	(j) or	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 c	configuration		1 x 2 5	
Reportir	ng interval	ms		
CQI	delay	ms	10 0	
Report	ing mode		PUSC	H 3-0
	and size	RB	6 (full	size)
	K feedback ode		Multiplexing	
Note 1: If the UE reports in an available uplink reporting instance at				
 subframe SF#n based on CQI estimation at a downlink subframe not later than SF#(n-4), this reported subband or wideband CQI cannot be applied at the eNB downlink before SF#(n+4). Note 2: Reference measurement channel RC.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 MHz			
Transmission mode			1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB		()	
power	$ ho_{\scriptscriptstyle B}$	dB	dB 0			
allocation	ation σ dB 0					
SNR	(Note 3)	dB	9	10	14	15
	(j) or	dB[mW/15kHz]	-89	-88	-84	-83
λ	$V_{oc}^{(j)}$	dB[mW/15kHz]	-9	98	-9	98
			Clause	B.2.4 wit	h $\tau_d = 0$).45 <i>μ</i> s,
Propagation channel $a = 1, f_D = 5 \text{ Hz}$						
Reporting interval ms 5						
CQI delay ms 8						
	ng mode		PUSCH 2-0			
	er of HARQ				1	
	nissions					
	d size (<i>k</i>)	RBs		3 (full	size)	
	of preferred nds (<i>M</i>)			Ę	5	
		orts in an available u	plink rep	orting ins	tance 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)					
	A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 FDD as					
	described in Annex A.5.1.1/2.					
	least one of the two SNR(s) and the respective wanted signal input					
	level.					

 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 Test 1 Test 2						st 2
Bandwidth MHz 10 MH			MHz			
Transmi	ssion mode		1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$ ho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB		()	
Uplink downlink 2						
confi	l subframe guration		4			
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	-6	98
Propagation channel Clause B.2.4 with $\tau_d = 0.45 \mu \text{s}$, $a = 1, f_D = 5 \text{Hz}$						
Reporting interval ms 5						
CQI delay ms 10 or 11						
Repor	ting mode			PUSC	CH 2-0	
	ber of HARQ				1	
	missions				•	
	nd size (<i>k</i>)	RBs		3 (full	size)	
	of preferred ands (<i>M</i>)			Ę	5	
	CK feedback hode			Multip	lexing	
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 TDD according to Table A.4-1 with one/two sided dynamic OCNG Pattern OP.1/2 TDD as described in Annex A.5.2.1/2. Note 3: For each test, the minimum requirements shall be fulfilled for at least one of the two SNR(s) and the respective wanted signal input level.						

Table 9.3.4.1.2-1 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 Test 1 Test 2					st 2		
	dwidth	MHz	10 MHz				
Transmission mode			1 (port 0)				
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0				
power		dB		(
allocation	$ ho_{\scriptscriptstyle B}$						
	σ	dB)	4.4	
SNR (Note 3)		dB	8	9	13	14	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-90	-89	-85	-84	
$N_{oc}^{(j)}$		dB[mW/15kHz]		-98 -98			
Propagat	ion channel		Clause	Clause B.2.4 with $\tau_d = 0.45 \mu {\rm s},$			
1.0			$a = 1, f_D = 5 Hz$				
Reporting	g periodicity	ms			= 2		
	delay	ms		8	3		
	channel for eporting			PUSCH	(Note 4)		
	Report Type band CQI			2	1		
	Report Type						
	band CQI				1		
	per of HARQ				1		
transmissions							
Subband size (k)		RBs		6 (full	size)		
	of bandwidth rts (<i>J</i>)			3	3		
pu	<u>K</u>				1		
cqi-pmi-(ConfigIndex				1		
Note 1:		orts in an available u	plink rep	orting ins	tance at		
		≠n based on CQI es				rame	
	not later than	SF#(n-4), this report	ted subb	and or wi	deband (CQI	
		olied at the eNB dov					
Note 2:		easurement channe					
	A.4-1 with one	e/two sided dynamic	COCNG I	Pattern C	P.1/2 FD	D as	
		Annex A.5.1.1/2.					
Note 3:		the minimum requi					
		ne two SNR(s) and t	he respe	ctive war	ited signa	al input	
Nists 4	level.						
Note 4:		sions between CQI					
	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					лосп		
Note 5:		rame SF#5, #7, #1 and #3.					
10000.		or the short subband (having 2RBs in the last					
		Int) are to be disregarded and data scheduling the most recent subband CQI report for bandwidth part				dth nart	
	with $j=1$.			. opon n		an pur	
Note 6: In the case where wideband CQI is reported, data is to be							
		cording to the most recently used subband CQI				I	
	report.	-					

Table 9.3.4.2.1-1 Subband test for single antenna transmission (FDD)

Table 9.3.4.2.1-2 Minimum requirement (FDD)

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

9.3.4.2.2 TDD

For the parameters specified in Table 9.3.4.2.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.4.2.2-2 and by the following

a) the ratio of the throughput obtained when transmitting on subbands reported by the UE the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected subband in set *S* shall be $\geq \gamma$;

The requirements only apply for subbands of full size and the random scheduling across the subbands is done by selecting a new subband in each available downlink transmission instance for TDD. The transport block size TBS (wideband CQI median) is that resulting from the code rate which is closest to that indicated by the wideband CQI median and the N_{PRB} entry in Table 7.1.7.2.1-1 of TS 36.213 [6] that corresponds to the subband size.

Para	ameter	Unit	Te	st 1	Tes	st 2
	Bandwidth MHz 10 MHz					
	ssion mode		1 (port 0)			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	0			
power	$\rho_{\scriptscriptstyle B}$	dB	0			
allocation	σ	dB		()	
Uplink	downlink	-				
config	guration			4	2	
	subframe			4	1	
	guration	<u> </u>		-		
	(Note 3)	dB	8 9 13 1		14	
	$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-90	-89	-85	-84
Ι	$V_{oc}^{(j)}$	dB[mW/15kHz]	-6	98	-9	8
Propagat	ion channel		Clause	B.2.4 wit	th $ au_d = 0$.45 <i>μ</i> s,
Fiopagai	ion channel				$_{D} = 5 \text{ Hz}$	
	g periodicity	ms			= 5	
	l delay	ms		10 c	or 11	
	channel for eporting			PUSCH	(Note 4)	
PUCCH I	Report Type				1	
	band CQI				T	
	Report Type				1	
	band CQI per of HARQ		· · · · · · · · · · · · · · · · · · ·			
	missions		1			
	nd size (<i>k</i>)	RBs		6 (ful	size)	
	of bandwidth					
pa	rts (J) K				1	
cai-pmi-(ConfigIndex				3	
	CK feedback					
	node			-	lexing	
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						
1010 2.	A.4-1 with one	e/two sided dynamic				
Note 2:		Annex A.5.2.1/2.	romonto	chall ha f		r ot
Note 3:	least one of th	test, the minimum requirements shall be fulfilled for at of the two SNR(s) and the respective wanted signal input				
level. Note 4: To avoid collisions between CQI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#3 and #8 to allow periodic CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe SF#7 and #2.						
Note 5:	CQI reports for bandwidth paraccording to t with j=1.	for the short subband (having 2RBs in the last art) are to be disregarded and data scheduling the most recent subband CQI report for bandwidth part				dth part
Note 6:			is reported, data is to be recently used subband CQI			

	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)

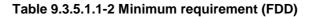
9.3.5.1.1 FDD

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%.

	ameter	Unit	Cell 1	Cell 2
Bandwidth		MHz		MHz
	ission mode			ort 0)
	ic 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
	l channel for reporting		PUSCH (Note 3)	N/A
PUCCH	Report Type		4	N/A
CC	qi-pmi- ırationIndex		1	N/A
Max num	ber of HARQ			N1/A
	missions		1	N/A
Note 2: Note 3: Note 4: Note 5: Note 5: Note 6: Note 7:	than SF#(n-4) eNB downlink Reference me A.4-1 for Cate FDD as descr Table A.4-1 for Pattern OP.1/ To avoid collis necessary to 1 DCI format 0 as to allow period in uplink subfr The respective cell relative to specified in cl. Two cells are 2 is the interfet the same. Inte Both cells are Static channe	considered in which ering cell. The num efering cell is fully l time-synchronous l is used for the inf	eband CQI canno el RC.1 FDD acco sided dynamic OC 1.1 and RC.4 FDI one/two sided dyr ed in Annex A.5.1. I reports and HAR SCH instead of PL d in downlink SF# x with the HARQ-/ and #3. spectral density of by its associated D ch Cell 1 is the ser ber of the CRS po oaded.	t be applied at the ording to Table CNG Pattern OP.1 D according to namic OCNG 1/2. Q-ACK it is JCCH. PDCCH 1, #3, #7 and #9 ACK on PUSCH each interfering IP value as oving cell and Cell orts in both cells is
Note 8:	SINR corresp	se model Cell 2 is onds to ${\widehat E_s}/{N_{oc}}$	•	ed in clause
Note 9:		sical channel setu defined in Annex /		OCNG pattern

 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
	rameter	Unit	Cell 1	Cell 2
-	ndwidth	MHz		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
			EPA5	Static (Note 7)
	ation channel			· · · · · · · · ·
	configuration		Low (1 x 2)	(1 x 2)
	(Note 4)	dB	N/A	-0.41
-	ference		Note 2	N/A
	ment channel rting mode		PUCCH 1-0	N/A
	ng periodicity	ms	$N_{\rm pd} = 5$	N/A
	QI delay	ms	10 or 11	N/A
	I channel for		PUSCH (Note	N/A
	reporting		3)	
	Report Type		4	N/A
Configu	qi-pmi- urationIndex		3	N/A
	ber of HARQ		1	N/A
ACK/NACK feedback			Multiplexing	N/A
Note 1:	node	orts in an available u		-
	subframe SF# than SF#(n-4) eNB downlink	n based on CQI es , this reported wide before SF#(n+4)	timation at a down band CQI cannot l	link SF not later be applied at the
Note 2:	A.4-1 for Cate TDD as descr Table A.4-1 for	easurement channe gory 2-8 with one s ibed in Annex A.5.2 or Category 1 with o 2 TDD as described	ided dynamic OCI 2.1 and RC.4 TDD ne/two sided dyna	NG Pattern OP.1 according to mic OCNG
Note 3:	necessary to DCI format 0 s	sions between CQI report both on PUSe shall be transmitted o multiplex with the 47 and #2	CH instead of PU0 in downlink SF#3	CCH. PDCCH and #8 to allow
Note 4:	The respective	e received power sp N_{ac} is defined by	•	•
Note 5: Note 6: Note 7:	specified in cla Two cells are 2 is the interfective same. Interfective Both cells are Static channe Gaussian nois	ause B.5.1. considered in which ering cell. The numb efering cell is fully lo time-synchronous. I is used for the inte se model Cell 2 is no	n Cell 1 is the serv er of the CRS por aded. Inference model. In ot present.	ing cell and Cell ts in both cells is a case for white
Note 8:	SINR correspo	onds to $ {\widehat E}_s ig/ N_{oc} {\widehat c} $	of Cell 1 as define	d in clause
Note 9:	8.1.1. Downlink phys	sical channel setup defined in Annex A	in Cell 2 applies C	

Table 9.3.5.1.2-1 Fading test for single antenna (TDD)

Tab	le 9).3.5. ⁻	1.2-2	Minimum	requirement	: (TDD)	ĺ
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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%.

			A 11 4	• "•
	rameter	Unit	Cell 1	Cell 2
	ndwidth ission mode	MHz		MHz 9
				-
	lic Prefix Cell ID		Normal	Normal 1
	R (Note 8)	dB	-2	N/A
	$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	N/A
	tion channel		EPA5	Static (Note 7)
	lation and configuration		Low (2 x 2)	(1 x 2)
Beamfo	rming Model		As specified in Section B.4.3 (Note 10, 11)	N/A
	(Note 4)	dB	N/A	-0.41
	cific reference ignals		Antenna ports 0,1	Antenna port 0
	rence signals		Antenna ports 15,16	N/A
	periodicity and ame offset		5/1	N/A
CSI-RS	S reference		2	N/A
	onfiguration		2	
conf Ic ZeroPc	iguration ^{CSI-RS / <i>owerCSI-RS</i> itmap}	Subframes / bitmap	N/A	1 / 001000000000 000
CodeBoo	kSubsetRestr n bitmap		001111	N/A
_	ference ment channel		Note 2	N/A
	rting mode		PUCCH 1-1	N/A
Reporting periodicity		ms	$N_{\rm pd} = 5$	N/A
	QI delay	ms	8	N/A
	al channel for		PUSCH (Note	N/A
	VII reporting		3)	IN/A
	Report Type CQI/PMI		2	N/A
PUCCH of	channel for RI porting		PUCCH Format 2	N/A
PUCCH	Report Type		3	N/A
	qi-pmi-			
	urationIndex		2	N/A
	onfigIndex		1	N/A
	ber of HARQ		1	N/A
	smissions			-
Note 1: Note 2:	subframe SF# than SF#(n-4) eNB downlink Reference me	rts in an available in based on CQI e , this reported wid before SF#(n+4) easurement channe sided dynamic O	stimation at a dow eband CQI canno el RC.11 FDD acc	Inlink SF not later t be applied at the cording to Table
Note 3: Note 4:	described in A To avoid collis necessary to DCI format 0 s periodic CQI/ uplink subfran The respective	Nnex A.5.1.1. sions between CQI report both on PUS shall be transmitte PMI to multiplex w ne SF#0 and #5. e received power s	// PMI reports and SCH instead of PL d in downlink SF# ith the HARQ-ACI	HARQ-ACK it is JCCH. PDCCH 1 and #6 to allow K on PUSCH in each interfering
Note 5:	specified in cl Two cells are	N_{oc} $$ is defined base B.5.1. considered in which ering cell. Intefering	ch Cell 1 is the ser	ving cell and Cell

Table 9.3.5.2.1-1 Fading test for single antenna (FDD)	(FDD)	Table 9.3.5.2.1-1 Fading test for single antenna	
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Note 6: Note 7:	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.
Note 8:	SINR corresponds to $ \widehat{E}_{s} \big/ {N_{oc}}^{ \prime}$ 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.
Note 10:	The precoder in clause B.4.3 follows UE recommended PMI.
	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).



γ	1.8
UE Category	≥2

9.3.5.2.2 TDD

For the parameters specified in Table 9.3.5.2.2-1, and using the downlink physical channels specified in Annex C, the minimum requirements are specified in 9.3.5.2.2-2 and by the following

- a) the ratio of the throughput obtained when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP and that obtained when transmitting the transport format indicated by each reported wideband CQI index subject to a white Gaussian noise source shall be $\geq \gamma$;
- b) when transmitting the transport format indicated by each reported wideband CQI index subject to an interference source with specified DIP, the average BLER for the indicated transport formats shall be greater than or equal to 2%.

Demonster	-	-	
Parameter Bandwidth	Unit MHz	Cell 1	Cell 2 MHz
Transmission mode			9
Uplink downlink			
configuration			2
Special subframe			4
configuration			_
Cyclic Prefix		Normal	Normal
Cell ID		-2	1 N/A
SINR (Note 8)	dB	-2	
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	-98
Propagation channel		EPA5	Static (Note 7)
Correlation and		Low (2 x 2)	(1 x 2)
antenna configuration			(1 × 2)
Beamforming Model		As specified in Section B.4.3	N/A
Deamonning Moder		(Note 11, 12)	IN/A
DIP (Note 4)	dB	N/A	-0.41
Cell-specific reference	-	Antenna ports	Antenna port 0
signals		0,1	
CSI reference signals		Antenna ports	N/A
CSI-RS periodicity and		15,16	
subframe offset		5/3	N/A
CSI-RS reference		2	N/A
signal configuration		2	IN/A
Zero-power CSI-RS			2.4
configuration	Subframes /	N/A	3/
I _{CSI-RS} / ZeroPowerCSI-RS	bitmap	IN/A	00100000000 0000
bitmap			0000
CodeBookSubsetRestr		001111	N/A
iction bitmap		001111	IN/A
Reference		Note 2	N/A
measurement channel			-
Reporting mode Reporting periodicity		PUCCH 1-1	N/A
CQI delay	ms	N _{pd} = 5 10	N/A N/A
Physical channel for	ms	PUSCH (Note	IN/A
CQI/PMI reporting		3)	N/A
PUCCH Report Type			N1/A
for CQI/PMI		2	N/A
Physical channel for RI		PUCCH	N/A
reporting		Format 2	11/7
PUCCH Report Type		3	N/A
for RI cqi-pmi-			
ConfigurationIndex		3	N/A
ri-ConfigIndex		805 (Note 9)	N/A
Max number of HARQ		1	N/A
transmissions		1	11/7
ACK/NACK feedback mode		Multiplexing	N/A
	ι orts in an available υ	plink reporting ins	tance at
	#n based on CQI es		
than SF#(n-4), this reported wide		
eNB downlinl	k before SF#(n+4)		
Note 2: Reference m	easurement channe		
	e sided dynamic OC	NG Pattern OP.1	TDD as
	Annex A.5.2.1.		
	sions between CQI/		
	report both on PUS shall be transmitted		
	PMI to multiplex wit		
	. Wi to multiplex wit		

Table 9.3.5.2.2-1 Fading test for single antenna (TDD)

Note 4:	uplink subframe SF#2 and #7. The respective received power spectral density of each interfering
	cell relative to $N_{\it oc}$ 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/N_{oc} ´ of Cell 1 as defined in clause
	8.1.1.
Note 9: Note 10:	RI reporting interval is set to the maximum allowable length of 160ms to minimise collisions between RI, CQI/PMI and HARQ-ACK reports. In the case when all three reports collide, it is expected that CQI/PMI reports will be dropped, while RI and HARQ-ACK will be multiplexed. At eNB, CQI report collection shall be skipped every 160ms during performance verification and the reported CQI in subframe SF#7 of the previous frame is applied in downlink subframes until a new CQI (after CQI/PMI dropping) is available. Downlink physical channel setup in Cell 2 applies OCNG pattern
	OP.1 TDD as defined in Annex A.5.2.1.
Note 11:	The precoder in clause B.4.3 follows UE recommended PMI.
Note 12:	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 9.3.5.2.2-2 Minimum requirement (TDD)

γ	1.8	
UE Category	≥2	

9.3.6 Minimum requirement (With multiple CSI processes)

The purpose of the test is to verify the reporting accuracy of the CQI and the UE processing capability for multiple CSI processes. Each CSI process is associated with a CSI-RS resource and a CSI-IM resource as shown in Table 9.3.6-1. For UE supports one CSI process, CSI processes 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.

	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

Table 9.3.6-1 Configuration of CSI processes	Table 9.3.6-	Configuration	of CSI	processes
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9.3.6.1 FDD

For the parameters specified in Table 9.3.6.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.3.6.1-2 and by the following

- a) a sub-band differential CQI offset level of 0 shall be reported at least α % of the time but less than β % for each sub-band for CSI process 1, 2, or 3;
- b) a CQI index not in the set {median CQI -1, median CQI, median CQI +1} shall be reported at least δ % of the time for CSI process 0;
- c) the difference of the median CQIs of the reported wideband CQI for configurated CSI processes shall be greater or equal to the values as in Table 9.3.6.1-3;

- d) the ratio of the throughput obtained when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS and that obtained when transmitting the TBS indicated by the reported wideband CQI median on a randomly selected sub-band in set *S* shall be $\geq \gamma$;
- e) when transmitting on a randomly selected sub-band among the sub-bands with the highest differential CQI offset level the corresponding TBS, the average BLER for the indicated transport formats shall be greater or equal to 0.02.

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each TTI for FDD, each available downlink transmission instance for TDD. Sub-bands of a size smaller than full size are excluded from the test.

Table 9.3.6.1-1	Fading te	est for FDD
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Parameter		11		Tes	st 1			Te	st 2	
Parameter		Unit	TP		TF	22	TP1 TF		22	
Bandwidth		MHz	10 MHz		10 MHz					
Transmission mode			10		1	0	10 10		0	
$ ho_{\scriptscriptstyle A}$		dB	0			0				
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0		-3 0					
allocation P _c		dB	-3 0))	
	σ	dB		-	3			-	3	
SNR (Note 7)	dB	10	11	7	8	14	15	9	10
\hat{I}_{a}	(j) Dr	dB[mW/15kHz]	-88	-87	-91	-90	-84	-85	-89	-88
N	(j) oc	dB[mW/15kHz]		-9	98		-98			
Propagatio	on channel		EPA 5 Low Clause B.2.4.1 with $\tau_d = 0.45 \mu \text{s},$ a = 1, $f_D = 5 \text{Hz}$		EPA 5 Low		$ au_d = 0$	B.2.4.1 ith 9.45 μs, = 1, = 5 Hz		
Antenna co	onfiguration		4x2 2x2		4x2 2x2		k 2			
Beamforming Model			As specified in Section B.4.3			As specified in Section B.4.3				
	between TPs	us	0			0				
Cell-specific re	et between TPs	Hz	0 Antenna ports 0,1					0 porte 0.1		
CSI-RS signal 0			Antenna ports 15,,18		N/A		Antenna Antenna ports 15,,18		í – – – –	/A
CSI-RS 0 periodicity and subframe offset $T_{CSI-RS} / \Delta_{CSI-RS}$			5/1		N/A		5		N	/A
	onfiguration		0		N	Ά	0		N	/A
CSI-RS	signal 1		N/#	Ą	Antenn 15		N	N/A Antenna po 15,16		
	and subframe offset $/ \Delta_{\rm CSI-RS}$		N//	Ą	5/	/1	N/A 5/		/1	
	onfiguration		N//	A		5	N	/A		5
Zero-power CSI-RS 0 configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap			N//		1 111000 00	000000		/A	111000	/ 000000 00
Zero-power CSI-RS 1 configuration I _{CSI-RS} / ZeroPowerCSI-RS bitmap			1 / 001001 ² 0000	10000	N	/A	00100	/ 110000 000	N	/A
CSI-IM 0 periodicity and subframe offset $T_{CSI-RS} / \Delta_{CSI-RS}$			5/1	l	5/	′1	5	/1	5,	
	onfiguration		2		2	2		2	2	2
T _{CSI-RS}	and subframe offset		5/1		N		5			/A
	onfiguration		6		N	Ά	(6	N,	/A
CSI-IM 2 periodicity and subframe offset $T_{CSI-RS} / \Delta_{CSI-RS}$			N/#		5/			/A		/1
CSI-IM 2 co	CSI-IM 2 configuration		N/A 1						1	
	CSI-RS CSI-IM				RS 0 IM 0				RS 0	
	Reporting mode						CSI-IM PUCCH			
	CodeBookSubsetR estriction bitmap		PUCCH 1-1 0x0000 0000 0000 0001		001	0x0000 0000 0000 0			001	
	Reporting	ms	N _{pd} = 5		N _{pd} = 5		= 5			
CSI process 0	periodicity CQI delay	ms	1	11		11				
	Physical channel for CQI/ PMI reporting		I	PUSCH (Note 6) PUSCH (
	PUCCH Report Type for CQI/PMI				2		2			
PUCCH channel			F	UCCH	Format 2			PUCCH	Format 2	

	for RI reporting					
	PUCCH report			_		
	type for RI		3	3	3	3
	cqi-pmi-		4		4	1
	ConfigurationIndex					
	ri-ConfigIndex			2	2	
	CSI-RS		CSI-		CSI-	
	CSI-IM				CSI-	
	Reporting mode		PUSC	CH 3-1	PUSC	H 3-1
CSI process 1	CodeBookSubsetR estriction bitmap		000	001	000	001
	Reporting interval	ms	Ę	5	5	5
	(Note 10) CQI delay	ms	1	1	1	1
	Sub-band size	RB	6 (full		6 (full	
	CSI-RS			RS 0	CSI-I	
	CSI-IM		CSI-		CSI-	
	Reporting mode		PUSC		PUSC	
CSI process 2	CodeBookSubsetR		0.0000.000	0 0000 0001		
(For UE configured	estriction bitmap		0x0000 000	0 0000 0001	0x0000 0000	0000 0001
single process)					5	
	CQI delay	ms	8	3	8	3
	Sub-band size	RB	6 (full size) (Note 9)		6 (full size) (Note 9)
	CSI-RS		CSI-RS 0		CSI-I	RS 0
	CSI-IM		CSI-		CSI-	
CSI process 2	Reporting mode		PUSCH 3-1		PUSCH 3-1	
(For UE configured	CodeBookSubsetR		0x0000 000	0 0000 0001	0x0000 0000 0000 0001	
multiple	estriction bitmap		0,0000,000	0 0000 0001		
processes)	Reporting interval (Note 10)	ms	Ę	5	5	
	CQI delay	ms	1	1	11	
	Sub-band size	RB	6 (full size		6 (full size	
	CSI-RS		CSI-		CSI-RS 1	
	CSI-IM			-IM 2	CSI-	
	Reporting mode		PUSC	CH 3-1	PUSC	H 3-1
CodeBookSubsetR 000001 000001					001	
CSI process 3	estriction bitmap					
	Reporting interval (Note 10	ms	Ę	5	5	5
	CQI delay	ms	1	1	1	1
	Sub-band size	RB	6 (full		6 (full	
CSI process for F	DSCH scheduling	T(D)		ocess 2	CSI pro	1
	II ID		0	6	0	6
	ated CSI-RS		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1
	ocated CRS		Same Cell ID	Same Cell ID	Same Cell ID	Same Cell ID
Quasi-00-10			as Cell 1	as Cell 2	as Cell 1	as Cell 2
PMI for subframe	2, 3, 4, 7, 8 and 9		0x0000 0000 0000 0001	100000	0x0000 0000 0000 0001	100000
PMI for subf	rame 1 and 6		0x0000 0000 0001 0000	100000	0x0000 0000 0001 0000	100000
Max number of HA	ARQ transmissions		1	N/A	1	N/A
Note 1: If the UE	reports in an available					
	SF#(n-4), this reported	d wideband CQI canr	not be applied at th	ne eNB downlink b	pefore SF#(n+4).	
	s allocated to PDCCH.					
	e measurement chann	el RC.12 FDD accord	ling to Table A.4-1	. PDSCH transmi	ssion is scheduled	d on subframe
	8 and 9 from TP1.	officiation A E 1 Q is tra-	nomitted on subfra	mo 1 and 6 from	TD1	
	NG OP.8 FDD as spective NG OP.8 FDD as spective spectrum of the spectrum of t					2
	collisions between CQ					
PDCCH [OCI format 0 shall be tr	ansmitted in downlinl				
Note 7: For each	PUSCH in uplink SF#2 test, the minimum requ		filled for at least or	ne of the two SNF	R(s) and the respe	ctive wanted
signal inp Note 8: PDCCH [ut level. DCI format 0 with a trig	ger for aperiodic CQI	shall be transmitte	ed in downlink SF	#1 and #6 to allow	<i>v</i> aperiodic
CQI/PMI/	RI to be transmitted in	uplink SF#0 and #5.				-
Note 9: For these	sub-bands which are	not selected for PDS	CH transmission,	TM10 OCNG shou	uld be transmitted.	

Note 10: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#2 and #7 to allow aperiodic CQI/PMI/RI to be transmitted in uplink SF#1 and #6.

	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)
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	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.

Paramotor		110:4		Te	st 1		Test 2			
Parameter		Unit	TP1 TP2		2	TP1 TP2				
Bandwidth		MHz			MHz		10 MHz			
Transmission mode			1		10 2		10			0
Uplink downlink configuration Special subframe configuration			2			<u>2</u> 1	2 4			2 4
		dB		-	0	ł	0		+	
	$ ho_{\scriptscriptstyle A}$				-				-	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB		0					0	
allocation	P _c	dB	-:)	-	3		0
01/5	σ	dB	10		3				3	1.0
	(Note 7)	dB	10	11	7	8	14	15	9	10
1	(j) or	dB[mW/15kHz]	-88	-87	-91	-90	-84	-85	-89	-88
Λ	$I_{oc}^{(j)}$	dB[mW/15kHz]		-6	98			-9	98	
					Clause	B.2.4.1			Clause	B.2.4.1
					w					ith
Propagati	on channel		EPA 5	5 Low	$\tau_d = 0$.45 μs,	EPA	5 Low	$\tau_d = 0$).45 <i>μ</i> s,
					a =	: 1,				= 1,
					$f_D = 5 \text{ Hz}$				$f_D =$	= 5 Hz
	onfiguration		4>		2)			x2		x2
	ning Model		As sp		n Section	B.4.3	As sp		n Section	B.4.3
	t between TPs	us			0		0			
	set between TPs eference signals	Hz	0 Antenna ports 0,1		0 Antenna ports 0,1					
•	Ť		Antenn				Antenna ports		()	
CSI-RS signal 0			15,, 18		N	/A	15,, 18		N	/A
CSI-RS 0 periodicity and subframe offset			5/	3	N/A		5/3		N	/A
Tcsi-Rs / ∆csi-Rs CSI-RS 0 configuration				0		/A	0		N	/A
						a ports		-		na ports
CSI-RS signal 1			N/A			16	N	/A		, 16
CSI-RS 1 periodicity and subframe offset $T_{CSI-RS} / \Delta_{CSI-RS}$			N/A		5,	/3	N	/A	5	/3
	configuration		N/A		Ę	5	N	/A		5
	RS 0 configuration					/				37
	verCSI-RS bitmap		N		111000 000			/A		000000 000
	RS 1 configuration verCSI-RS bitmap		3 00100 ² 000	10000	N	/A	00100	; / 110000 000	N	/A
	and subframe offset		5/	3	5,	/3	5	/3	5	/3
	/ Acsi-RS		2	2		2		2		2
CSI-IM 1 periodicity	/ and subframe offset / Δcsi-Rs		5/	3	N	/A	5	/3	N	/A
	onfiguration		6	6	N	/A	(6	N	/A
CSI-IM 2 periodicity	and subframe offset		N	/Δ		/3	N	/A		/3
	/ Acsi-rs									
CSI-IM 2 c	configuration		N/			1	N	/A		1
	CSI-RS CSI-IM				RS 0 -IM 0				<u>RS 0</u> -IM 0	
	Reporting mode		1		CH 1-1				CH 1-1	
	CodeBookSubsetR estriction bitmap		0x0		0 0000 0	001	0x0000 0000 0000 0001		001	
CSI process 0	Reporting periodicity	ms	N _{pd} = 5			N _{pd} = 5				
	CQI delay	ms		1	2			1	2	
	Physical channel for CQI/ PMI reporting		PUSCH (Note 6)			PUSCH (Note 6)				
	PUCCH Report		2			2				

Table 9.3.6.2-1 Fading test for TDD

		Type for CQI/PMI					
		PUCCH channel		PUCCH	Format 2	PUCCH	Format 2
		for RI reporting PUCCH report		3			3
		type for RI cqi-pmi-					
		ConfigurationIndex		3 805 (Note 10)			3
		<i>ri-ConfigIndex</i> CSI-RS			RS 1	805 (N CSI-	
		CSI-RS CSI-IM			-IM 0		IM 0
		Reporting mode			CH 3-1	PUSC	
		CodeBookSubsetR		FU30	JU 2-1	F030	JU 2-1
CSI pro	ocess 1	estriction bitmap		000001		000	001
		Reporting interval (Note 9)	ms	:	5	ŧ	5
		CQI delay	ms		2	1	2
		Sub-band size	RB	6 (ful	l size)	6 (ful	size)
		CSI-RS		CSI-	RS 0	CSI-	RS 0
		CSI-IM		CSI	-IM 1	CSI-	·IM 1
		Reporting mode		PUSC	CH 3-1	PUSC	CH 3-1
CSI pro	cess 2	CodeBookSubsetR estriction bitmap		0x0000 000	0 0000 0001	0x0000 000	0 0000 0001
001 p10		Reporting interval (Note 9)	ms		5	ę	5
		CQI delay	mc	1	2	1	2
		Sub-band size	ms RB	-	e) (Note 8)	6 (full size	=
		CSI-RS			RS 1		
	•	CSI-IM			-IM 2	CSI-RS 1 CSI-IM 2	
		Reporting mode			CH 3-1	PUSCH 3-1	
		CodeBookSubsetR					
CSI pro	icess 3	estriction bitmap		000001		000001	
Report		Reporting interval	ms	5		5	
		(Note 9)		1	0	1	2
		CQI delay Sub-band size	ms RB	12 6 (full size)		6 (ful	
CSLore	peope for D	DSCH scheduling	ΚD		ocess 2		DCess 2
Corpic	Cel			0	6	0	6
0		ated CSI-RS		CSI-RS 0	CSI-RS 1	CSI-RS 0	CSI-RS 1
		cated CRS		Same Cell ID	Same Cell ID	Same Cell ID	Same Cell ID
				as Cell 1 0x0000 0000	as Cell 2	as Cell 1 0x0000 0000	as Cell 2
PI	MI for subf	rame 4and 9		0000 0001	100000	0000 0001	100000
PI	MI for subfr	ame 3 and 8		0x0000 0000 0001 0000	100000	0x0000 0000 0001 0000	100000
		RQ transmissions		1	N/A	1	N/A
		edback mode		Multiplexing	N/A	Multiplexing	N/A
Note 1: Note 2:	later than 3 symbols	reports in an available SF#(n-4), this reported allocated to PDCCH.	d wideband CQI canr	not be applied at th	ne eNB downlink b	pefore SF#(n+4).	
Note 3:	and 9 from						a on subiralle 4
Note 4: Note 5:	TM10 OC	NG OP.8 TDD is trans NG OP.8 TDD is trans	mitted as specified in	A.5.2.8 on subfra	ame 3, 4, 8 and 9	from TP2.	
Note 6:							
Note 7:	ACK on PUSCH in uplink SF#7 and #2.						
	signal input level.						
Note 8:	CQI/PMI/RI to be transmitted in uplink SF#7 and #2.						
Note 9:	ote 9: For these sub-bands which are not selected for PDSCH transmission, TM10 OCNG should be transmitted.						
Note 10:							
	verification	n and the reported CQ /PMI dropping) is avai	I in subframe SF#7 o				
	(after CQI	/PMI dropping) is avai	lable.				

	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

$$\gamma = \frac{t_{ue}}{t_{rnd}} \, .$$

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	
Bandwidth		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	
Λ	$V_{oc}^{(j)}$	dB[mW/15kHz]	-98	
Report	ing mode		PUSCH 3-1	
	ng interval	ms	1	
PMI del	ay (Note 2)	ms	8	
	ent channel		R. 10 FDD	
	Pattern		OP.1 FDD	
	er of HARQ		4	
	ncy version sequence		{0,1,2,3}	
Note 1: For random precoder selection, the precoder shall be updated in each TTI (1 ms granularity).				
Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n- 4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4).				

Table 9.4.1.1.1-1 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	
Transmis	sion mode		6	
	downlink		1	
config	guration		1	
	subframe		4	
	guration			
	ion channel		EVA5	
	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	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	
Report	ing mode		PUSCH 3-1	
Reportir	ng interval	ms	1	
PMI dela	ay (Note 2)	ms	10 or 11	
	nent channel		R.10 TDD	
OCNG	Pattern		OP.1 TDD	
	er of HARQ		4	
	nissions		'	
	ncy version		{0,1,2,3}	
	sequence		(0, ., _, 0)	
	K feedback		Multiplexing	
	ode For rondom n	reader coloction th	o procedor	
		recoder selection, the tection is the technologies the technologies and technolo		
transmission instance.				
Note 2: If the UE reports in an available uplink reporting				
		brame SF#n based		
	estimation at	a downlink SF not la	ater than SF#(n-	
	4), this report	ed PMI cannot be a	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.

Daran	notor	Unit	Test 1		
Parameter Bandwidth					
		MHz	10 6		
Transmiss			EVA5		
Propagatio Correlat			EVAS		
antenna co			Low 4 x 2		
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-6		
power	$ ho_{\scriptscriptstyle B}$	dB	-6		
allocation	σ	dB	3		
N_{a}^{\prime}	(j)	dB[mW/15kHz]	-98		
PMI c	delay	ms	8 or 9		
Reportin			PUCCH 2-1 (Note 6)		
Reporting		ms	$N_{\rm pd} = 2$		
Physical cl CQI rep			PUSCH (Note 3)		
PUCCH Re for wideban	eport Type		2		
PUCCH Re for subba	eport Type		1		
Measureme			R.14-1 FDD		
OCNG I			OP.1/2 FDD		
Precoding		PRB	6 (full size)		
Number of			х <i>г</i>		
parts (<i>J</i>)			3		
K	C		1		
cqi-pmi-Co			1		
Max numbe			4		
transmi					
Redundan	•		{0,1,2,3}		
coding se					
		recoder selection, th (2 ms granularity).	ne precoder shall be updated		
Note 2: If	the UE repo	rts in an available u	plink reporting instance at		
			mation at a downlink SF not later		
			cannot be applied at the eNB		
		re SF#(n+4).			
			Q-ACK and wideband CQI/PMI or		
			eport both on PUSCH instead of		
			nall be transmitted in downlink		
			odic 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 bandwide					
part) are to be disregarded and instead data is to be transmitted					
	the most recently used subband for bandwidth part with $j=1$.				
	transmitted on the most recently used subband.				
Note 6: The bit field for PMI confirmation in DCI format 1B shall be mappe					
to "0" and TPMI information shall indicate the codebook index use					
	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.

Paramet						
Parameter		Unit	Test 1			
Bandwidth		MHz	10			
Transmission mode			6			
Uplink downlink configuration			1			
Special sub			4			
configurat			4			
Propagation of			EVA5			
Correlation antenna config			Low 4 x 2			
Downlink	ρ_{A}	dB	-6			
power	$ ho_{\scriptscriptstyle B}$	dB	-6			
allocation	σ	dB	3			
$N_{oc}^{(j)}$	-	dB[mW/15kHz]	-98			
PMI dela	av	ms	10			
Reporting r		ino	PUCCH 2-1 (Note 6)			
Reporting per		ms	$N_{\rm P} = 5$			
Physical char	nnel for		PUSCH (Note 3)			
CQI repor						
PUCCH Repo for wideband (2			
PUCCH Repo			1			
for subband Measurement			R.14-1 TDD			
OCNG Pat			OP.1/2 TDD			
Precoding gra		PRB	6 (full size)			
Number of ba			, <i>i</i>			
parts (J			3			
K	/		1			
cqi-pmi-ConfigIndex			4			
Max number o			4			
transmissi Redundancy						
coding sequ			{0,1,2,3}			
ACK/NACK fe	edback		Multiplexing			
mode						
			ne precoder shall be updated in			
		e downlink transmis				
	- <u>-</u>		plink reporting instance at imation at a downlink SF not later			
			cannot be applied at the eNB			
		re SF#(n+4).	carrier be applied at the end			
			Q-ACK and wideband CQI/PMI or			
			port both on PUSCH instead of			
		CH DCI format 0 shall be transmitted in downlink				
SF#4 and #9 to allow periodic CQI to multiplex with the HARQ-AC						
on PUSCH in uplink subframe SF#8 and #3.						
Note 4: Reports for the short subband (having 2RBs in the last bandwidth						
part) are to be disregarded and instead data is to be transmitted o						
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						
		the most recently u				
			in DCI format 1B shall be mapped			
			indicate the codebook index used			
			[4] according to the latest PMI			
	ort on PUC					

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.

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode			9	
	on channel		EPA5	
Precoding	granularity	PRB	50	
	tion and		Low	
antenna co	onfiguration		ULA 4 x 2	
	c reference		Antenna ports	
sigr	nals		0,1	
	nce signals		Antenna ports 15,,18	
	ning model		Annex B.4.3	
CSI-RS per	iodicity and		_ / .	
	ne offset		5/ 1	
I CSI-RS	Δ _{CSI-RS}			
	eference		6	
Signal cor	nfiguration SubsetRestr		0.0000 0000	
	bitmap		0x0000 0000 0000 FFFF	
	ыпар			
	$ ho_{\scriptscriptstyle A}$	dB	0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	0	
allocation	Pc	dB	-3	
	σ	dB	-3	
N	(j) oc	dB[mW/15kHz]	-98	
Reportir	ng mode		PUSCH 3-1	
Reportin	g interval	ms	5	
PMI dela	y (Note 2)	ms	8	
Measurement channel			R.44 FDD	
OCNG	Pattern		OP.1 FDD	
Max numbe	er of HARQ		4	
transm			4	
Redundancy version			{0,1,2,3}	
coding sequence			• • • •	
Note 1: F	or random p	recoder selection, th	ne precoder	
S	shall be updated in each TTI (1 ms granularity).			
		orts in an available uplink reporting		
		brame SF#n based		
		a downlink SF not la		
		ed PMI cannot be ap	oplied at the	
	eNB downlink before SF#(n+4).			
	PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per			
	subcarrier at the receiver.			
Subcamer 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.

Doron	notor	Unit	Test 1
Parameter Bandwidth		MHz	10
Transmission mode		1011 12	9
Uplink downlink			3
configuration			1
Special s			
configu			4
Propagatio			EVA5
Precoding		PRB	50
Antenna co			8 x 2
Correlation			High, Cross polarized
Cell-specific	c reference		Antenna ports
sign			0,1
CSI referer	nce signals		Antenna ports 15,,22
Beamform	ing model		Annex B.4.3
CSI-RS per	iodicity and		
subfram	e offset		5/4
T _{CSI-RS} /	Δ csi-rs		
CSI-RS r			0
signal con	figuration		
			0x0000 0000
CodeBookS			001F FFE0
iction b	oitmap		0000 0000
			FFFF
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink	$ ho_{\scriptscriptstyle B}$	dB	0
power allocation	Pc	dB	-6
anooation	6	dB	-3
	σ (i)		-0
N_{a}	(<i>J</i>) DC	dB[mW/15kHz]	-98
Reportin	a mode		PUSCH 3-1
Reporting		ms	5
PMI delay		ms	10
	\$ F		R.45-1 TDD
			for UE
Measureme	nt channel		Category 1,
Measurenne			R.45 TDD for
			UE Category
			≥2
			OP.7 TDD for
	- <i></i>		UE Category
OCNG	Pattern		1, and OP.1
			TDD for UE
Max number			Category ≥2
Max number of HARQ			4
transmissions Redundancy version			
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback			
ACK/NACK			Multiplexing
mo			
Mote 1: F	or random p	recoder selection, th	ne precoder
Mote 1: F	or random p hall be upda	ted in each TTI (1 m	ne precoder as granularity).
Mote 1: F S Note 2: If	or random p hall be upda the UE repo	ted in each TTI (1 m orts in an available u	ne precoder is granularity). plink reporting
Note 1: F s Note 2: If	or random p hall be upda the UE repo stance at su	ted in each TTI (1 m orts in an available u ıbrame SF#n based	ne precoder ls granularity). plink reporting on PMI
Note 1: F S Note 2: If ir e	or random p hall be upda the UE reponstance at su stimation at	ted in each TTI (1 m orts in an available u ıbrame SF#n based a downlink SF not la	ne precoder is granularity). plink reporting on PMI ater than SF#(n-
Note 1: F s Note 2: If ir e 4	or random p hall be upda the UE repo istance at su stimation at), this report	ted in each TTI (1 m orts in an available u Ibrame SF#n based a downlink SF not la ed PMI cannot be ap	ne precoder is granularity). plink reporting on PMI ater than SF#(n-
Note 1: F s Note 2: If ir e 4	or random p hall be upda the UE repo nstance at su stimation at), this report NB downlink	ted in each TTI (1 m orts in an available u Ibrame SF#n based a downlink SF not la ed PMI cannot be ap t before SF#(n+4).	ne precoder is granularity). plink reporting on PMI ater than SF#(n- oplied at the
Note 1: F s Note 2: If e 4 Note 3: P	or random p hall be upda the UE repo nstance at su stimation at), this report NB downlink DCCH DCI 1	ted in each TTI (1 m orts in an available u Ibrame SF#n based a downlink SF not la ed PMI cannot be ap t before SF#(n+4). format 0 with a triggo	he precoder is granularity). plink reporting on PMI ater than SF#(n- oplied at the er for aperiodic
Note 1: F S Note 2: If e 4 Note 3: P	or random p hall be upda the UE repo istance at su stimation at), this report NB downlink DCCH DCI f QI shall be t	ted in each TTI (1 m orts in an available u Ibrame SF#n based a downlink SF not la ed PMI cannot be ap t before SF#(n+4). format 0 with a triggo ransmitted in downli	he precoder is granularity). plink reporting on PMI ater than SF#(n- oplied at the er for aperiodic ink SF#4 and #9
Note 1: F S Note 2: If e 4 Note 3: P	or random p hall be upda the UE repo istance at su stimation at), this report NB downlink DCCH DCI f QI shall be t	ted in each TTI (1 m orts in an available u Ibrame SF#n based a downlink SF not la ed PMI cannot be ap t before SF#(n+4). format 0 with a triggo ransmitted in downli odic CQI/PMI/RI to b	he precoder is granularity). plink reporting on PMI ater than SF#(n- oplied at the er for aperiodic ink SF#4 and #9

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

Note 4:	Randomization of the principle beam direction
	shall be used as specified in B.2.3A.4

Table 9.4.1.3.2-2 Minimum requirement (TDD)

Parameter	Test 1
γ	3
UE Category	≥1

- 9.4.1a 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.

			-
Parameter		Unit	Test 1
Bandwidth		MHz	10
Transmission mode			6
Propagati	on channel		EPA5
Precoding granularity (only for reporting and following PMI)		PRB	6
	tion and		Low 2 x 2
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3
power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3
allocation	σ	dB	0
N	r(j) oc	dB[mW/15kHz]	-98
	ng mode		PUSCH 1-2
	g interval	ms	1
PMI	delay	ms	8
Measurement channel			R.11-3 FDD for UE Category 1, R.11 FDD for UE Category ≥2
OCNG Pattern			OP.1/2 FDD
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
Note 2:	shall be updated in each TTI (1 ms granularity). 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). One/two sided dynamic OCNG Pattern OP.1/2		
FDD as described in Annex A.5.1.1/2 shall be used.			.1/2 Shall de

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.

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmission mode			6	
Uplink downlink configuration			1	
Special s	ubframe		4	
configu				
Propagatio			EPA5	
Precoding				
(only for rep		PRB	6	
followin	g PMI)			
Correlat	ion and		Low 2 x 2	
antenna co	nfiguration			
Downlink	$ ho_{\scriptscriptstyle A}$	dB	-3	
power	$ ho_{\scriptscriptstyle B}$	dB	-3	
allocation	σ	dB	0	
N_{a}^{0}	(j)	dB[mW/15kHz]	-98	
Reportin	g mode		PUSCH 1-2	
Reporting	interval	ms	1	
PMI c		ms	10 or 11	
	3		R.11-3 TDD	
			for UE	
			Category 1	
Measureme	ent channel		R.11 TDD for	
			UE Category	
			≥2	
OCNG I	Pattern		OP.1/2 TDD	
Max numbe				
transmi	ssions		4	
Redundan			(0 1 2 2)	
coding se			{0,1,2,3}	
ACK/NACK			Multiplexing	
mode				
		recoder selection, th		
S	hall be updat	ted in each available	e downlink	
	transmission instance.			
Note 2: If	If the UE reports in an available uplink reporting			
		brame SF#n based on PMI		
		a downlink SF not la		
		ed PMI cannot be a	oplied at the	
		before SF#(n+4).		
	One/two sided dynamic OCNG Pattern OP.1/2			
		ibed in Annex A.5.2	.1/2 shall be	
used.				

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

Parameter	Test 1
γ	1.2
UE Category	≥1

9.4.2.2 Minimum requirement PUSCH 2-2 (Cell-Specific Reference Symbols)

9.4.2.2.1 FDD

For the parameters specified in Table 9.4.2.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.4.2.2.1-2.

Parameter		Unit	Test 1	
Bandwidth		MHz	10	
Transmi	ssion 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	$N_{oc}^{(j)}$ c		-98	
PMI delay		ms	8	
Reporting mode			PUSCH 2-2	
Reporting interval		ms	1	
Measurement channel			R.14-2 FDD	
OCNG Pattern			OP.1/2 FDD	
Subband size (k)		RBs	3 (full size)	
Number of preferred subbands (<i>M</i>)			5	
Max number of HARQ transmissions			4	
Redundancy version coding sequence		{0,1,2,3}		
Note 1:	For random p	n precoder selection, the precoder shall be updated in 1 ms granularity)		
Note 2:				
	downlink before SF#(n+4)			

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

Table 9.4.2.2.1-2	Minimum rec	quirement ((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.

Parameter		Unit	Test 1
Band	lwidth	MHz	10
Transmiss	sion mode		6
	downlink uration		1
	subframe		
	uration		4
Propagatio	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
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98
PMI	delay	ms	10
Reportir	ng mode		PUSCH 2-2
Reporting interval		ms	1
Measurement channel			R.14-2 TDD
OCNG	Pattern		OP.1/2 TDD
	d size (<i>k</i>)	RBs	3 (full size)
Number of preferred subbands (M)			5
Max number of HARQ transmissions			4
Redundancy version coding sequence			{0,1,2,3}
ACK/NACK feedback mode			Multiplexing
Note 1: F Note 2: I	Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance.		
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)

	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
Bandwidth		MHz	10
Transmission mode Propagation channel			9
			EVA5
	granularity		0
	porting and	PRB	6
	ng PMI) tion and		Low
	onfiguration		Low ULA 4 x 2
	ic reference		
	nals		Antenna ports
sig	11015		0,1 Antenna ports
CSI refere	nce signals		15,,18
Beamform	ning model		Annex B.4.3
	riodicity and		
	ne offset		5/ 1
T _{CSI-RS}	/ Δ csi-rs		
	reference		0
signal co	nfiguration		8
CodeBook	SubsetRestr		0x0000 0000
iction	bitmap		0000 FFFF
	$\rho_{\scriptscriptstyle A}$	dB	0
Downlink	$ ho_{\scriptscriptstyle B}$	dB	0
power allocation	Pc	dB	-3
anocation	-		-
	σ	dB	-3
	r(j) oc	dB[mW/15kHz]	-98
	ng mode		PUSCH 1-2
	g interval	ms	5
PMI	delay	ms	8
Measurem	ent channel		R.45-1 FDD for UE Category 1, R.45 FDD for UE Category ≥2
OCNG Pattern			OP.7 FDD for UE Category 1 OP.1 FDD for UE Category ≥2
	er of HARQ		4
transmissions Redundancy version			
coding sequence			{0,1,2,3}
		recoder selection, th	ne precoders
Note 2: I	shall be updated in each TTI (1 ms granularity). 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-		
Note 3: Note 4: F	 4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4). Void. PDSCH _RA= 0 dB, PDSCH_RB= 0 dB in order to have the same PDSCH and OCNG power per subcarrier at the receiver. 		

Table 9.4.2.3.1-1 PMI test for single-layer (FDD)

Parameter	Test 1
γ	1.3
UE Category	≥1

Table 9.4.2.3.1-2 Minimum requirement (FDD)

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.

Derer		Unit	Test 1
Paran Bandy		MHz	10
Transmiss		1011 12	9
Uplink d			
configu			1
Special s			
configu			4
Propagatio			EVA5
Precoding			
(only for rep		PRB	6
followin			
Antenna co	onfiguration		8 x 2
Correlation	modeling		High, Cross
Cell-specific	-		polarized Antenna ports
sign			0,1
			Antenna ports
CSI referer	ice signals		15,,22
Beamform			Annex B.4.3
CSI-RS per			
subfram			5/ 4
T _{CSI-RS} /			
CSI-RS r			4
signal con	figuration		•
CodeBookS	wheetDeatr		0x0000 0000
			001F FFE0
iction b	ытар		0000 0000 FFFF
	0	dB	0
Downlink	ρ_A	dB	0
power	$ ho_{\scriptscriptstyle B}$	-	-
allocation	Pc	db	-6
	σ	dB	-3
N_{a}	(j) oc	dB[mW/15kHz]	-98
Reportin	a mode		PUSCH 1-2
Reporting		ms	5 (Note 4)
PMI		ms	10
	<u> </u>		R.45-1 TDD
			for UE
Measureme	nt channel		Category 1,
Measurenne			R.45 TDD for
			UE Category
			≥2
			OP.7 TDD for
	D //		UE Category 1
OCNG	Pattern		OP.1 TDD for
			UE Category ≥2
Max numbe			-2
transmissions			4
Redundancy version			
coding se			{0,1,2,3}
ACK/NACK feedback			Multiplexing
niode			
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			
			upileu at the
	eNB downlink before SF#(n+4). Note 3: Void.		
		ormat 0 with a trico.	er for aperiodic
Note 4: PDCCH DCI format 0 with a trigger for aperiodic			

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

	CQI shall be transmitted in downlink SF#4 and #9
	to allow aperiodic CQI/PMI/RI to be transmitted
	on uplink SF#3 and #8.
Note 5:	Randomization of the principle beam direction
	shall be used as specified in B.2.3A.4.

Table 9.4.2.3.2-2 Minimum requirement (TDD)

Parameter	Test 1
γ	3.5
UE Category	≥1

- 9.4.3 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 transmissio	on mode			4		
	$ ho_{\scriptscriptstyle A}$	dB	-3			
Downlink power allocation	$\rho_{\scriptscriptstyle B}$	dB		-3		
allocation	σ	dB		0		
Propagation condit antenna configu				2 x 2 EPA5		
CodeBookSubsetRe				11 for fixed RI = 1		
bitmap	551101011			00 for fixed $RI = 2$		
				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 0	and follow RI 20	and follow RI 20	
				-	-	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98	
$\hat{I}_{or}^{(j)}$ dB[mW/15kHz] -98			-78	-78		
	Maximum number of HARQ 1					
transmissions Reporting mode			PUCCH 1-1 (Note 4)			
Physical channel for	Physical channel for CQI/PMI		PUCCH Format 2			
reporting						
PUCCH Report Type for CQI/PMI			2			
Physical channel	for RI		PUSCH (Note 3)			
reporting PUCCH Report Typ	o for Pl			3		
Reporting period		ms		$N_{\rm pd}=5$		
PMI and CQI de		ms		8		
cqi-pmi-Configurati		1115		6		
ri-Configuration				1 (Note 5)		
		l /ailable.uplink.repor	ting instance at subfra		on PMI and	
			ot later than SF#(n-4),			
			NB downlink before S			
			according to Table A		ed dynamic	
		FDD as described ir				
			d HARQ-ACK it is neo	cessary to report	both on	
			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.						
			DCI format 2 shall be r			
			recoding information b			
			recoding information b			
			recoding information b			
			hen applying CQI and			
			ne subframe delay in a	addition to Note 1	to align with	
CQI and P	MI reports.					

Table 9.5.1.1-1 RI Test (FDD)

Table 9.5.1.1-2 Minimum	requirement ((FDD)
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	Test 1	Test 2	Test 3
γı	N/A	1.05	0.9
<i>j</i> 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

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.1.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.1.2-2.

Paramete	r	Unit	Test 1	Test 2	Test 3	
Bandwidth MHz 10						
PDSCH transmiss	mission mode 4					
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	-3			
allocation	$ ho_{\scriptscriptstyle B}$	dB	-3			
	σ	dB		0		
Uplink downlink cor	nfiguration			2		
Special subfra configuratio	n		4			
Propagation cond antenna configu			2 x 2 EPA5			
CodeBookSubsetR	estriction		000011 for fixed RI = 1 010000 for fixed RI = 2			
bitmap	bitmap		010011 for UE reported RI			
Antenna correlation			Low	Low	High	
D L configuration			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]	z] -98 -98 -98		-98	
$\hat{I}_{or}^{(j)}$	$\hat{I}_{or}^{(j)}$ dB[mW/15kHz] -98 -78		-78			
Maximum number				1	•	
transmissions						
Reporting mode			PUSCH 3-1 (Note 3)			
Reporting interval		ms	5			
PMI and CQI delay		ms	10 or 11			
	ACK/NACK feedback mode		Bundling hk reporting instance at subframe SF#n based on PMI and			
			porting instance at sut ot later than SF#(n-4),			
			NB downlink before S			
					sided dynamic	
	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.					
			ed and sub-band CQI	is discarded.		

Table 9.5.1.2-1 RI Test (TDD)

Table 9.5.1.2-2 Minimum requirement (TDD)	
---------------------------------------	------	--

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

9.5.2 Minimum requirement (CSI Reference Symbols)

9.5.2.1 FDD

The minimum performance requirement in Table 9.5.2.1-2 is defined as

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

b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;

For the parameters specified in Table 9.5.2.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.2.1-2.

Parameter Unit Test 1 Test 2 Test 3						
Bandwidth		MHz		10		
PDSCH transmission mode				9		
	_	dB		0		
Downlink power	ρ_A	dB				
allocation	$\rho_{\scriptscriptstyle B}$	-		0		
	Pc	dB dB		0		
Dropogation condi	σ tion and	uБ		0		
Propagation condition and 2 x 2 EPA5						
Cell-specific reference signals Antenna ports 0						
Beamforming N				fied in Section B.	4.3	
CSI reference si				nna ports 15, 16		
CSI-RS periodici						
subframe offs				5/1		
$T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$						
CSI reference s	ignal			6		
configuratio	n			6		
CodeBookSubsetR	estriction			11 for fixed RI = 1		
bitmap	estriction			20 for fixed RI = 2		
			010011	for UE reported		
Antenna correla	ation		Low	Low	High	
RI configurati	on		Fixed RI=2 and	Fixed RI=1	Fixed RI=1	
_		dB	follow RI	and follow RI 20	and follow RI 20	
	SNR N(i)			-	-	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	-98	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-78	-78	
Maximum number o			1			
transmission Reporting mo				PUCCH 1-1		
Physical channel for						
reporting	• • • •		PL	JSCH (Note 3)		
PUCCH Report T	ype for			2		
CQI/PMI				2		
Physical channel	for RI		PU	CCH Format 2		
reporting						
PUCCH Report Ty				3		
Reporting perio		ms		$N_{\rm pd} = 5$		
PMI and CQI d		ms		8		
cqi-pmi-Configuratio				2 1 (Note 4)		
ri-Configuration			l porting instance at sub		ad an DMI and	
			ot later than SF#(n-4),			
					li allu	
	wideband CQI cannot be applied at the eNB downlink before SF#(n+4). Note 2: Reference measurement channel RC.9 FDD according to Table A.4-1 with one sided dynamic					
		FDD as described in				
			orts and HARQ-ACK	it is necessary to	report both on	
			format 0 shall be tran			
			with the HARQ-ACK			
#5.						
			when applying CQI and			
	e to be appl MI reports.		ne subframe delay in a	addition to Note 1	I to align with	

Table 9.5.2.1-1 RI Test (FDD)

	Test 1	Test 2	Test 3
<i>γ</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	Parameter Unit Test 1 Test 2 Test 3						
Bandwidth		MHz	10				
PDSCH transmission mode			9				
	$ ho_{\scriptscriptstyle A}$	dB	0				
Downlink power		dB		0			
allocation	$ ho_{\scriptscriptstyle B}$ Pc	dB		0			
	σ	dB		0			
Uplink downlink con	-	ЧD		1			
Special subfra				-			
configuratio			4				
Propagation condi							
antenna configu				2 x 2 EPA5			
Cell-specific referen	ce signals		Ar	ntenna ports 0			
CSI reference si				nna ports 15, 16			
Beamforming N			As speci	fied in Section B	.4.3		
CSI reference s				4			
configuratio				•			
CSI-RS periodici				- / /			
subframe offs				5/4			
$T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$	RS		0000/	11 for fixed RI = 1	1		
CodeBookSubsetRestriction				100 for fixed RI = 200 for fixed RI = 200 for fixed RI = 2000 for fixed RI = 20000 for fixed RI = 20000 for fixed RI = 200000000000000000000000000000000000			
bitmap				for UE reported			
Antenna correl	ation		Low	Low	High		
			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		-98		
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98 -78 -78				
Maximum number	of HARQ			1			
transmissior							
Reporting mo				PUCCH 1-1			
Physical channel for	CQI/ PMI		PL	JSCH (Note 3)			
reporting	far 001/			(/			
PUCCH report type PMI				2			
Physical channel	for RI		PU	CCH Format 2			
reporting Reporting perio	dicity	ms		$N_{\rm pd} = 5$			
PMI and CQI d		ms		10			
ACK/NACK feedba		1115		Bundling			
cqi-pmi-Configurat			4				
ri-Configuratio			1				
Note 1: If the UE r CQI estim wideband	reports in ar ation at a de CQI cannot	ownlink subframe no be applied at the e	porting instance at sub ot later than SF#(n-4), NB downlink before S	this reported PM F#(n+4).	1I and		
			DD according to Table	e A.4-1 with one	sided dynamic		
		TDD as described in					
Note 3: To avoid collisions between CQI/PMI reports and HARQ-ACK it is necessary to report both on PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and #9 to allow periodic CQI/PMI to multiplex with the HARQ-ACK on PUSCH in uplink SF#3 and #8.							

Table 9.5.2.2-1 RI Test (TDD)

Table 9.5.2.2-2 Minimum requiremer	nt (TDD)
Table 5.5.2.2-2 Minimum requirement	

	Test 1	Test 2	Test 3
γı	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.

Desemptor		1 loc it	Т	est 1	Tes	st 2
Parameter		Unit	Cell 1	Cell 2	Cell 1	Cell 2
Bandwidth		MHz	0	10 Nata 40	1	-
PDSCH transmissic		JD	3	Note 10	3	Note 10
Downlink power	ρ_{A}	dB		-3	-:	-
allocation	$ ho_{\scriptscriptstyle B}$	dB		-3	-:	
D (* 197	σ	dB		0	()
Propagation condit antenna configur				2 EPA5	2 x 2	EPA5
bitmap	CodeBookSubsetRestriction		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	tion		Fixed	_ow	Lo	W
RI configuration	on		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
$N_{\scriptscriptstyle oc}^{(j)}$	$N_{\rm oc2}^{(j)}$	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
$\hat{I}^{(j)}_{or}$		dB[mW/15k Hz]	-98	-110	-78	-92
Subframe Configu	iration		Non- MBSFN	Non-MBSFN	Non-MBSFN	Non-MBSFN
Cell Id			0	1	0	1
Time Offset betwee		μs	2.5 (synch N/A	1000000 1000000 1000000 1000000 1000000 1000000	2.5 (synchro N/A	00000000000000000000000000000000000000
RLM/RRM Measur Subframe Pattern (1000000 1000000 1000000 1000000 1000000 1000000	N/A	10000000 10000000 10000000 10000000 1000000	N/A
CSI Subframe Sets (Note 8)	Ccsi,0 Ccsi,1		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 o transmission				1	1	
Reporting mo			PUC	CH 1-0	PUCC	H 1-0
Physical channel f reporting				l Format 2		Format 2
PUCCH Report Type	e for CQI			4	2	1

Table 9.5.3.1-1 RI Test (FDD)

Physical	channel for RI reporting		PUCCH	Format 2	PUCCH	Format 2
PUCC	PUCCH Report Type for RI		3		3	3
Re	porting periodicity	ms	N _{pd} =	= 10	N _{pd} =	= 10
cqi-pn	ni-ConfigurationIndex		1	1	1	1
ri-	ConfigurationInd		5		4.5	5
cqi-pm	ni-ConfigurationIndex2		1	0	1	0
ri-0	ConfigurationInd2		2		22	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	later than SF#(
Note 2:	Reference measurement OCNG Pattern OP.1 FDI			•	ble A.4-1 with one	sided dynamic
Note 3:	This noise is applied in C overlapping with the agg		#1, #2, #3, #5, #	#6, #8, #9, #10	,#12, #13 of a sub	frame
Note 4:	This noise is applied in C ABS.		#0, #4, #7, #11	of a subframe	overlapping with t	he aggressor
Note 5:	This noise is applied in a					
Note 6:	ABS pattern as defined i	n [9]. PDSCH of	ther than SIB1/	baging and its	associated PDCC	H/PCFICH are
	transmitted in the serving					subframe of
	aggressor cell and the su					
Note 7:	Time-domain measurem					
Note 8:	As configured according to the time-domain measurement resource restriction pattern for CSI measurements defined in [7].					
Note 9:						
Note 10:	Downlink physical chann defined in Annex A.5.1.5		2 in accordance	e with Annex C	.3.3 applying OCN	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	st1	Tes	st2
			Cell 1	Cell 2	Cell 1	Cell 2
Bandwidth		MHz	1	-	1(
PDSCH transmission mode Uplink downlink configuration			3	Note 11	3	Note 11
Special subfrai					-	
configuration			4		4	
	$ ho_{\scriptscriptstyle A}$	dB	-3	3	-3	}
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	-3	3	-3	3
anocation	σ	dB	C)	0	
Propagation condit antenna configur			2 x 2 l	EPA5	2 x 2 E	EPA5
CodeBookSubsetRe bitmap			01 for fixed RI = 10 for fixed RI = 2 11 for UE reported	N/A	01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	N/A
Antenna correla	ation		RI Lo	NA/	Lo	A4/
			Fixed			••
RI configuration	on		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	uration		Non- MBSFN	Non- MBSFN	Non-MBSFN	Non-MBSFN
Cell Id			0	1	0	1
Time Offset betwee	en Cells	μs	2.5 (sync cel		2.5 (synchro	nous cells)
ABS Pattern (No	ote 7)		N/A	0000000 001 0000000 001	N/A	0000000001 0000000001
RLM/RRM Measur Subframe Pattern (00000000 01 00000000 01	N/A	0000000001 00000000001	N/A
CSI Subframe Sets	Ccsi,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
Symbols Maximum number of HARQ		l			1	
Maximum number o			1		1	
Maximum number o transmission	S					
Maximum number o transmission Reporting mod	s de		PUCC		PUCC	
Maximum number o transmission	s de Ccsi,0 CQI			H 1-0		H 1-0

Table 9.5.3.2-1 RI Test (TDD)

	Physical channel for C _{CSI,1} CQI and RI reporting		PUSCH	(Note 3)	PUSCH	(Note 3)
	Report Type for RI		3		3	
	orting periodicity	ms	N _{pd} =	= 10	N _{pd} =	= 10
ACK/NA	ACK feedback mode		Multip	lexing	Multip	lexing
	-ConfigurationIndex		8		8	
	ConfigurationInd		5		5	
	ConfigurationIndex2		g		ę	
-	onfigurationInd2		C		(
	Cyclic prefix		Normal	Normal	Normal	Normal
Note 1:	If the UE reports in an estimation at a downli be applied at the eNB	nk subframe n downlink befo	ot later than S re SF#(n+4).	SF#(n-4), this	s reported wideba	nd CQI cannot
Note 2:	Reference measurem dynamic OCNG Patte					with one sided
Note 3:						
Note 4:	This noise is applied i overlapping with the a	n OFDM symb	ols #1, #2, #3			
Note 5:	This noise is applied i aggressor ABS.			7, #11 of a su	ıbframe overlappi	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	d in [9]. PDSC	H other than	SIB1/paging	and its associate	d
	PDCCH/PCFICH are with the ABS subfram					
	reference channel.	00				
Note 8:	Time-domain measure	ement resource	e restriction p	attern for PC	cell measurements	s as defined in
Note 9:	As configured accordi measurements define		domain meas	surement res	ource restriction p	battern for CSI
Note 10:	Cell 1 is the serving cand Cell 2 is the same	ell. Cell 2 is the	e aggressor c	ell. The num	ber of the CRS po	orts in Cell 1
Note 11:	Downlink physical cha pattern as defined in A		Cell 2 in acco	rdance with	Annex C.3.3 apply	ying OCNG

Table 9.5.3.2-2 Minimum requirement (TDD)

	Test 1	Test 2
yı -	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)	2x2 EPA5 (Note 2)
CodeBookSubsetRe bitmap			01 for fixed RI = 1 10 for fixed RI = 2 11 for UE reported RI	As defined in Note 1	As defined in Note 1
	N _{oc1}	dB[mW/15k Hz]	-98 (Note 3)	N/A	N/A
N_{oc} at antenna port	N _{oc2}	dB[mW/15k Hz]	-98 (Note 4)	N/A	N/A
	N _{oc3}	dB[mW/15k Hz]	-93 (Note 5)	N/A	N/A
\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	Ccsi,0		10000000 10000000 10000000 10000000 1000000	N/A	N/A
(Note 8)	Ccsi,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	<i>N_{pd}</i> = 10	N/A	N/A

Table 9.5.4.1-1: RI Test (FDD)

cqi-pr	ni-ConfigurationIndex		11	N/A	N/A	
ri-	ConfigurationInd		5	N/A	N/A	
cqi-pm	i-ConfigurationIndex2		10	N/A	N/A	
ri-C	ConfigurationInd2		2	N/A	N/A	
	Cyclic prefix		Normal	Normal	Normal	
Note 1:	Downlink physical chan			rdance with Annex	C.3.3 applying	
	OCNG pattern OP.5 FD					
Note 2:	The propagation condition					
Note 3:	This noise is applied in		#1, #2, #3, #5, #6, #8	3, #9, #10,#12, #1	3 of a subframe	
	overlapping with the age					
Note 4:	This noise is applied in	OFDM symbols	#0, #4, #7, #11 of a s	subframe overlapp	oing with the	
	aggressor ABS.					
Note 5:	This noise is applied in a	all OFDM symbo	ols of a subframe ove	rlapping with agg	ressor non-ABS	
Note 6:	ABS pattern as defined					
	PDCCH/PCFICH are tra					
	overlapped with the ABS		ggressor cell and the	subframe is availa	able in the	
Note 7:	definition of the reference		atriation mattern for D		to op 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		nain measurement re	source restriction	pattern for CSI	
Nata O.	measurements defined		a wat available for AD	Canal is O for the	a uh france a	
Note 9:	The number of control C indicated by "0" of ABS		s not available for AB	ss and is 3 for the	subframe	
Note 10:	If the UE reports in an a	vailable uplink r	eporting instance at s	subframe SF#n ba	sed 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 cannot					
	be applied at the eNB d			-		
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			e same.		
Note 13:	SIB-1 will not be transm	itted in Cell2 an	d Cell 3 in this test.			

Table 9.5.4.1-2 Minimum requirement (FDD)

	Test 1	Test 2	Test 3
\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
η	N/A	1.05	0.9
<i>γ</i> 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 transmissio			3	As defined in Note 1	As defined in Note 1
Uplink downlink conf			1	1	1
Special subframe con	figuration		4	4	4
Downlink power	$ ho_{\scriptscriptstyle A}$	dB	-3	-3	-3
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 9.5.4.2-2 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 betwee	een Cells	Hz	N/A	300	-100
Cell Id			0	126	1
ABS pattern (No	te 6)		N/A	0000000001 0000000001	0000000001 0000000001
RLM/RRM Measur Subframe Pattern (0000000001 0000000001	N/A	N/A
CSI Subframe Sets	C _{CSI,0}		0000000001 0000000001	N/A	N/A
(Note 8)	C _{CSI,1}		1100111000 1100111000	N/A	N/A
Number of control symbols	OFDM		3	Note 9	Note 9
Maximum number o transmission			1	N/A	N/A
Reporting mod	-		PUCCH 1-0	N/A	N/A
Physical channel for (and RI reportin	Ccsi,0 CQI		PUCCH format 2	N/A	N/A
Physical channel for (C _{CSI,1} CQI		PUSCH (Note	N/A	N/A
and RI reportin PUCCH Report Type			14) 4	N/A	N/A
PUCCH Report Typ			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-Configuratio			9	N/A	N/A
		1			
ri-Configuration	Ind2		0	N/A	N/A

Table 9.5.4.2-1: RI Test (TDD)

Note 1:	Downlink physical channel setup in Cell 2 and Cell 3 in accordance with Annex C.3.3 applying
	OCNG pattern OP.5 TDD as defined in Annex A.5.2.5.
Note 2:	The propagation conditions for Cell 1, Cell 2 and Cell 3 are statistically independent.
Note 3:	This noise is applied in OFDM symbols #1, #2, #3, #5, #6, #8, #9, #10,#12, #13 of a subframe overlapping with the aggressor ABS.
Note 4:	This noise is applied in OFDM symbols #0, #4, #7, #11 of a subframe overlapping with the aggressor ABS.
Note 5:	This noise is applied in all OFDM symbols of a subframe overlapping with aggressor non-ABS
Note 6:	ABS pattern as defined in [9]. PDSCH other than SIB1/paging and its associated
Note 0.	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.
Nists 7	
Note 7:	Time-domain measurement resource restriction pattern for PCell measurements as defined in [7]
Note 8:	As configured according to the time-domain measurement resource restriction pattern for CSI
	measurements defined in [7].
Note 9:	The number of control OFDM symbols is not available for ABS and is 3 for the subframe
	indicated by "0" of ABS pattern.
Note 10:	If the UE reports in an available uplink reporting instance at subframe SF#n based on CQI
	estimation at a downlink subframe not later than SF#(n-4), this reported wideband CQI cannot
	be applied at the eNB downlink before SF#(n+4).
Note 11:	Reference measurement channel in Cell 1 RC.2 TDD according to Table A.4-1 with one sided
11010 111	dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.
Note 12:	•
Note 13:	
Note 14:	To avoid collisions between RI/CQI reports and HARQ-ACK it is necessary to report them on
11010 14.	PUSCH instead of PUCCH. PDCCH DCI format 0 shall be transmitted in downlink SF#4 and
	#9 to allow periodic RI/CQI to multiplex with the HARQ-ACK on PUSCH in uplink subframe
	SF#8 and #3.

Table 9.5.4.2-2 Minimum requirement (TDD)

	Test 1	Test 2	Test 3
${\hat E_s}/{N_{oc2}}$ for Cell 1 (dB)	4	20	20
$\hat{I}_{or}^{(j)}$ for Cell 1 (dB[mW/15kHz])	-94	-78	-78
Antenna correlation	High for Cell 1, low for Cell 2 and Cell 3	Low for Cell 1, Cell 2 and Cell 3	High for Cell 1, low for Cell 2 and Cell 3
71	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 for Test 1 and Test 2, but CSI process 1 is not configured for Test 2. The corresponding γ requirements for Test 1 and Test 2 shall be fulfilled. The requirement on reported RI for CSI process 1 in Test 2 is not applicable.

For UE supports multiple CSI processes, CSI process 0 is configured for Test 1 and CSI processes 0 and 1 are configured for Test 2. The corresponding γ requirements for Test 1 and Test 2 shall be fulfilled, and also the requirement on reported RI for CSI process 1 in Test 2.

Table 9.5.5-1	Configuration	of CSI	processes
---------------	---------------	--------	-----------

	CSI process 0	CSI process 1
CSI-RS resource	CSI-RS signal 0	CSI-RS signal 1
CSI-IM resource	CSI-IM resource 0	CSI-IM resource 1

9.5.5.1 FDD

The minimum performance requirement in Table 9.5.5.1-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;
- c) For Test 2, the RI reported for CSI process 1 shall be the same as the most recent RI reported for CSI process 0 if UE is configured with multiple CSI processes.

For the parameters specified in Table 9.5.5.1-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.5.1-2.

Table 9.5.5.1-1 RI Test (FDD)

Parameter Bandwidth		l Init	Test 1		Test 2	
		Unit	TP1	TP2	TP1	TP2
		MHz		MHz		MHz
Transmission mode			10	10	10	10
	$ ho_{\scriptscriptstyle A}$	dB	(0	0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	(0	0	
allocation	P _c	dB	0	0	0	0
	σ	dB	(0		0
SNR	-	dB	0	0	20	20
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-98	-78	-78
						10
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98		-98	
Propagation channel	el		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 betwe		US		0 0		0 0
Frequency offset be Cell-specific referen		Hz		a ports 0		a ports 0
•			Antenna ports		Antenna ports	
CSI-RS signal 0			15,16	N/A	15,16	N/A
CSI-RS 0 periodicit T _{CSI-RS} / Δ _{CSI-RS}	y and subframe offset		5/1	N/A	5/1	N/A
CSI-RS 0 configura	tion		0	N/A	0	N/A
CSI-RS signal 1			N/A	Antenna ports	N/A	Antenna ports
CSI-RS 1 periodicit	y and subframe offset		N/A	15,16 5/1	N/A	15,16 5/1
T _{CSI-RS} / Δ _{CSI-RS}	ti		-			
CSI-RS 1 configura	ition		N/A	3	N/A	3
Zero-power CSI-RS 0 configuration <i>I</i> _{CSI-RS} / <i>ZeroPowerCSI-RS</i> bitmap			N/A	10000010000 00000	N/A	10000010000 00000
Zero-power CSI-RS I _{CSI-RS} / ZeroPower			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	ion		2	N/A	2	N/A
	and subframe offset		N/A	5/1	N/A	5/1
$T_{\text{CSI-RS}} / \Delta_{\text{CSI-RS}}$	ion					
CSI-IM 1 configurat	lon		N/A Fixed RI=2	6	N/A Fixed RI=1	6
RI configuration			and follow RI	N/A	and follow RI	N/A
Physical channel fo	r CQI/PMI reporting		PUSCH (Note	N/A	PUSCH (Note	PUSCH (Note
•			6)		6)	6)
PUCCH Report Typ	be for CQI/PMI		2 PUCCH	N/A	2 PUCCH	2 PUCCH
Physical channel for	r RI reporting		Format 2	N/A	Format 2	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 process 0	CSI-IM		CSI-IM 0	N/A	CSI-IM 0	N/A
	Reporting mode		PUCCH 1-1	N/A	PUCCH 1-1	N/A
	Reporting periodicity	ms	$N_{\rm pd}=5$	N/A	$N_{\rm pd} = 5$	N/A
(Note 7)	CQI delay	ms	8	N/A	10	N/A
	cqi-pmi- ConfigurationIndex		6	N/A	6	N/A
	ri-ConfigIndex		1	N/A	1	N/A
	CSI-RS		N/A	N/A	N/A	CSI-RS 1
CSI process 1	CSI-IM		N/A	N/A	N/A	CSI-IM 1
(Note 7, Note 9)	Reporting mode		N/A	N/A	N/A	PUCCH 1-1
,	Reporting periodicity	ms	N/A	N/A	N/A	$N_{\rm pd}=5$

	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 s	ubframe 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.

Note 9: If UE supports one CSI process, CSI process 1 is not configured in Test 2.

Table 9.5.5.1-2 Minimum requirement (FDD)

	Test 1	Test 2
'n	N/A	1.0
72	1.0	N/A
UE Category	≥2	≥2

9.5.5.2 TDD

The minimum performance requirement in Table 9.5.5.2-2 is defined as

- a) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 1 shall be $\geq \gamma_1$;
- b) The ratio of the throughput obtained when transmitting based on UE reported RI and that obtained when transmitting with fixed rank 2 shall be $\geq \gamma_2$;
- c) For Test 2, the RI reported for CSI process 1 shall be the same as the most recent RI reported for CSI process 0 if UE is configured with multiple CSI processes.

For the parameters specified in Table 9.5.5.2-1, and using the downlink physical channels specified in Annex C.3.2, the minimum requirements are specified in Table 9.5.5.2-2.

Table 9.5.5.2-1 RI Test (TDD)

Parameter		11	Tes	st 1	Te	st 2
	ameter	Unit	TP1	TP2	TP1	TP2
Bandwidth		MHz		MHz		MHz
Transmission mode	9		10	10	10	10
	$ ho_{\scriptscriptstyle A}$	dB	(0	0	
Downlink power	$ ho_{\scriptscriptstyle B}$	dB	(D		0
allocation	P _c	dB	0	0	0	0
	σ	dB	- (0		0
Uplink downlink co	_	üD	2	2	2	2
Special subframe c			4	4	4	4
SNR		dB	0	0	20	20
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-98	-98	-78	-78
		db[IIIW/15KH2]	-30	-30	-70	-70
$N_{oc}^{(j)}$		dB[mW/15kHz]	-9	98	-9	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		Section B.4.3
Timing offset betwe		US		0 0		0
Frequency offset b		Hz		-		0 Departs 0
Cell-specific refere	nce signais		Antenna Antenna ports	a ports 0	Antenna Antenna ports	a ports 0
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 periodicit T _{CSI-RS} / Δ _{CSI-RS}	ty and subframe offset		N/A	5/3	N/A	5/3
CSI-RS 1 configura	ation		N/A	3	N/A	3
Zero-power CSI-RS I _{CSI-RS} / ZeroPower	S 0 configuration		N/A	3 / 10000010000 00000	N/A	3 / 10000010000 00000
Zero-power CSI-RS I _{CSI-RS} / ZeroPower			3 / 00110000000 00000	N/A	3 / 00110000000 00000	N/A
CSI-IM 0 periodicity Tcsi-rs / Acsi-rs	y and subframe offset		5/3	N/A	5/3	N/A
CSI-IM 0 configura	tion		2	N/A	2	N/A
	y and subframe offset		N/A	5/3	N/A	5/3
$T_{\text{CSI-RS}}$ / $\Delta_{\text{CSI-RS}}$						
CSI-IM 1 configura	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
	CSI-RS		CSI-RS 0	N/A	CSI-RS 0	N/A
CSI process 0	CSI-IM		CSI-IM 0	N/A	CSI-IM 0	N/A
(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, 8)	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 PD	SCH scheduling		· · · ·	ocess 0		ocess 0
Cell ID						6 CSL BS 1
Quasi-co-located C	51-10		CSI-RS 0 Same Cell ID	CSI-RS 1 Same Cell ID	CSI-RS 0 Same Cell ID	CSI-RS 1 Same Cell ID
Quasi-co-located C	RS		as Cell 1	as Cell 2	as Cell 1	as Cell 2
PMI for subframe 4	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	uplink reporting insta	nce at subframe S	SF#n based on CO	QI estimation at a	downlink SF not		
later than SF#(n-4), this reporte	d wideband CQI cann	ot be applied at th	ne eNB downlink b	pefore SF#(n+4)			
Note 2: 3 symbols allocated to PDCCH							
Note 3: Reference measurement chann	el RC.13 TDD accord	ing to Table A.4-1	. PDSCH transmi	ssion is schedule	d on subframe 4		
and 9 from TP1.							
Note 4: TM10 OCNG as specified in A.5	5.2.8 is transmitted on	subframe 3 and 8	3 from TP1.				
Note 5: TM10 OCNG as specified in A.5	5.2.8 is transmitted on	subframe 3, 4, 8	and 9 from TP2 fo	or Test 1; TP2 is b	lanked for Test		
2.							
Note 6: Reported wideband CQI and PM							
Note 7: If UE supports multiple CSI proc				process' for CSI	process 1.		
	If UE supports one CSI process, CSI process 1 is not configured in Test 2.						
Note 9: PDCCH DCI format 0 with a trigger for aperiodic CQI shall be transmitted in downlink SF#3and #8 to allow aperiodic							
CQI/PMI/RI to be transmitted in	uplink SF#7 and #2.						

Table 9.5.5.2-2 Minim	um requirement (TDD)
-----------------------	----------------------

	Test 1	Test 2
<i>y</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	Parameter		Pcell	Scell	
PDSCH transmission	on mode			1	
Downlink power	$ ho_{\scriptscriptstyle A}$	dB		0	
allocation	$ ho_{\scriptscriptstyle B}$	dB		0	
Propagation condit antenna configur		ion and AWGN (1 x 2)		N (1 x 2)	
SNR		dB	10	4	
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	-88	-94	
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98	
Physical channel f reporting	or CQI		PUCCH	Format 2	
PUCCH Report	Туре			4	
Reporting period	dicity	ms	N _{pd}	= 10	
cqi-pmi-ConfigurationIndex			16 [shift of 5 ms relat to Pcell]		
Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 FDD as described in Annex A.5.1.1.					

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

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

Test nu	ımber	Bandwidth combination	
1		10MHz for both cells	
2		20MHz for both cells	
Note 1:	The app	blicability of requirements for different CA configurations and	
	bandwid	dth 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	Parameter		Pcell	Scell	
PDSCH transmissio	on mode			1	
Uplink downlink configuration			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	for CQI		PUCCH Format 2		
PUCCH Report	Туре			4	
Reporting period	dicity	ms	N	_{pd} = 10	
cqi-pmi-ConfigurationIndex			8 13 [shift of 5 ms rela to Pcell]		
Note 1: 3 symbols are allocated to PDCCH. No PDSCH for user data is scheduled for the UE with one sided dynamic OCNG Pattern OP.1 TDD as described in Annex A.5.2.1.					

Table 9.6.1.2-1: 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		
1		20MHz for both cells		
Note 1:	The applicability of requirements for different CA configuration 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.					

Table 10.1-1: Common	Test Parameters (FDD)
----------------------	-----------------------

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			
$N_{\it oc}$ 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	Referen	Reference value	
number		Channel	Pattern	condition	Matrix and	BLER	SNR(dB)	UE
					antenna	(%)		Category
1	10 MHz	R.37 FDD	OP.4				4.1	≥1
			FDD					
2	10 MHz	R.38 FDD	OP.4	MBSFN			11.0	≥1
			FDD	channel	1x2 low	1		
3	10 MHz	R.39 FDD	OP.4	model (Table	IXZ IOW	I	20.1	≥2
			FDD	B.2.6-1)				
	5.0MHz	R.39-1 FDD	OP.4				20.5	1
			FDD					

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).

Parameter	Unit	Value
Number of HARQ processes	Processes	None
Subcarrier spacing	kHz	15 kHz
Allocated subframes per Radio Frame (Note 1)		5 subframes
Number of OFDM symbols for PDCCH		2
Cyclic Prefix		Extended
		36.331, Uplink-Downlink Configuration 5 is 43/4/7/8/9) are available for MBMS.

Table	10.2-1:	Common	Test	Parameters	(TDD)
Table	10.2-1.	001111011	1 COL	i arameters	(100)

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
	$ ho_{\scriptscriptstyle A}$	dB	0
Downlink power allocation	$ ho_{\scriptscriptstyle B}$	dB	0 (Note 1)
	σ	dB	0
$N_{_{oc}}$ at antenna	$N_{\scriptscriptstyle oc}$ at antenna port		-98
Note 1: $P_B = 0$.			

Table 10.2.1-1: Test Parameters for Testing

Table 10.2. [•]	1-2: Minin	num perforr	nance

.

Test	Bandwidth	Reference	OCNG	Propagation	Correlation	Referen	ce value	MBMS
number		Channel	Pattern	condition	Matrix and	BLER	SNR(dB)	UE
					antenna	(%)		Category
1	10 MHz	R.37 TDD	OP.4				3.4	≥1
			TDD					
2	10 MHz	R.38 TDD	OP.4	MBSFN			11.1	≥1
			TDD	channel	1x2 low	1		
3a	10 MHz	R.39 TDD	OP.4	model (Table	1 X2 10W	1	20.1	≥2
			TDD	B.2.6-1)				
3b	5MHz	R.39-1 TDD	OP.4				20.5	1
			TDD					

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

The measurement channels in the following subclauses are defined to derive the requirements in clause 6 (Transmitter Characteristics) and clause 7 (Receiver Characteristics). The measurement channels represent example configurations of physical channels for different data rates.

A.2.1.1 Applicability and common parameters

The UL reference measurement channels comprise transmission of PUSCH and Demodulation Reference signals 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	

Table A.2.1.3-1: Overview of UL reference measurement channels

500			00	0.001/	4/5	0.1			
FDD	Table A.2.2.2.1-1		20	QPSK	1/5	81		≥1	
FDD	Table A.2.2.2.1-1		20	QPSK	1/6	90		≥ 1	
FDD	Table A.2.2.2.1-1		20	QPSK	1/6	96		≥ 1	
	tial RB allocation,	16-QAM					<u> </u>		
FDD	Table A.2.2.2.2-1		1.4 - 20	16QAM	3/4	1		≥ 1	
FDD	Table A.2.2.2.2-1		1.4 - 20	16QAM	3/4	2		≥ 1	
FDD	Table A.2.2.2.2-1		1.4 - 20	16QAM	3/4	3		≥ 1	
FDD	Table A.2.2.2.2-1		1.4 - 20	16QAM	3/4	4		≥ 1	
FDD	Table A.2.2.2.2-1		1.4 - 20	16QAM	3/4	5		≥ 1	
FDD	Table A.2.2.2.2-1		3 - 20	16QAM	3/4	6		≥ 1	
FDD	Table A.2.2.2.2-1		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.2.2.2.2-1		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	Table A.2.2.2.2-1		20	16QAM	2/5	96		≥ 2	
	I RB allocation, QP	SK							
TDD	Table A.2.3.1.1-1		1.4	QPSK	1/3	6		≥ 1	
TDD	Table A.2.3.1.1-1		3	QPSK	1/3	15		≥ 1	
TDD	Table A.2.3.1.1-1		5	QPSK	1/3	25		≥ 1	
TDD	Table A.2.3.1.1-1		10	QPSK	1/3	50		≥ 1	
TDD	Table A.2.3.1.1-1		15	QPSK	1/5	75		≥ 1	
TDD	Table A.2.3.1.1-1		20	QPSK	1/6	100		≥ 1	
TDD, Ful	I RB allocation, 16-	QAM							
TDD	Table A.2.3.1.2-1		1.4	16QAM	3/4	6		≥ 1	
TDD	Table A.2.3.1.2-1		3	16QAM	1/2	15		≥ 1	
TDD	Table A.2.3.1.2-1		5	16QAM	1/3	25		≥ 1	

TDD	Table A.2.3.1.2-1		10	16QAM	3/4	50	≥ 2	
TDD	Table A.2.3.1.2-1		-		1/2			
			15	16QAM		75	 ≥2	
TDD Do	Table A.2.3.1.2-1		20	16QAM	1/3	100	≥ 2	
TDD, Par	Table A.2.3.2.1-1		4 20	ODSK	1/2	1	 ≥ 1	
			.4 - 20	QPSK	1/3	1		
TDD	Table A.2.3.2.1-1 Table A.2.3.2.1-1		.4 - 20	QPSK	1/3	2	 ≥1	
TDD			.4 - 20	QPSK	1/3	3	 ≥1	
TDD	Table A.2.3.2.1-1		.4 - 20	QPSK	1/3	4	≥1	
TDD	Table A.2.3.2.1-1		.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		0 - 20	QPSK	1/3	25	≥1	
TDD	Table A.2.3.2.1-1		0 - 20	QPSK	1/3	27	≥1	
TDD	Table A.2.3.2.1-1		0 - 20	QPSK	1/3	30	≥1	
TDD	Table A.2.3.2.1-1		0 - 20	QPSK	1/3	32	≥1	
TDD	Table A.2.3.2.1-1		0 - 20	QPSK	1/3	36	≥1	
TDD	Table A.2.3.2.1-1		0 - 20	QPSK	1/3	40	 ≥ 1	
TDD	Table A.2.3.2.1-1		0 - 20	QPSK	1/3	45	≥ 1	
TDD	Table A.2.3.2.1-1		0 - 20	QPSK	1/3	48	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/3	50	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/3	54	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/4	60	≥ 1	
TDD	Table A.2.3.2.1-1		5 - 20	QPSK	1/4	64	≥ 1	
TDD	Table A.2.3.2.1-1	1	5 - 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 Dou	Table A.2.3.2.1-1		20	QPSK	1/6	96	≥ 1	
	tial RB allocation,		4 00	400 414	0/4			
TDD	Table A.2.3.2.2-1		.4 - 20	16QAM	3/4	1	≥ 1	
TDD	Table A.2.3.2.2-1		.4 - 20	16QAM	3/4	2	≥ 1	
TDD	Table A.2.3.2.2-1		.4 - 20	16QAM	3/4	3	≥1	
TDD	Table A.2.3.2.2-1		.4 - 20	16QAM	3/4	4	≥ 1	
TDD	Table A.2.3.2.2-1		.4 - 20	16QAM	3/4	5	≥ 1	
TDD	Table A.2.3.2.2-1		3 - 20	16QAM	3/4	6	≥ 1	
TDD	Table A.2.3.2.2-1		3 - 20	16QAM	3/4	8	≥ 1	
TDD	Table A.2.3.2.2-1		3 - 20	16QAM	3/4	9	≥ 1	
TDD	Table A.2.3.2.2-1		3 - 20	16QAM	3/4	10	≥ 1	
TDD	Table A.2.3.2.2-1		3 - 20	16QAM	3/4	12	≥ 1	

TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/2	15	≥ 1	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/2	16	≥ 1	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/2	18	≥ 1	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/3	20	≥ 1	
TDD	Table A.2.3.2.2-1	5 - 20	16QAM	1/3	24	≥ 1	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	1/3	25	≥ 1	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	1/3	27	≥ 1	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	30	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	32	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	36	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	40	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	45	≥ 2	
TDD	Table A.2.3.2.2-1	10 - 20	16QAM	3/4	48	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	3/4	50	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	3/4	54	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	2/3	60	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	2/3	64	≥ 2	
TDD	Table A.2.3.2.2-1	15 - 20	16QAM	1/2	72	≥ 2	
TDD	Table A.2.3.2.2-1	20	16QAM	1/2	75	≥ 2	
TDD	Table A.2.3.2.2-1	20	16QAM	1/2	80	≥ 2	
TDD	Table A.2.3.2.2-1	20	16QAM	1/2	81	≥ 2	
TDD	Table A.2.3.2.2-1	20	16QAM	2/5	90	≥ 2	
TDD	Table A.2.3.2.2-1	20	16QAM	2/5	96	≥ 2	

A.2.2 Reference measurement channels for FDD

A.2.2.1 Full RB allocation

A.2.2.1.1 QPSK

Table A.2.2.1.1-1 Reference Channels for QPSK with full RB allocation

Parameter	Unit			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5	1/6
Payload size	Bits	600	1544	2216	5160	4392	4584
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks per Sub-Frame (Note 1)		1	1	1	1	1	1
Total number of bits per Sub-Frame	Bits	1728	4320	7200	14400	21600	28800
Total symbols per Sub-Frame		864	2160	3600	7200	10800	14400
UE Category		≥ 1	≥ 1	≥ 1	≥ 1	≥1	≥1
Note 1: If more than one Code Block is	present, a	n additior	al CRC s	sequence	of L = 24	Bits is a	ttached
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 Code Block (otherwise L = 0 Bi	•	n additional	CRC sequ	ience of L :	= 24 Bits is	attached t	o each

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 Categoi 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.2.2.2.1 Reference Channels for 16-QAM with partial RB allocation

A.2.2.2.3 64-QAM

[FFS]

A.2.2.3 Void

Table A.2.2.3-1: Void

A.2.3 Reference measurement channels for TDD

For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL:2UL.

A.2.3.1 Full RB allocation

A.2.3.1.1 QPSK

Parameter	Unit			Va	lue			
Channel bandwidth	MHz	1.4	3	5	10	15	20	
Allocated resource blocks		6	15	25	50	75	100	
Uplink-Downlink Configuration (Note 2)		1	1	1	1	1	1	
DFT-OFDM Symbols per Sub-Frame		12	12	12	12	12	12	
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	
Target Coding rate		1/3	1/3	1/3	1/3	1/5	1/6	
Payload size								
For Sub-Frame 2,3,7,8	Bits	600	1544	2216	5160	4392	4584	
Transport block CRC	Bits	24	24	24	24	24	24	
Number of code blocks per Sub-Frame								
(Note 1)								
For Sub-Frame 2,3,7,8		1	1	1	1	1	1	
Total number of bits per Sub-Frame								
For Sub-Frame 2,3,7,8	Bits	1728	4320	7200	14400	21600	28800	
Total symbols per Sub-Frame								
For Sub-Frame 2,3,7,8		864	2160	3600	7200	10800	14400	
UE Category		≥1	≥ 1	≥1	≥1	≥1	≥1	
Note 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached								
to each Code Block (otherwise L = 0 Bit)								
Note 2: As per Table 4.2-2 in TS 36.21	1 [4]							

A.2.3.1.2 16-QAM

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 present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 2: As per Table 4.2-2 in TS 36.211 [4] 									

A.2.3.1.3 64-QAM

[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

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

Parame ter	Ch BW	Allocat ed RBs	UDL Configu ration (Note 2)	DFT- OFDM Symbol s per Sub- Frame	Mod'n	Target Coding rate	Payloa d size for Sub- Frame 2, 3, 7, 8	Transp ort block CRC	Number of code blocks per Sub- Frame (Note 1)	Total number of bits per Sub- Frame for Sub- Frame 2, 3, 7, 8	Total symbol s per Sub- Frame for Sub- Frame 2, 3, 7, 8	UE Categor y
Unit	MHz						Bits	Bits		Bits		
	1.4 - 20	1	1	12	QPSK	1/3	72	24	1	288	144	≥ 1
	1.4 - 20	2	1	12	QPSK	1/3	176	24	1	576	288	≥ 1
	1.4 - 20	3	1	12	QPSK	1/3	256	24	1	864	432	≥ 1
	1.4 - 20	4	1	12	QPSK	1/3	392	24	1	1152	576	≥ 1
	1.4 - 20	5	1	12	QPSK	1/3	424	24	1	1440	720	≥1
	3-20	6	1	12	QPSK	1/3	600	24	1	1728	864	≥1
	3-20	8	1	12	QPSK	1/3	808	24	1	2304	1152	≥1
	3-20 3-20	9 10	1	12 12	QPSK QPSK	1/3 1/3	776 872	24 24	1	2592 2880	1296 1440	≥1
	3-20	10	1	12	QPSK	1/3	1224	24	1	2880 3456	1728	≥1 ≥1
	5-20	12	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	1	12	QPSK	1/3	4008	24	1	12960	6480	≥ 1
	10-20	48	1	12	QPSK	1/3	4264	24	1	13824	6912	≥ 1
	15 - 20	50	1	12	QPSK	1/3	5160	24	1	14400	7200	≥1
	15 - 20	54	1	12	QPSK	1/3	4776	24	1	15552	7776	≥1
	15 - 20	60	1	12	QPSK	1/4	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 QPSK	1/4	5160 4392	24 24	1	20736	10368	≥1
	20 20	75 80	1	12 12	QPSK	1/5 1/5	4392	24	1	21600 23040	10800 11520	≥ 1 ≥ 1
	20	80	1	12	QPSK	1/5	4776	24	1	23040	11664	≥1
	20	90	1	12	QPSK	1/5	4776	24	1	25920	12960	≥1
	20	90 96	1	12	QPSK	1/6	4008	24	1	27648	13824	≥1
Note 1: Note 2:	If more t	han one Co	-	resent, an a			-		ed to each C			-

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	1	12	16QAM	3/4	19080	24	4	25920	6480	≥ 2
	10-20	48	1	12	16QAM	3/4	20616	24	4	27648	6912	≥2
	15 - 20	50	1	12	16QAM	3/4	21384	24	4	28800	7200	≥2
	15 - 20	54	1	12	16QAM	3/4	22920	24	4	31104	7776	≥2
	15 - 20	60 64	1	12 12	16QAM 16QAM	2/3 2/3	23688 25456	24 24	4 4	34560 36864	8640 9216	≥2 ≥2
	15 - 20 15 - 20	64 72	1	12	16QAM 16QAM	1/2	20616	24	4	41472	10368	≥2
	20	72	1	12	16QAM	1/2	20616	24	4	43200	10368	≥2
	20	80	1	12	16QAM	1/2	21364	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	90	1	12	16QAM	2/5	20010	24	4	55296	13824	≥2
Note 1: Note 2:	If more t	han one Coo	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 Void

Table A.2.3.3-1: Void

A.3 DL reference measurement channels

A.3.1 General

The number of available channel bits varies across the sub-frames due to PBCH and PSS/SSS overhead. The payload size per sub-frame is varied in order to keep the code rate constant throughout a frame.

No user data is scheduled on subframes #5 in order to facilitate the transmission of system information blocks (SIB).

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation N_{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].

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

TDD TDD TDD	Table A.3.2-4a Table A.3.2-4a		5 10	64QAM 64QAM	3/4 3/4	18 17		-	
			10	64QAM	3/4	17		-	
TDD									
	Table A.3.2-4a		15	64QAM	3/4	17		-	
TDD	Table A.3.2-4a		20	64QAM	3/4	17		-	
TDD, Recei	ver requirements,	Maximum inp	ut level	for UE Ca	tegorie	s 2			
TDD	Table A.3.2-4b		1.4	64QAM	3/4	6		-	
TDD	Table A.3.2-4b		3	64QAM	3/4	15		-	
TDD	Table A.3.2-4b		5	64QAM	3/4	25		-	
TDD	Table A.3.2-4b		10	64QAM	3/4	50		-	
TDD	Table A.3.2-4b		15	64QAM	3/4	75		-	
TDD	Table A.3.2-4b		20	64QAM	3/4	83		-	
FDD, PDSC	H Performance, S	ingle-antenna	transm	ission (CR	(S)				
FDD	Table A.3.3.1-1	R.4 FDD	1.4	QPSK	1/3	6		≥ 1	
FDD	Table A.3.3.1-1	R.42 FDD	20	QPSK	1/3	100		≥ 1	
FDD	Table A.3.3.1-1	R.2 FDD	10	QPSK	1/3	50		≥ 1	
FDD	Table A.3.3.1-2	R.3-1 FDD	5	16QAM	1/2	25		≥ 1	
FDD	Table A.3.3.1-2	R.3 FDD	10	16QAM	1/2	50		≥ 2	
FDD	Table A.3.3.1-3	R.5 FDD	3	64QAM	3/4	15		≥ 1	
FDD	Table A.3.3.1-3	R.6 FDD	5	64QAM	3/4	25		≥ 2	
FDD	Table A.3.3.1-3	R.7 FDD	10	64QAM	3/4	50		≥ 2	
FDD	Table A.3.3.1-3	R.8 FDD	15	64QAM	3/4	75		≥ 2	
FDD	Table A.3.3.1-3	R.9 FDD	20	64QAM	3/4	100		≥ 3	
FDD	Table A.3.3.1-3a	R.6-1 FDD	5	64QAM	3/4	18		≥ 1	_
FDD	Table A.3.3.1-3a	R.7-1 FDD	10	64QAM	3/4	17		≥ 1	
FDD	Table A.3.3.1-3a	R.8-1 FDD	15	64QAM	3/4	17		≥ 1	_
FDD	Table A.3.3.1-3a	R.9-1 FDD	20	64QAM	3/4	17		≥ 1	
FDD	Table A.3.3.1-3a	R.9-2 FDD	20	64QAM	3/4	83		≥ 2	
FDD	Table A.3.3.1-6	R.41 FDD	10	QPSK	1/10	50		≥ 1	
FDD, PDSC	H Performance, S	ingle-antenna	transm	ission (CR	S), Sin	gle PR	B (Cha	annel e	edge)
FDD	Table A.3.3.1-4	R.0 FDD	3	16QAM	1/2	1		≥ 1	
FDD	Table A.3.3.1-4	R.1 FDD	10 /	16QAM	1/2	1		≥ 1	
	H Performance, S		20		I	I	R (MR		onfiguration)
FDD, FDSC	Table A.3.3.1-5	R.29 FDD	10	16QAM	1/2			2 1	onngulation
	H Performance: C					<u> </u>		<u> </u>	
				-	0.84-	1		\ -	
FDD	Table A.3.3.1-7	R.49 FDD	20	64QAM	0.87	100		≥ 5	
-	H Performance: C	00 0			offset				
FDD	Table A.3.3.2.1-3	R.60 FDD	10	64QAM		50		≥ 3	
	H Performance, M			· ·	1	1	na port		
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.11-1 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	
	Table A.3.3.2.1-1	R.30-1 FDD	15	16QAM	1/2	75		≥ 2	
FDD	Table A.5.5.2.1-1								
FDD FDD	Table A.3.3.2.1-1	R.35 FDD	10	64QAM	1/2	50		≥ 2	

500			45	040404	0.00	75			[
FDD	Table A.3.3.2.1-1	R.35-2 FDD	15	64QAM	0.39	75		≥ 2	
FDD	Table A.3.3.2.1-1	R.35-3 FDD	10	64QAM	0.39	50		≥ 2	
FDD	Table A.3.3.2.1-2	R.35-4 FDD	10	64QAM	0.47	50		≥ 2	
FDD	Table A.3.3.2.1-2	R.46 FDD	10	QPSK		50		≥ 1	
FDD	Table A.3.3.2.1-2	R.47 FDD	10	16QAM		50		≥ 1	
	CH Performance, N	1		1	1	1	na por		
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	
	CH Performance (U			-	-	-			
FDD	Table A.3.3.3.1-1	R.51 FDD	10	16QAM	1/2	50		≥ 2	
	CH Performance (U			-	-	-RS, n	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	IE specific RS) Four a	ntenna po	rts (CS	I-RS)			I
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)		1	-	
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	
TDD, PDS	CH Performance, S	ingle-antenna	transm	ission (CR	S), Sin	gle PR	B (Cha	nnel e	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		ission (CR	S). Sin	gle PR	B (MB	SFN C	onfiguration)
TDD	Table A.3.4.1-5	R.29 TDD	10	16QAM	1/2	1		≥ 1	
· · · · ·			-		I	1	I		L

TDD, PDS	CH Performance: C	arrier aggrega	ation wit	h power i	mbalan	се		
TDD	Table A.3.4.1-7	R.49 TDD	20	64QAM	0.81- 087	100	≥ 5	
TDD, PDS	CH Performance, N	lulti-antenna t	ransmis	sion (CRS		antenna p	orts	
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	
TDD, PDS	CH Performance, N				6), Four	antenna	ports	
TDD	Table A.3.4.2.2-1	R.12 TDD	1.4	QPSK	1/3	6	≥ 1	
TDD	Table A.3.4.2.2-1	R.13 TDD	10	QPSK	1/3	50	≥ 1	
TDD	Table A.3.4.2.2-1	R.14 TDD	10	16QAM	1/2	50	≥ 2	
TDD	Table A.3.4.2.2-1	R.14-1 TDD	10	16QAM	1/2	6	≥ 1	
TDD	Table A.3.4.2.2-1	R.14-2 TDD	10	16QAM	1/2	3	≥ 1	
TDD	Table A.3.4.2.2-1	R.43 TDD	20	16QAM	1/2	100	≥2	
TDD	Table A.3.4.2.2-1	R.36 TDD	10	64QAM	1/2	50	≥ 2	
TDD, PDS	CH Performance, S	ingle antenna	port (D	RS)	1			
TDD	Table A.3.4.3.1-1	R.25 TDD	10	QPSK	1/3	50	≥ 1	
TDD	Table A.3.4.3.1-1	R.26 TDD	10	16QAM	1/2	50	≥ 2	
TDD	Table A.3.4.3.1-1	R.26-1 TDD	5	16QAM	1/2	25	≥ 1	
TDD	Table A.3.4.3.1-1	R.27 TDD	10	64QAM	3/4	50	≥ 2	
TDD	Table A.3.4.3.1-1	R.27-1 TDD	10	64QAM	3/4	18	≥ 1	
TDD	Table A.3.4.3.1-1	R.28 TDD	10	16QAM	1/2	1	≥ 1	
TDD, PDS	CH Performance, T	wo antenna po	orts (DR	S)				
TDD	Table A.3.4.3.2-1	R.31 TDD	10	QPSK	1/3	50	≥ 1	
TDD	Table A.3.4.3.2-1	R.32 TDD	10	16QAM	1/2	50	≥ 2	
TDD	Table A.3.4.3.2-1	R.32-1 TDD	5	16QAM	1/2	[25]	≥ 1	
TDD	Table A.3.4.3.2-1	R.33 TDD	10	64QAM	3/4	50	≥ 2	
TDD	Table A.3.4.3.2-1	R.33-1 TDD	10	64QAM	3/4	[18]	≥ 1	
TDD	Table A.3.4.3.2-1	R.34 TDD	10	64QAM	1/2	50	≥ 2	
TDD, PDS	CH Performance (U	E specific RS) Two ar	ntenna por	rts (CSI	-RS)		
TDD	Table A.3.4.3.3-1	R.51 TDD	10	16QAM	1/2	50	≥ 2	
TDD, PDS	CH Performance (U	E specific RS) Two ar	ntenna por	rts (CSI	-RS, non	Quasi Co-	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) Four a	-	rts (CS	I-RS)		
TDD	Table A.3.4.3.4-1	R.44 TDD	10	64QAM	1/2	50	≥ 2	
TDD	Table A.3.4.3.4-1	R.48 TDD	10	QPSK		50	≥ 1	

TDD, PDS	CH Performance (U	E specific RS) Eight a	antenna po	orts (CS	il-RS)		
TDD	Table A.3.4.3.5-1	R.50 TDD	10	QPSK	1/3	50	≥ 1	
TDD	Table A.3.4.3.5-2	R.45 TDD	10	16QAM	1/2	50	≥ 2	
TDD	Table A.3.4.3.5-2	R.45-1 TDD	10	16QAM	1/2	39	≥ 1	
FDD, PDC	CH / PCFICH Perfo	rmance					·	
FDD	Table A.3.5.1-1	R.15 FDD	10	PDCCH				
FDD	Table A.3.5.1-1	R.15-1 FDD	10	PDCCH				
FDD	Table A.3.5.1-1	R.15-2 FDD	10	PDCCH				
FDD	Table A.3.5.1-1	R.16 FDD	10	PDCCH				
FDD	Table A.3.5.1-1	R.17 FDD	5	PDCCH				
TDD, PDC	CH / PCFICH Perfo	rmance	-	1	ī.			
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				
), PHICH Performar	nce	-		1			1
FDD / TDD	Table A.3.6-1	R.18	10	PHICH				
FDD / TDD	Table A.3.6-1	R.19	10	PHICH				
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/			
FDD / TDD	Table A.3.7-1	R.23	1.4	QPSK	40/ 1920			
FDD, PMC	H Performance							
FDD	Table A.3.8.1-1	R.40 FDD	1.4	QPSK	1/3	6	≥ 1	
FDD	Table A.3.8.1-1	R.37 FDD	10	QPSK	1/3	50	≥ 1	
FDD	Table A.3.8.1-2	R.38 FDD	10	16QAM	1/2	50	≥ 1	
FDD	Table A.3.8.1-3	R.39-1 FDD	5	64QAM	2/3	25	≥ 1	
FDD	Table A.3.8.1-3	R.39 FDD	10	64QAM	2/3	50	≥ 2	
TDD, PMC	H Performance		-		1			1
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	-						1
FDD	Table A.3.9.1-1	R.31-1 FDD	10	64QAM	0.40 0.59-		≥ 1	
FDD	Table A.3.9.1-1	R.31-2 FDD	10	64QAM	0.64		≥ 2	
FDD	Table A.3.9.1-1	R.31-3 FDD	20	64QAM	0.62		≥ 2	
FDD	Table A.3.9.1-1	R.31-3A FDD	10	64QAM	0.85- 0.90		≥ 2	
FDD	Table A.3.9.1-1	R.31-3C FDD	15	64QAM	0.87- 0.91		≥ 3	
FDD	Table A.3.9.1-1	R.31-4 FDD	20	64QAM	0.87- 0.90		≥ 3	
FDD	Table A.3.9.1-1	R.31-4B FDD	15	64QAM	0.85-		≥ 4	

					0.88			
			45		0.85-			
FDD	Table A.3.9.1-1	R.31-5 FDD	15	64QAM	0.91		≥ 3	
TDD, Sus	tained data rate (CF Table A.3.9.2-1	R.31-1 TDD	10	64QAM	0.40		≥ 1	
TDD	Table A.3.9.2-1	R.31-1 TDD R.31-2 TDD	10	64QAM	0.40		≥ 1 ≥ 2	
					0.64 0.59-			
TDD	Table A.3.9.2-1	R.31-3 TDD	20	64QAM	0.62		≥ 2	
TDD	Table A.3.9.2-1	R.31-3A TDD	15	64QAM	0.90		≥ 2	
TDD	Table A.3.9.2-1	R.31-4 TDD	20	64QAM	0.87- 0.90		≥ 3	
FDD, Sus	tained 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, Sus	tained data rate tes	t with EPDCCI	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.

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					W. 3 sym	bols alloc	cated to
PDCCH for 5 MHz and 3 MHz. 4 s							
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)						

Table A.3.2-1: Fixed Reference Channel for Receiver Requirements (FDD)

Parameter	Unit			Va	lue		
Channel Bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
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		≥ 1	≥ 1	≥ 1	≥1	≥1	≥ 1
Note 1:For normal subframes(0,4,5,9), 2 s channel BW; 3 symbols allocated for 1.4 MHz. For special subframeNote 2:For 1.4MHz, no data shall be sche insufficient PDCCH performance	to PDCCH for (1&6), only 2 eduled on spec	5 MHz a OFDM sy cial subfra	nd 3 MHz ymbols a ames(1&0	z; 4 symb re allocat 6) to avoi	ols alloca ed to PD d probler	ated to PI CCH for a ns with	DCCH
Note 3: Reference signal, Synchronization Note 4: If more than one Code Block is pre- each Code Block (otherwise L = 0 Note 5: As per Table 4.2-2 in TS 36.211 [4]	esent, an addi Bit).						ed to

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				nnel BW. 3	symbols a	llocated to	PDCCH
for 5 MHz and 3 MHz. 4 symbols a							
Note 2: Reference signal, Synchronization	signals and F	PBCH alloc	ated as pe	r TS 36.21	1 [4].		

Table A.3.2-3: Fixed Reference Channel for Maximum input level for UE Categories ≥ 3 (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			Va	lue		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	18	17	17	17
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	2984	8504	10296	10296	10296	10296
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	6456	8248	10296	10296	10296
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame							
(Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	2	2	2	2	2
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		N/A	2	2	2	2	2
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	13608	14076	14076	14076
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	N/A	8820	11088	14076	14076	14076
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	9079.6	9266.4	9266.4	9266.4
Note 1: 2 symbols allocated to PDCCH fo	r 20 MHz, 15 M	MHz and 10) MHz char	nnel BW. 3	symbols a	llocated to	PDCCH
for 5 MHz and 3 MHz. 4 symbols							
Note 2: Reference signal, Synchronization							
Note 3. If more than one Code Block is pr	esent an addi	tional CRC	sequence	of $I = 24 F$	Rits is attac	ched to eac	h 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
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.3.2-3b: 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 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	eduled on spec	cial subfrar	nes(1&6) to	o avoid pro	blems with	insufficien	t PDCCH
performance.				TO 00 04			
Note 3: Reference signal, Synchronization						h a al 4 a	h Cada
Note 4: If more than one Code Block is pre	esent, an addi	tional CRC	sequence	of $L = 24 E$	sits is attac	med to eac	n Coae
Block (otherwise L = 0 Bit).	11						
Note 5: As per Table 4.2-2 in TS 36.211 [4	+j.						

Table A.3.2-4: Fixed Reference Channel for Maximum input level for UE Categories ≥ 3 (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 s							
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	eduled on spec	cial subfrar	nes(1&6) to	o avoid pro	blems with	Insufficien	t PDCCH
performance.				- TO 00 04	4 [4]		
Note 3: Reference signal, Synchronization Note 4: If more than one Code Block is pre-						had to can	h Codo
Block (otherwise $L = 0$ Bit).	esent, an audi		sequence	01 L = 24 E	סווש וש מוומט		
Note 5: As per Table 4.2-2 in TS 36.211 [4	11						

Table A.3.2-4a: Fixed Reference Channel for Maximum input level for UE Category 1 (TDD)

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	
Uplink-Downlink Configuration (Note 5)		1	1	1	1	1	1	
Allocated subframes per Radio Frame		2	3+2	3+2	3+2	3+2	3+2	
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM	
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4	
Number of HARQ Processes	Processes	7	7	7	7	7	7	
Maximum number of HARQ transmissions		1	1	1	1	1	1	
Information Bit Payload per Sub-Frame								
For Sub-Frames 4,9	Bits	2984	8504	14112	30576	46888	51024	
For Sub-Frames 1,6	Bits	N/A	6968	11448	23688	35160	39232	
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	
For Sub-Frame 0	Bits	N/A	6968	12576	30576	45352	51024	
Transport block CRC	Bits	24	24	24	24	24	24	
Number of Code Blocks per Sub-Frame								
(Note 4)								
For Sub-Frames 4,9		1	2	3	5	8	9	
For Sub-Frames 1,6		N/A	2	3	5	7	7	
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A	
For Sub-Frame 0		N/A	2	3	5	8	9	
Binary Channel Bits per Sub-Frame								
For Sub-Frames 4,9	Bits	4104	11340	18900	41400	62100	68724	
For Sub-Frames 1,6		N/A	9828	16668	33768	50868	56340	
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	
For Sub-Frame 0	Bits	N/A	9252	16380	39312	60012	66636	
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	23154	
 Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance. 								
Note 3:Reference signal, SynchronizationNote 4:If more than one Code Block is problemBlock (otherwise L = 0 Bit).Note 5:As per Table 4.2-2 in TS 36.211 [4]	esent, an addi					hed to eac	h Code	

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			Value		
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					bols allocated	
to PDCCH for 5 MHz and 3 MHz;						
Note 2: Reference signal, synchronization						
Note 3: If more than one Code Block is pre		tional CR	C seque	nce of L = 24 Bits i	s 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	R.3		
				FDD	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	or 20 MHz, 15	MHz and	10 MI	Iz channel	BW; 3 sym	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 p		itional CR	C sec	quence of L	. = 24 Bits i	s attache	ed to
each Code Block (otherwise L = 0) Bit).						

Table A.3.3.1-3: Fixed Reference Channel 64QAM R=3/4

Parameter	Unit	Value					
Reference channel			R.5	R.6	R.7	R.8	R.9 FDD
			FDD	FDD	FDD	FDD	
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Allocated subframes per Radio Frame			9	9	9	9	9
Modulation		64QAM	64QAM	64QAM	64QAM	64QAM	64QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		8504	14112	30576	46888	61664
For Sub-Frame 5	Bits		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits		6456	12576	28336	45352	61664
Number of Code Blocks per Sub-Frame							
(Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9			2	3	5	8	11
For Sub-Frame 5			N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0			2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		11340	18900	41400	62100	82800
For Sub-Frame 5	Bits		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits		8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	Mbps		7.449	12.547	27.294	42.046	55.498
UE Category			≥ 1	≥ 2	≥ 2	≥ 2	≥ 3
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH							
for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz.							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4].							
Note 3. If more than one Code Block is present, an additional CRC sequence of $I = 24$ 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	Value					
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, synchronization signals and PBCH allocated as per TS 36.211 [4].							
Note 3: Localized allocation started from RB #0 is applied.							
Note 4 If more than one Code Block is present an additional CRC sequence of L = 24 Bits is attached to each							

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:

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		
Note 1: 2 symbols allocated to PDCCH for PDCCH for 5 MHz and 3 MHz; 4 Note 2: Reference signal, synchronizatio Note 3: If more than one Code Block is p Code Block (otherwise L = 0 Bit).	symbols allocan signals and for a signals and for a signal	ated to PI PBCH allo	DCCH for 1. ocated as pe	4 MHz. er TS 36.2	211 [4].		

	Parameter	Unit	Value				
Referenc	e channel	•	R.29 FDD				
			(MBSFN)				
Channel bandwidth		MHz	10				
Allocated	resource blocks		1				
MBSFN (Configuration (Note 3)		111111				
Allocated	subframes per Radio Frame		3				
Modulatio	n		16QAM				
Target Co	oding Rate		1/2				
Informatio	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	Number of Code Blocks per Sub-Frame						
(Note 4)							
For Sub-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 Category ≥ 1							
Note 1:							
Note 2: Reference signal, synchronization signals and PBCH							
allocated as per TS 36.211 [4].							
Note 3: MBSFN Subframe Allocation as defined in [7], one frame							
	with 6 bits is chosen for MBSFN subframe allocation.						
Note 4:	Note 4: If more than one Code Block is present, an additional						
	CRC sequence of $L = 24$ Bits is attached to each Code						
Block (otherwise $L = 0$ Bit).							

Table A.3.3.1-5: 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 to PDCCH for 5 MHz and 3 MHz; Note 2: Reference signal, synchronization	4 symbols all	ocated to	PDCCH	for 1.4 N	IHz.	bols allo	ocated		
Note 3: If more than one Code Block is p									

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 Frame		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	Bits	63776				
For Sub-Frame 5	Bits	N/A				
Number of Code Blocks per Sub-Frame (Note 3)						
For Sub-Frames 0,1,2,3,4,6,7,8,9	Code Blocks	11				
For Sub-Frame 5	Code Blocks	N/A				
Binary Channel Bits Per Sub-Frame						
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 Block (otherwise L = 0 Bit). 						

A.3.3.2 Multi-antenna transmission (Common Reference Symbols)

A.3.3.2.1 Two antenna ports

Table A.3.3.2.1-1: Fixed Reference Channel two antenna ports
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Parameter	Unit						Val	ue					
Reference channel		R.10 FDD	R.11 FDD	R.11-1 FDD	R.11- 2 FDD	R.11- 3 FDD Note 5	R.11- 4 FDD	R.30 FDD	R.30- 1 FDD	R.35- 1 FDD	R.35 FDD	R.35- 2 FDD	R.35-3 FDD
Channel bandwidth	MHz	10	10	10	5	10	10	20	15	20	10	15	10
Allocated resource blocks (Note 4)		50	50	50	25	40	50	100	75	100	50	75	50
Allocated subframes per Radio Frame		9	9	8	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 4)	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
UE Category		≥1	≥2	≥2	≥ 1	≥ 1	≥ 1	≥ 2	≥2	4	≥2	≥ 2	≥ 2
Note 1: 2 symb MHz; 4 Note 2: Refere Note 3: If more L = 0 E	l symbols ince sign than on Bit). per comp	s allocate al, synchi e Code B ponent ca	d to PDCC onization s lock is pre	H for 1.4 N signals and sent, an ac	/Hz. J PBCH a Iditional (allocated CRC seq	as per TS	6 36.211	[4].		to PDCCH	for 5 MH	

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

Parameter	Unit									
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 MH	Iz and 10 N	IHz channe	I BW; 3	symbols	allocated	to PDCCH	for 5 MHz	
and 3 MHz; 4 symbols allocate										
Note 2: Reference signal, synchroniza										
Note 3: If more than one Code Block i	s present,	an additio	nal CRC se	quence of	L = 24 B	its is att	ached to e	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

Parameter	Unit	Value						
Reference channel		R.60 FDD						
Channel bandwidth	MHz	10						
Number of CRS ports		2						
Allocated resource blocks		50						
Allocated subframes per Radio Frame		8						
Modulation		64QAM						
Coding Rate								
For Sub-Frame 1,2,3,4,6,7,8,9,		0.54						
For Sub-Frame 5		n/a						
For Sub-Frame 0		n/a						
Information Bit Payload								
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	21384						
For Sub-Frame 5	Bits	n/a						
For Sub-Frame 0	Bits	n/a						
Number of Code Blocks per Sub-Frame								
(Note 3)								
For Sub-Frames 1,2,3,4,6,7,8,9	Code	4						
	Blocks							
For Sub-Frame 5	Code	n/a						
	Blocks							
For Sub-Frame 0	Code	n/a						
	Blocks							
Binary Channel Bits Per Sub-Frame (Note								
4)	-							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	39600						
For Sub-Frame 5	Bits	n/a						
For Sub-Frame 0	Bits	n/a						
Max. Throughput averaged over 1 frame (Note 4)	Mbps	17.11						
UE Category		≥ 3						
Note 1: 2 symbols allocated to PDCCH.		20						
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS								
36.211 [4].								
Note 3: If more than one Code Block is present, an additional CRC sequence of								
L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).								
Note 4: Given per component carrier per codeword.								

Table A.3.3.2.1-3: PCell and SCell Fixed Reference Channel for NC CA demodulation with timing offset and power imbalance

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 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, synchroniz					S 36.211 [4	4].			
Note 3: If more than one Code Block							d to each C	ode	
Block (otherwise L = 0 Bit).		•		•					
	e 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					
Reference	e channel		R.51 FDD					
	bandwidth	MHz	10					
Allocated	l resource blocks		50 (Note 3)					
	I subframes per Radio Frame		9					
Modulatio			16QAM					
Target C	oding Rate		1/2					
	on Bit Payload							
For Sub	-Frames 1,4,6,9	Bits	11448					
For Sub	-Frames 2,3,7,8	Bits	11448					
For Sub	-Frame 5	Bits	N/A					
For Sub	-Frame 0	Bits	9528					
Number	of Code Blocks (Note 4)							
For Sub	-Frames 1,4,6,9	Code	2					
		blocks						
For Sub	-Frames 2,3,7,8	Code	2					
		blocks						
	-Frame 5	Bits	N/A					
For Sub	-Frame 0	Bits	2					
	hannel Bits							
	-Frames 1,4,6,9	Bits	24000					
	-Frames 2,7		23600					
	-Frames 3,8		23200					
	-Frame 5	Bits	N/A					
	-Frame 0	Bits	19680					
	oughput averaged over 1	Mbps	10.1112					
frame								
UE Cate			≥ 2					
Note 1:	2 symbols allocated to PDCC							
Note 2:	Reference signal, synchroniz		s and PBCH					
Nata 0.	allocated as per TS 36.211 [4].							
Note 3: 50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and								
	RB30–RB49) are allocated in sub-frame 0.							
Note 4:	If more than one Code Block							
11010 -	CRC sequence of $L = 24$ Bits							
	Block (otherwise $L = 0$ Bit).							
Dioon (Otherwise L = 0 Dit).								

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	16QAM					
Target Coding Rate		1/2	1/2	1/2					
Information Bit Payload									
For Sub-Frames 1,3,4,6,8,9	Bits	18336	18336	11448					
For Sub-Frames 2,7	Bits	16416	16416	11448					
For Sub-Frame 5	Bits	n/a	n/a	n/a					
For Sub-Frame 0	Bits	14688	14688	9528					
Number of Code Blocks (Note 4)									
For Sub-Frames 1,3,4,6,8,9	Code	3	3	2					
	blocks								
For Sub-Frames 2, 7	Code	3	3	2					
	blocks								
For Sub-Frame 5	Bits	n/a	n/a	n/a					
For Sub-Frame 0	Bits	3	3	2					
Binary Channel Bits									
For Sub-Frames 1,3,4,6,8,9	Bits	36000	36000	24000					
For Sub-Frames 2,7		34200	33600	22800					
For Sub-Frame 5	Bits	n/a	n/a	n/a					
For Sub-Frame 0	Bits	29520	29520	19680					
Max. Throughput averaged over 1	Mbps	15.7536	15.7536	10.1112					
frame									
Note 1: 2 symbols allocated to PDCCH									
Note 2: Reference signal, synchroniza									
,	RB20 and RB30–RB49) are allocated in sub-frame 0.								
Note 4: If more than one Code Block is each Code Block (otherwise L		an additional CRC s	sequence of L = 24 Bi	ts is attached to					

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 PDCC									
Note 2: Reference signal, synchroniz	ation signa	ls and PBCH a	allocated as pe	r TS 36.211					
[4].									
	50 resource blocks are allocated in sub-frames 1, 2, 3, 4, 6, 7, 8, 9 and 41 resource blocks (RB0–RB20 and RB30–RB49) are allocated in sub-frame 0.								
Note 4: If more than one Code Block									
Bits is attached to each Code									

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 F	rame		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 s	subframe)	Bits	3624	11448	8760
For Sub-Frames (CSI-RS subfra	ame)	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 s	subframe)		1	2	2
For Sub-Frames (CSI-RS subfra	ame)		1	2	2
For Sub-Frames (ZeroPowerCS	I-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-Frai	me				
For Sub-Frames (Non CSI-RS s	subframe)	Bits	12000	24000	18720
For Sub-Frames (CSI-RS subfra		Bits	11600	23200	18096
For Sub-Frames (ZeroPowerCS	I-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 P	DCCH for 5	MHz and 3 MH	lz; 4 symbols a	llocated to P	DCCH
for 1.4 MHz			-		
Note 2: Reference signal, sync					
Note 3: For R.44 and R.45, 50					
41 resource blocks (RI					
R.45-1, 39 resource bl	ocks are allo	cated in all sub	oframes (RB0-l	RB20 and RI	330–
RB47).					
Note 4. If more than one Code	Block is pre-	sent an additic	nal CRC sequ	ence of $I = 2$	24 Rits is

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)

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

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

TDD TDD TDD TDD Channel bandwidth MHz 1.4 20 11 Allocated resource blocks (Note 6) 6 100 50 Uplink-Downlink Configuration (Note 4) 1 1 1 Allocated subframes per Radio Frame (D+S) 3 3+2 3+ Modulation QPSK QPSK QP Target Coding Rate 1/3 1/3 1/ Information Bit Payload (Note 6) 1 1 1 For Sub-Frames 4,9 Bits 408 8760 439 For Sub-Frames 1,6 Bits N/A 7736 329 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 1 2 1 For Sub-Frames 1,6 N/A 2 1 For Sub-Frame 5 N/A N/A N/A For Sub-Frame 6 1 2 1 Binary Channel Bits (Note	.2					
TDD TDD TDD TDD Channel bandwidth MHz 1.4 20 11 Allocated resource blocks (Note 6) 6 100 50 Uplink-Downlink Configuration (Note 4) 1 1 1 Allocated subframes per Radio Frame (D+S) 3 3+2 3+ Modulation QPSK QPSK QP Target Coding Rate 1/3 1/3 1/ Information Bit Payload (Note 6) 1 1 1 For Sub-Frames 4,9 Bits 408 8760 433 For Sub-Frames 1,6 Bits N/A 7736 32 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 6 N/A 1 2 1 For Sub-Frame 5 N/A N/A N/A N/A For Sub-Frame 5 N/A N/A N/A N/A For Sub-Frame 6 1 2 1	··-					
Allocated resource blocks (Note 6) 6 100 55 Uplink-Downlink Configuration (Note 4) 1 1 1 1 Allocated subframes per Radio Frame (D+S) 3 3+2 3+ Modulation QPSK QPSK QP Target Coding Rate 1/3 1/3 1/ Information Bit Payload (Note 6) 1 1 1 For Sub-Frames 4,9 Bits 408 8760 43: For Sub-Frames 1,6 Bits N/A 7736 32: For Sub-Frame 5 Bits N/A N/A N/A Number of Code Blocks 0 43: 1 2 1 (Notes 5 and 6) 1 2 1 1 2 1 For Sub-Frames 1,6 N/A 2 1 1 2 1 For Sub-Frames 1,6 N/A 2 1 1 2 1 For Sub-Frame 0 1 2 1 1 2 1 B	DD					
Uplink-Downlink Configuration (Note 4) 1	0					
Allocated subframes per Radio Frame (D+S) 3 3+2 3+ Modulation QPSK QPSK QPSK QP Target Coding Rate 1/3 1/3 1/ Information Bit Payload (Note 6) 1/3 1/3 1/ For Sub-Frames 4,9 Bits 408 8760 433 For Sub-Frames 1,6 Bits N/A 7736 324 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 Bits 208 8760 433 Number of Code Blocks 1 2 1 (Notes 5 and 6) 1 2 1 For Sub-Frames 1,6 N/A N/A N/A For Sub-Frame 5 N/A N/A N/A For Sub-Frame 5 N/A N/A N/A For Sub-Frame 0 1 2 1 Binary Channel Bits (Note 6) 1 2 1 For Sub-Frames 1,6 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A N/A 142 For	50					
Modulation QPSK QPSK QPSK QP Target Coding Rate 1/3 1/3 1/3 1/1 Information Bit Payload (Note 6) 1/3 1/3 1/3 1/1 For Sub-Frames 4,9 Bits 408 8760 433 For Sub-Frames 1,6 Bits N/A 7736 324 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 Bits 208 8760 433 Number of Code Blocks I 2 1	1					
Target Coding Rate 1/3 1/3 1/3 1/3 Information Bit Payload (Note 6) <t< td=""><td>+2</td></t<>	+2					
Information Bit Payload (Note 6) Image: Mark text of the system Mark text of tex of text of text of tex of text of tex of tex of tex	PSK					
For Sub-Frames 4,9 Bits 408 8760 439 For Sub-Frames 1,6 Bits N/A 7736 320 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 Bits 208 8760 439 Number of Code Blocks Image: Code Blocks	/3					
For Sub-Frames 1,6 Bits N/A 7736 32- For Sub-Frame 5 Bits N/A N/A N/A N/A For Sub-Frame 0 Bits 208 8760 43- Number of Code Blocks Image: Comparison of Code Blocks Image: Code Blocks Image: Code Blocks Image: Code Blocks Image: Code Blocks Ima						
For Sub-Frames 1,6 Bits N/A 7736 32- For Sub-Frame 5 Bits N/A N/A N/A N/A For Sub-Frame 0 Bits 208 8760 43- Number of Code Blocks Image: Comparison of Code Blocks Image: Code Blocks Image: Code Blocks Image: Code Blocks Image: Code Blocks Ima	392					
For Sub-Frame 0 Bits 208 8760 439 Number of Code Blocks (Notes 5 and 6) 1 2 1 For Sub-Frames 4,9 1 2 1 For Sub-Frames 1,6 N/A 2 1 For Sub-Frames 5 N/A N/A N/ For Sub-Frame 0 1 2 1 Binary Channel Bits (Note 6) 1 2 1 For Sub-Frames 1,6 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A N/A N/ For Sub-Frames 1,6 Bits N/A 2656 112 For Sub-Frames 1,6 Bits N/A N/A N/ For Sub-Frames 1,6 Bits N/A N/A N/ For Sub-Frame 5 Bits N/A N/A N/ For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9	240					
Number of Code Blocks (Notes 5 and 6) 1 2 1 For Sub-Frames 4,9 1 2 1 For Sub-Frames 1,6 N/A 2 1 For Sub-Frames 5 N/A 1 2 1 For Sub-Frame 5 N/A N/A N/ For Sub-Frame 0 1 2 1 Binary Channel Bits (Note 6) 1 2 1 For Sub-Frames 4,9 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A 2656 112 For Sub-Frame 5 Bits N/A N/ N/ For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9	I/A					
(Notes 5 and 6) 1 2 1 For Sub-Frames 4,9 1 2 1 For Sub-Frames 1,6 N/A 2 1 For Sub-Frame 5 N/A N/A N/A For Sub-Frame 0 1 2 1 Binary Channel Bits (Note 6) 1 2 1 For Sub-Frames 4,9 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A 22656 112 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9	392					
For Sub-Frames 4,9 1 2 1 For Sub-Frames 1,6 N/A 2 1 For Sub-Frame 5 N/A N/A N/A For Sub-Frame 0 1 2 1 Binary Channel Bits (Note 6) 1 2 1 For Sub-Frames 4,9 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A 22656 112 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9						
For Sub-Frames 1,6 N/A 2 1 For Sub-Frame 5 N/A N/A N/A For Sub-Frame 0 1 2 1 Binary Channel Bits (Note 6) 1 2 1 For Sub-Frames 4,9 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A 22656 112 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9						
For Sub-Frame 5 N/A N/A N/A For Sub-Frame 0 1 2 1 Binary Channel Bits (Note 6) 1 2 1 For Sub-Frames 4,9 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A N/A 12 For Sub-Frames 1,6 Bits N/A 2656 112 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9	1					
For Sub-Frame 0 1 2 1 Binary Channel Bits (Note 6)	1					
Binary Channel Bits (Note 6) Image: Channel Bits (Note 6) For Sub-Frames 4,9 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A 22656 112 For Sub-Frame 5 Bits N/A N/A N/ For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9	I/A					
For Sub-Frames 4,9 Bits 1368 27600 138 For Sub-Frames 1,6 Bits N/A 22656 112 For Sub-Frame 5 Bits N/A N/A N/A For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9	1					
For Sub-Frames 1,6 Bits N/A 22656 112 For Sub-Frame 5 Bits N/A N/A N/ For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9						
For Sub-Frame 5BitsN/AN/AFor Sub-Frame 0Bits67226904131Max. Throughput averaged over 1 frameMbps0.1024.1751.9	800					
For Sub-Frame 0 Bits 672 26904 131 Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9	256					
Max. Throughput averaged over 1 frame Mbps 0.102 4.175 1.9	I/A					
	104					
	966					
(Note 6)						
UE Category ≥ 1 ≥ 1 ≥						
Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3	3					
symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to						
PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to)					
PDCCH.						
Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to						
zero (no scheduling) to avoid problems with insufficient PDCCH performance at						
the test point.						
Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.21	1					
[4].						
Note 4: As per Table 4.2-2 in TS 36.211 [4].						
Note 5: If more than one Code Block is present, an additional CRC sequence of $L = 24$ Bits is attached to each Code Block (otherwise $L = 0$ Bit).						
Note 6: Given per component carrier per codeword.						

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

Parameter	Unit			Va	lue		
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	ie 1&6, on	ly 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 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 allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH. Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: As per Table 4.2-2 TS 36.211 [4]. Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). 							

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

Parameter	Unit			Va	lue		
Reference channel			R.6-1	R.7-1	R.8-1	R.9-1	R.9-2
			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							
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 allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols							symbols
are allocated to PDCCH.							
Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [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			Val	ue		
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	gory ≥1 ≥1						
Note 1: 2 symbols allocated to PDCCH for 2							
PDCCH for 5 MHz and 3 MHz; 4 syr		ated to PE	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].				<i>.</i>			
Note 4: If more than one Code Block is pres	ent, an ado	ditional CR	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 Sin	gle PRB
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	Parameter	Unit	Value
Referenc	e channel		R.29 TDD
			(MBSFN)
Channel	bandwidth	MHz	10
Allocated	resource blocks		1
MBSFN (Configuration (Note 3)		010010
Uplink-Do	ownlink Configuration (Note 4)		1
Allocated	subframes per Radio Frame (D+S)		1+2
Modulatio	ก		16QAM
Target Co	oding Rate		1/2
Informatio	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 5)	-		
For Sub	-Frames 4,9	Bits	0 (MBSFN)
For Sub	-Frames 1,6	Bits	1
For Sub	-Frame 5	Bits	N/A
	-Frame 0	Bits	1
Binary Ch	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. Thre	oughput averaged over 1 frame	kbps	67.2
UE Categ			≥ 1
Note 1:	2 symbols allocated to PDCCH.		
Note 2:	Reference signal, synchronization s	ignals and	PBCH allocated as
	per TS 36.211 [4].		
Note 3:	MBSFN Subframe Allocation as def		one frame with 6
	bits is chosen for MBSFN subframe		
Note 4:	as per Table 4.2-2 in TS 36.211 [4].		
Note 5:	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			Va	alue		
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	20 MHz, 15 I	MHz and	10 MHz (channel	BW; 3 sym	bols allo	cated
to PDCCH for 5 MHz and 3 MHz; 4	symbols allo	ocated to	PDCCH	for 1.4 N	IHz. For su	Ibframe	1&6,
only 2 OFDM symbols are allocate							
Note 2: For BW=1.4 MHz, the information I					et to zero (i	no scheo	duling)
to avoid problems with insufficient							
Note 3: Reference signal, synchronization		BCH 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		tional CR	C seque	nce of L	= 24 Bits is	s attache	ed to
each Code Block (otherwise $L = 0$	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						
CRC sequence of L = 24 Bits is attached to 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			Uı	nit					Va	lue
Reference channel		R.10 TDD	R.11 TDD	R.11-1 TDD	R.11-2 TDD	R.11-3 TDD Note 6	R.11-4 TDD	R.30 TDD	R.30-1 TDD	R.30-2 TDD
Channel bandwidth	MHz	10	10	10	5	10	10	20	20	20
Allocated resource blocks (Note 5)		50	50	50	25	40	50	100	100	100
Uplink-Downlink Configuration (Note 3)		1	1	1	1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		3+2	3+2	2+2	3+2	3+2	2	3+2	2+2	2
Modulation		QPSK	16QAM	16QAM	16QAM	16QAM	QPSK	16QAM	16QAM	16QAM
Target Coding Rate		1/3	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
Information Bit Payload (Note 5)										
For Sub-Frames 4,9	Bits	4392	12960	12960	5736	10296	6968	25456	25456	25456
For Sub-Frames 1,6		3240	9528	9528	5160	9144	N/A	22920	21384	N/A
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	4392	12960	N/A	4968	10296	N/A	25456	N/A	N/A
Number of Code Blocks (Notes 4 and 5)										
For Sub-Frames 4,9		1	3	3	1	2	2	5	5	5
For Sub-Frames 1,6		1	2	2	1	2	N/A	4	4	N/A
For Sub-Frame 5		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0		1	3	N/A	1	2	N/A	5	N/A	N/A
Binary Channel Bits (Note 5)										
For Sub-Frames 4,9	Bits	13200	26400	26400	12000	21120	13200	52800	52800	52800
For Sub-Frames 1,6		10656	21312	21312	10512	16992	10656	42912	42912	N/A
For Sub-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Sub-Frame 0	Bits	12528	25056	N/A	10656	19776	12528	51456	N/A	N/A
Max. Throughput averaged over 1 frame (Note 5)	Mbps	1.966	5.794	4.498	2.676	4.918	1.39	12.221	9.368	5.091
UE Category		≥ 1	≥2	≥2	≥ 1	≥ 1	≥1	≥2	≥2	3

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			Val	ue		
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)	D ''	5100	0700				
For Sub-Frames 4,9	Bits	5160	8760	18336			
For Sub-Frames 1,6	Dit	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)							
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		•		1.077			
(Note 5)							
For Sub-Frames 4,9	Bits	13200	26400	39600			
For Sub-Frames 1,6		10656	21312	31968			
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							
frame (Note 5)							
UE Category		≥ 1	≥ 1	≥ 2			
			0 MHz, 15 MH				
			symbols alloca	ted to PDC0	CH for 1.4 N	MHz. For subf	rame 1&6,
		are allocated					
			gnals and PB0	CH allocated	l as per TS	36.211 [4].	
		S 36.211 [4].					
			ent, an additio	nal CRC sec	quence of L	. = 24 Bits is a	ttached to
		rwise L = 0 Bi					
Note 5: Given per co	imponent c	carrier per cod	iewora				

Table A.3.4.2.1-2: Fixed Reference Channel two antenna ports

A.3.4.2.2 Four antenna ports

Parameter	Unit	1			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)		0	012	212	-	2	212	212
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)	<u> </u>		.,,0				.,_	.,_
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	1	1						
(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 fo	or 1.4 MHz. F	or subfram	ne 1&6, onl	y 2 OFDM s	symbols are	9
allocated to PDCCH.							· · ·	
Note 2: For BW=1.4 MHz, the inform					et to zero (no schedulir	ng) to avoid	1
problems with insufficient PDCCH performance at the test point.								
Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4]. Note 4: As per Table 4.2-2 in TS 36.211 [4].								
Note 5: If more than one Code Bloc		ut an additio	nal CRC see	uence of I	– 24 Bite i	s attached t	n each Coc	le Block
(otherwise $L = 0$ Bit).	n is piesei	n, an auullu			- 24 DIG I			
lote 6: Given per component carrier per codeword								

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.					

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 CDM-multiplexed UE specific reference symbols with two cell-specific antenna ports.

Refere	nce channel		R.31 TDD	R.32 TDD	R.32-1 TDD	R.33 TDD	R.33-1 TDD	R.34 TDD
Channel I	bandwidth	MHz	10	10	5	10	10	10
Allocated			50 ⁴	50 ⁴	25 ⁴	50 ⁴	18 ⁶	50 ⁴
blocks					-		-	
Uplink-Do	ownlink		1	1	1	1	1	1
Configura	ation (Note 3)							
Allocated	subframes		3+2	3+2	3+2	3+2	3+2	3+2
per Radio	Frame (D+S)							
Modulatic			QPSK	16QAM	16QAM	64QAM	64QAM	64QAM
	oding Rate		1/3	1/2	1/2	3/4	3/4	1/2
	on Bit Payload							
	-Frames 4,9	Bits	3624	11448	5736	27376	9528	18336
	-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
	of Code Blocks							
per Sub-F	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
	nannel Bits Per							
Sub-Fram		D '/	10000	0.4000	40000		10000	
	-Frames 4,9	Bits	12000	24000	10800	36000	12960	36000
	-Frames 1,6	Dite	7872	15744	6528	23616	10368	23616
	-Frame 5	Bits	N/A	N/A	N/A	N/A	N/A	N/A
	-Frame 0	Bits	9840	19680	7344	29520	12960	29520
Max. Thro		Mbps	1.556	4.79	2.119	11.089	4.354	7.502
	over 1 frame		≥ 1	≥2	> 1	≥2	≥1	≥2
UE Categ			-	_	≥1	_	-	
Note 1:	2 symbols allo allocated to PD							
	For subframe 1							.4 IVINZ.
Note 2:	Reference sign						or TS 36 21	1 [4]
Note 2:	as per Table 4.			griais and		saleu as pe	10 30.21	· [┯].
Note 4:	For R.31, R.32			source blo	cks are all	ocated in si	ub-frames 4	9 and 41
11010 11	resource block							
	DwPTS portion							
	frames 4,9 and							
	0 and the DwP					,		
Note 5:	If more than or					C sequence	e of L = 24 E	Bits is
	attached to eac							
Note 6:	Localized alloc	ation starte	ed from RB	#0 is appli	ied.			

Table A.3.4.3.2-1: Fixed Reference Channel for CDM-multiplexed DM RS
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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.

	Parameter	Unit	Value
Referenc	e channel		R.51 TDD
Channel I	bandwidth	MHz	10
Allocated	resource blocks		50 (Note 5)
	ownlink Configuration (Note 3)		1
	subframes per Radio Frame		3+2
(D+S)	·		
Modulatio	n		16QAM
Target Co	oding Rate		1/2
Informatio	on Bit Payload		
For Sub	-Frames 4,9 (non CSI-RS	Bits	11448
subframe)		
For Sub	-Frame 4,9	Bits	11448
For Sub	-Frames 1,6	Bits	7736
For Sub	-Frame 5	Bits	N/A
For Sub	-Frame 0	Bits	9528
Number of	of Code Blocks		
(Note 4)			
For Sub	-Frames 4, 9 (non CSI-RS	Code	2
subframe)	blocks	
For Sub	-Frames 4,9	Code	2
		blocks	
For Sub	-Frames 1,6	Code	2
		blocks	
	-Frame 5		N/A
For Sub	-Frame 0	Code	2
		blocks	
	nannel 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 Categ	jory		≥2
Note 1:	2 symbols allocated to PDCCH		
Note 2:	Reference signal, synchronizat		s and PBCH
Nete 0	allocated as per TS 36.211 [4].		
Note 3:	as per Table 4.2-2 in TS 36.21		on additional
Note 4:	If more than one Code Block is		
	CRC sequence of $L = 24$ Bits is	s attached	to each Code
Note C.	Block (otherwise $L = 0$ Bit).	مانہ مناہ 4	nomoo 40
Note 5:	50 resource blocks are allocate		
	41 resource blocks (RB0–RB2)		
	allocated in sub-frame 0 and th		portion of
	sub-frames 1,6.		

Table A.3.4.3.3-1: Fixed Reference Channel for CDM-multiplexed DM RS with two CSI-RS antenna ports

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		.,_	=	.,_		
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 PDCCH	Η.	1	1			
Note 2: Reference signal, synchroniza Note 3: as per Table 4.2-2 in TS 36.21	ation signal 11 [4].					
Note 4: If more than one Code Block is attached to each Code Block ((otherwise	L = 0 Bit).				
Note 5: 50 resource blocks are allocat and RB30–RB49) are allocate 6.						

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 Value							
Referenc	e channel	•	R.44 TDD	R.48				
Reference	e chamer			TDD				
Channel	bandwidth	MHz	10	10				
			50 (Note 4)	50 (Note				
Allocated	Allocated resource blocks		50 (Note 4)					
Linkels D	auguliale Configuration		4	4)				
	ownlink Configuration		1	1				
(Note 3)	Loubfrom con or Dodio		2.0	2.2				
	l subframes per Radio		3+2	3+2				
Frame (D			040414	0001/				
Modulatio			64QAM	QPSK				
	oding Rate		1/2					
	on Bit Payload							
	-Frames 4,9 (non CSI-RS	Bits	18336	N/A				
subframe								
	-Frames 4,9 (CSI-RS	Bits	16416	6200				
subframe								
	-Frames 1,6		11832	4264				
For Sub	-Frame 5	Bits	N/A	N/A				
For Sub	-Frame 0	Bits	14688	4968				
Number	of Code Blocks per Sub-							
Frame								
(Note 5)								
For Sub	-Frames 4,9 (non CSI-RS		3	2				
subframe	subframe)							
For Sub-	For Sub-Frames 4,9 (CSI-RS		3	2				
subframe								
For Sub	-Frames 1,6		2	1				
For Sub	-Frame 5		N/A	N/A				
For Sub	-Frame 0		3	1				
	hannel Bits Per Sub-							
Frame								
For Sub	-Frames 4,9 (non CSI-RS	Bits	36000	12000				
subframe								
For Sub-	Frames 4,9 (CSI-RS	Bits	33600	11600				
subframe								
For Sub	-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 Cate	vorv		≥ 2	≥1				
Note 1:	2 symbols allocated to PD	CCH.						
Note 2:	Reference signal, synchro		onals and PBC	Н				
	allocated as per TS 36.211 [4].							
Note 3:								
Note 4:								
-	resource blocks (RB0-RB							
	in sub-frame 0 and the DwPTS portion of sub-frames 1,6.							
Note 5:	If more than one Code Blo							
	sequence of $L = 24$ Bits is attached to each Code Block							
	(otherwise $L = 0$ Bit).							
	· /							

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			
	e channel		R.50 TDD			
	bandwidth	MHz	10			
	resource blocks		50 (Note 4)			
Uplink-Do	ownlink Configuration (Note		1			
3)						
	subframes per Radio		3+2			
Frame (D	0+S)					
Modulatio			QPSK			
Target Co	oding Rate		1/3			
Information	on Bit Payload					
For Sub	-Frames 4,9 (non CSI-RS	Bits	3624			
subframe	e)					
For Sub-	Frames 4,9 (CSI-RS	Bits	3624			
subframe	.)					
For Sub	-Frames 1,6		2664			
	-Frame 5	Bits	N/A			
For Sub	-Frame 0	Bits	2984			
Number of	of Code Blocks per Sub-					
Frame						
(Note 5)						
For Sub	-Frames 4,9 (non CSI-RS		1			
subframe	•)					
For Sub-	Frames 4,9 (CSI-RS		1			
subframe						
For Sub	-Frames 1,6		1			
	-Frame 5		N/A			
	-Frame 0		1			
Binary Cl	nannel Bits Per Sub-Frame					
For Sub	-Frames 4,9 (non CSI-RS	Bits	12000			
subframe						
	Frames 4,9 (CSI-RS	Bits	10400			
subframe		2.10				
	-Frames 1,6	1	7872			
	-Frame 5	Bits	N/A			
	-Frame 0	Bits	9840			
	oughput averaged over 1	Mbps	1.556			
frame		inopo	1.000			
UE Categ	orv		≥ 1			
	2 symbols allocated to PDC	CH.	. – .			
Note 2:			als and PBCH			
11010 2.	allocated as per TS 36.211					
Note 3:	as per Table 4.2-2 in TS 36.					
Note 4:	50 resource blocks are alloc		-frames 4.9 and			
	41 resource blocks (RB0–R	B20 and RI	B30–RB49) are			
	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 $L = 24$ Bi					
	Block (otherwise $L = 0$ Bit).					
BIOCK (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				
Referenc	e channel		R.45	R.45-1			
			TDD	TDD			
	bandwidth	MHz	10	10			
	resource blocks		50 ⁴	39			
	ownlink Configuration (Note 3)		1	1			
	subframes per Radio Frame		4+2	4+2			
(D+S)							
Allocated	subframes per Radio Frame		5	5			
Modulatio			16QAM	16QAM			
	oding Rate		1/2	1/2			
	on Bit Payload						
	-Frames 4 and 9	Bits	N/A	N/A			
	SI-RS subframe)						
	-Frames 4 and 9	Bits	11448	8760			
	S subframe)						
	Frames 1,6	Bits	7736	7480			
	-Frame 5	Bits	N/A	N/A			
	-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			
	-Frame 0		2	2			
	nannel Bits Per Sub-Frame	D'/	N1/A	N1/A			
	-Frames 4 and 9	Bits	N/A	N/A			
	SI-RS subframe)	D'/	00.400	47470			
	-Frames 4 and 9	Bits	22400	17472			
	S subframe)	Dite	45744	14070			
	Frames 1,6	Bits	15744	14976			
	-Frame 5	Bits	N/A	N/A			
	-Frame 0	Bits	19680	18720			
	oughput averaged over 1 frame	Mbps	4.7896	4.1240			
UE Cateo			≥ 2	≥1			
Note 1:	2 symbols allocated to PDCCH for						
	BW; 3 symbols allocated to PDCCI allocated to PDCCH for 1.4 MHz. F						
	symbols are allocated to PDCCH of 1.4 MHz. r	or subiranie i	ao, only 2 OF	Divi			
Note 2:	Reference signal, synchronization	signals and PF	RCH allocated	as per TS			
NOLE Z.	36.211 [4].	Signais and FL		as per 13			
Note 3:	As per Table 4.2-2 in TS 36.211 [4	1					
Note 4:	For R.45, 50 resource blocks are a		-frames 4 9 a	nd 41			
1010 4.	resource blocks (RB0–RB20 and R						
	frame 0 and the DwPTS portion of						
	resource blocks are allocated in su						
	of sub-frames 1,6 (RB0–RB20 and						
Note 5:				luence of			
11010 0.	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 R			,-			
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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

Parameter	Unit	Value							
Reference channel		R.18	R.19	R.20	R.24				
Number of transmitter antennas		1	2	4	1				
Channel bandwidth	MHz	10	10	5	10				
User roles (Note 1)		W I1 I2	W I1 I2	W I1 I2	W I1				
Resource allocation (Note 2)	te 2) (0,0) (0,1) ((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	A R R	A R				
Note 1: W=wanted user, I1=interf Note 2: The resource allocation p Note 3: The power offsets (per us relative to the first interference)	er user is ger) 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		Value						
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		1			1				
Subframe (Note 3)									
Binary Channel Bits Per Subframe									
For Sub-Frames 1,2,3,6,7,8	Bits	1224			10200				
For Sub-Frames 0,4,5,9	Bits	N/A			N/A				
MBMS UE Category		≥ 1			≥ 1				
Note 1: For FDD mode, up to 6 su 36.331.	ıbframes (#	±1/2/3/6/7/8) ar	e avail	able fo	r MBMS, in lin	ne with	TS		
Note 2: 2 OFDM symbols are rese 36.211.	erved for P	DCCH; and ref	erence	signal	l allocated as	per TS			
Note 3: If more than one Code Blo attached to each Code Blo		•	nal CRO	C sequ	ence of L = 24	4 Bits is	6		

Table A.3.8.1-1: Fixed Reference Channel QPSK R=1/3

Parameter	Parameter PMCH						
	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	availat	ole for	MBMS, in lin	e with	TS
Note 2: 2 OFDM symbols are reserved for PD 36.211.	CCH; an	d refer	ence s	signal a	allocated as p	er 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	i

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		PMCH									
	Unit	Unit Value									
Reference channel				R.39-1 FDD	R.39 FDD						
Channel bandwidth	MHz	1.4	3	5	10	15	20				
Allocated resource blocks				25	50						
Allocated subframes per Radio Frame(Note1)				6	6						
Modulation				64QAM	64QAM						
Target Coding Rate				2/3	2/3						
Information Bit Payload (Note 2)				1							
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				1	I		<u>I</u>				
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, an Code Block (otherwise L = 0 Bit).	; and refere	ence sig	nal all	ocated as p	er TS 36.211.		ach				

A.3.8.2 TDD

Parameter		РМСН								
	Unit	Unit Value								
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 3	6.331, Up	link-Downlink	Config	juratior	n 5 is propose	d, up to	o 5			
subframes (#3/4/7/8/9) are availa										
Note 2: 2 OFDM symbols are reserved for										
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	ık Con	figura	tion 5 is prop	osed, ı	up to	
5 subframes (#3/4/7/8/9) are available	ofor MBN	1S.						
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	РМСН										
	Unit	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 If more than one Code Block is attached to each Code Block (ailable fo for PDC s present	r MBMS CH; re , an ad	S. ferenc ditiona	ce signal allocat	ed as per TS 3	36.211					

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 Value								
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									
Note 2: Reference signal, synchron									
Note 3: If more than one Code Blo	ck is pres	sent, an ad	ditional CF	RC sequen	ce of L = 24	Bits is atta	ched to ea	ch Code Bl	ock
(otherwise $L = 0$ Bit).									
Note 4: Resource blocks n _{PRB} = 0.							dwidths.		
Note 5: Resource blocks $n_{PRB} = 6$.									
Note 6: Resource blocks $n_{PRB} = 3$.	.49 are a	llocated fo	r the user of	data in sub	-frame 5, a	nd resource	blocks nP	_{кв} = 049 ir	n sub-
frames 0,1,2,3,4,6,7,8,9.									
Note 7: Resource blocks $n_{PRB} = 4$.	.99 are a	llocated fo	r the user of	data in sub	-frame 5, ai	nd resource	blocks n _P	_{RB} = 099 ir	n sub-
frames 0,1,2,3,4,6,7,8,9.									
Note 9: Resource blocks nPRB =	474 are	allocated f	or the use	r data in su	ib-frame 5,	and resour	ce blocks r	1PRB = 07	4 in sub-

Note 9: Resource blocks nPRB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nPRB = 0..74 in sub frames 0,1,2,3,4,6,7,8,9.

Note 10: Resource blocks $n_{PRB} = 4..71$ are allocated for the user data in sub-frames 0,1,2,3,4,5,6,7,8,9.

Note 11: Resource blocks n_{PRB} = 4..74 are allocated for the user data in sub-frame 5, and resource blocks n_{PRB} = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.

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						
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			000		04 01	
Note 4: If more than one Code Block is p		additional	CRC sequ	ence of L =	= 24 Bits is a	attached
to each Code Block (otherwise L		or CID trees	omiocian -	in out fra-		
Note 5: Resource blocks nPRB = 02 are	anocated f	OF SIB TRAN	SITUSSIONS	in sub-tram	ie o ior all	
bandwidths. Note 6: Resource blocks n _{PRB} = 614.30	10 ara al	located for	the upper of	nto in all au	bframes	
Note 6: Resource blocks $n_{PRB} = 614,30$	4 3 ale al	iucaleu 101	116 0261 02	ala ili ali Su	unames.	

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)								
(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)								
UE Categories		≥ 1	≥2	≥2	≥2	≥ 3	≥ 3	≥ 4

Note 1: 1 symbol allocated to PDCCH for all tests.

Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211.

Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

Note 4: Resource blocks n_{PRB} = 0..2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.

Note 5: Resource blocks n_{PRB} = 6..14,30..49 are allocated for the user data in all sub-frames.

Note 6: Resource blocks n_{PRB} = 3..49 are allocated for the user data in sub-frame 5, and resource blocks n_{PRB} = 0..49 in sub-frames 0,1,2,3,4,6,7,8,9.

Note 7: Resource blocks n_{PRB} = 4..99 are allocated for the user data in sub-frame 5, and resource blocks n_{PRB} = 0..99 in sub-frames 0,1,2,3,4,6,7,8,9.

Note 8: Given per component carrier per codeword.

Note 9: Resource blocks n_{PRB} = 4..71 are allocated for the user data in sub-frames 0,1,2,3,4,5,6,7,8,9.

Note 10: Resource blocks nprB = 4..74 are allocated for the user data in sub-frame 5, and resource blocks nprB = 0..74 in sub-frames 0,1,2,3,4,6,7,8,9.

A.3.9.4 TDD (EPDCCH scheduling)

Table A.3.9.4-1: Fixed Reference Channel for sustained data-rate with EPDCCH scheduling (TDD)

Parameter	Unit			Value		
Reference channel		R.31E-1	R.31E-2	R.31E-3	R.31E-3A	R.31E-4
		TDD	TDD	TDD	TDD	TDD
Channel bandwidth	MHz	10	10	20	15	20
Allocated resource blocks		Note 6	Note 7	Note 8	Note 9	Note 8
Uplink-Downlink Configuration (Note 3)		5	5	5	1	1
Number of HARQ Processes per component carrier	Processes	15	15	15	7	7
Allocated subframes per Radio		8+1	8+1	8+1	4	4
Frame (D+S)						
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		<u>N/A</u>	N/A	N/A	N/A	N/A
For Sub-Frames 5		0.4114	0.6512	0.6279	0.8922	0.8748
For Sub-Frames 6		0.4114	0.6109	0.6024	N/A	N/A
For Sub-Frames 0		0.4114	0.6349	0.6138	0.9175	0.9065
Information Bit Payload		0	0.0010	0.0.00		0.0000
For Sub-Frames 4,9	Bits	10296	25456	51024	51024	75376
For Sub-Frames 3,7,8	Bits	10296	25456	51024	N/A	N/A
For Sub-Frame 1	Bits	0	0	0	N/A	N/A
For Sub-Frame 5	Bits	10296	25456	51024	51024	71112
For Sub-Frame 6	Bits	10296	25456	51024	N/A	N/A
For Sub-Frame 0	Bits	10296	25456	51024	51024	75376
Number of Code Blocks per Sub- Frame (Note 4)						
For Sub-Frames 4,9		2	5	9	9	13
For Sub-Frames 3,7,8		2	5	9	N/A	N/A
For Sub-Frame 1		N/A	N/A	N/A	N/A	N/A
For Sub-Frame 5		2	5	9	9	12
For Sub-Frame 6	Bits	2	5	9	N/A	N/A
For Sub-Frame 0		2	5	9	9	13
Binary Channel Bits per Sub-Frame (subframes with PDCCH USS monitoring)						
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	Bits	26100	41184	84384	56736	84384
Binary Channel Bits per Sub-Frame (subframes with EPDCCH USS						
monitoring) For Sub-Frames 4,9	Bits	25200	42336	85536	57000	95526
For Sub-Frames 3,7,8	Bits	25200	42336	85536	57888 N/A	85536 N/A
		0	42330	0	N/A N/A	N/A N/A
For Sub-Frame 1						1 1 1 / 1
For Sub-Frame 1 For Sub-Frame 5	Bits Bits	25200	39312	81648	57456	81648

For Sub-	Frame 0	Bits	25200	40320	83520	55872	83520		
Number o	f layers		1	2	2	2	2		
Max. Thro	ughput averaged over 1	Mbps	8.237	20.365	40.819	20.409	29.724		
frame (No	te 10)	-							
UE Categ	ory		≥ 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:	As per Table 4.2-2 in TS 36.	211 [4].							
Note 4:	If more than one Code Block	is present, an additional CRC sequence of L = 24 Bits is attached to each Code							
	Block (otherwise $L = 0$ Bit).								
Note 5:	Resource blocks nPRB = 02	2 are allocated for SIB transmissions in sub-frame 5 for all bandwidths.							
Note 6:	Resource blocks nPRB = 61	4,3049 are a	allocated for th	ie user data in	all subframes	6.			
Note 7:	Resource blocks n _{PRB} = 34	9 are allocate	d 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:	lote 8: Resource blocks n _{PRB} = 499 are allocated for the user data in sub-frame 5, and resource blocks n _{PRB} = 09								
	in sub-frames 0,3,4,6,7,8,9.								
Note 9:	Resource blocks nPRB = 47	1 are allocate	d for the user	data in all sub	o-frames				
Note10:	Given per component carrie	r per codewoi	d.						

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			Valu	e		
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: Ref	erence (Channel	TDD
--------------	-----------	----------	---------	-----

Parameter	Unit			Value			
Reference channel		R.55 TDD	R.56 TDD	R.57 TDD	R.58 TDD	R.59 TDD	
Number of transmitter antennas		2	2	2	2	2	
Channel bandwidth	MHz	10	10	10	10	10	
Number of OFDM symbols for PDCCH	symbols	2	2	1	1	1	
Aggregation level	CCE	4	16	2	8	2	
DCI Format		2A	2A	2C	2C	2D	

A.4 CSI reference measurement channels

This section defines the DL signal applicable to the reporting of channel status information (Clause 9.2, 9.3 and 9.5).

In Table A.4-1 are specified the reference channels. Table A.4-13 specifies the mapping of CQI index to modulation coding scheme, which complies with the CQI definition specified in Section 7.2.3 of [6].

Table A.4-0: Void

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 or 7 (Note 8)	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									
RC.2 FDD	FDD	10	50	-		MCS.2	8	1	
RC.2 TDD	TDD	10	50	Note 3		MCS.2	10 or 7 (Note 8)	1	
RC.6 FDD	FDD	10	15	-		MCS.16	8	1	Note 6
RC.6 TDD	TDD	10	15	Note 3		MCS.16	7	1	Note 6
				1 CRS Por	t + CSI-RS				
		40			Non CSI-RS	MCS.11			
RC.8 FDD	FDD	10	6	-	2 CSI-RS	MCS.12	8	1	
					Non	MCS.11			
RC.8 TDD	TDD	10	6	Note 3	CSI-RS 2 CSI-RS	MCS.12	10	1	
					Non	MCS.3			
RC.9 FDD	FDD	10	50	-	CSI-RS 2 CSI-RS	MCS.4	8	1	
					Non	MCS.3			
RC.9 TDD	TDD	10	50	Note 3	CSI-RS 2 CSI-RS	MCS.4	7	1	
2 CRS Port	+ CSI-RS				2 001110	inio di l		I	
					Non	MCS.5			
RC.7 FDD	FDD	10	50	-	CSI-RS 4 CSI-RS	MCS.7	8	1	
					Non	MCS.5			
RC.7 TDD	TDD	10	50	Note 3	CSI-RS 8 CSI-RS	MCS.8	10	1	
					Non				
RC.11 FDD	FDD	10	50	-	CSI-RS	MCS.5	8	1	
					2 CSI-RS Non	MCS.6			
RC.11 TDD	TDD	10	50	Note 3	CSI-RS	MCS.5	10	1	
					2 CSI-RS	MCS.6			
1 CRS Port	+ CSI-RS	+ CSI-IM		ł				I	
		10	50		Non CSI- RS/IM	MCS.3	0	4	
RC.13 FDD	FDD	10	50	-	CSI- RS/IM	N/A	8	1	
					Non CSI-	MCS.3			
RC.13 TDD	TDD	10	50	Note 3	RS/IM CSI-		10	1	
					RS/IM	N/A			
2 CRS Port	+ CSI-RS	+ CSI-IM			Non				
RC.10 FDD	FDD	10	50	_	Non CSI-RS	MCS.5	8	1	
		10	00		4 CSI- RS,	MCS.8	Ŭ		

Table A.4-1: CSI reference measurement channels

					1 CSI					
					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		Non CSI- RS/IM	MCS.13	8	1		
KG.12 FDD	FDD	10	0		CSI- RS/IM	N/A	0	1		
RC.12 TDD	TDD	10	6	Note 3	Non CSI- RS/IM	MCS.13	10	1		
RG.12 IDD	עטו	10	б	Note 3	CSI- RS/IM	N/A	10	I		
Note 1: 3 symbols allocated to PDCCH. Note 2: For FDD only subframes 1, 2, 3, 4, 6, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.										

Note 3: TDD UL-DL configuration as specified in the individual tests.

Note 4: For TDD when UL-DL configuration 1 is used only subframes 4 and 9 are allocated to avoide PBCH and synchronizaiton signal overhead.

Note 5: For TDD when UL-DL configuration 2 is used only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead.

Note 6: Centered within the Transmission Bandwidth Configuration (Figure 5.6-1).

Note 7: Only subframes 2, 3, 4, 7, 8 and 9 are allocated to avoid PBCH and synchronization signal overhead.
 Note 8: The number of HARQ processes is 10 for TDD UL/DL configuration 2 and 7 for TDD UL/DL configuration 1.

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.4-6: Void

Table A.4-6a: Void Table A.4-6b: Void Table A.4-6c: Void

Table A.4-6d: Void

Table A.4-6e: Void

Table A.4-6f: Void

Table A.4-7: Void

Table A.4-8: Void

Table A.4-9: Void

Table A.4-10: Void

Table A.4-11: Void

Table A.4-12: Void

Table A.4-13: Mapping of CQI Index to Modulation coding scheme (MCS)

C	QI Inde	ex	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Targe	arget Coqing Rate 0 0.0762 0 0.1885 0 0.0762 0 0.1885 0 0.0762 0 0.1885 0 0.1172 0 0.0762 0 0.1885 0 0.1172 0 0.0762 0 0.1885 0 0.0762 0 0							0.9258	Notes										
М	odulati	-	OOR			QP	SK			1	6QAN	Λ			64Q	AM			
MCS Scheme	PRB	Available RE-s								Imc	s								
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:	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]. 3 symbols allocated to PDCCH. Sub-frame#0 and #5 are not used for the corresponding requirement. The next subframe (i.e. sub-frame#1 or #6) shall be used for potential retransmissions.									e#1 or									

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 $\gamma_{\scriptscriptstyle PRB}$ [dl	B]								
	Subframe										
	0 5 1 - 4, 6 - 9										
		Allocation		Data							
First	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 wite PDSCHs shall be uncorrelated particular to the second structure of the second s								
	data, which is QPS	K modulated. The parameter ${\gamma}_{_{Pl}}$	$_{RB}$ is used to scale the power of Pl	DSCH.							
Note 2:			I in the test, the OCNG shall be tra RS according to transmission mod								
	parameter $\gamma_{\scriptscriptstyle PRB}$ ap	plies to each antenna port separ	ately, so the transmit power is eq	ual between all							
	the transmit antenn section 7.1 in 3GPF		e antenna transmission modes ar	e specified in							

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	Relative power level $\gamma_{_{PRB}}$ [dE	3]	
		Subframe		
	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)	i boon bata
	and	and	and	
(Last all	ocated 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 PDSCHs		
	modulated. The pa	rameter $\gamma_{\scriptscriptstyle PRB}$ is used to scale t	he power of PDSCH.	
Note 2:	If two or more trans	smit antennas with CRS are us	ed in the test, the OCNG shall I	be transmitted to the virtual
	users by all the trai	nsmit antennas with CRS accor	rding to transmission mode 2. T	The parameter ${\gamma}_{\scriptscriptstyle PRB}$ applies
		ort separately, so the transmit p ne antenna transmission modes		

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

		Re	lative power l	evel $\gamma_{\scriptscriptstyle PRB}$ [d	B]				
Alloca			Subframe						
$n_{P_{e}}$	RB	0	0 5 4, 9 1 - 3, 6 - 8						
1 – 49		0	0 (Allocation: all empty PRB-s) 0 N/A		Note 1	N/A			
0 —	49	N/A	N/A	0	N/A	Note 2			
Note 1: Note 2: Note 3:	one PDS uncorrel used to Each ph each PF measure contain paramet If two or the virtu transmit	hysical resource SCH per virtual ated pseudo ra- scale the powe sysical resource RB shall be unce ement. The MB cell-specific Re- ter γ_{PRB} is used more transmit al users by all to power shall be enna transmiss	UE; the data t indom data, wh r of PDSCH. block (PRB) is orrelated with of SFN data shal ference Signal to scale the p antennas are of he transmit an equally split b	ransmitted over hich is QPSK ro s assigned to b data in other F l be QPSK mo s only in the fi ower of PMCF used in the test tennas accord etween all the	er the OCNG F modulated. The MBSFN transm PRBs over the odulated. PMCI rst symbol of the st, symbol of the st, the OCNG s ling to transmis transmit anter	PDSCHs sh e paramete nission. The period of al H subframe he first time hall be transsion mode nas used	all be ar γ_{PRB} is e data in my es shall e slot. The asmitted to e 2. The in the test.		
N/A:	Not App								

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.

		Re	lative power I	evel $\gamma_{\scriptscriptstyle PRB}$ [dB]						
Alloca			PDSCH Data	PMCH Data						
n_{PP}	RB	0, 4, 9	5	1 – 3, 6 – 8	Duiu	Dulu				
First unallocated PRB – Last unallocated PRB		0	0 (Allocation: N/A all empty PRB-s)		Note 1	N/A				
First unallocated PRB – Last unallocated PRB		N/A	N/A N/A N/A		N/A	Note 2				
Note 1:				ssigned to an arbitrary numb ransmitted over the OCNG F						
	uncorrel	ated pseudo ra	ndom data, wł	nich is QPSK modulated. The	e paramete	r $\gamma_{_{PRB}}$ is				
Note 2:	Each ph each PF measure	B shall be unclement. The MB	block (PRB) is orrelated with o SFN data shal	s assigned to MBSFN transn data in other PRBs over the p l be QPSK modulated. PMCI s only in the first symbol of tl	period of ar H subframe	ny es shall				
	paramet	ter $\gamma_{\scriptscriptstyle PRB}$ is used	I to scale the p	ower of PMCH.						
Note 3:	If two or more transmit antennas are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode 2. The transmit power shall be equally split between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213.									
N/A:	Not 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							
First u	First unallocated PRB First unallocated PRB First unallocated PRB							
Last u	unallocated PRB	I PRB Last unallocated PRB Last unallocated PRB						
	0	0	0	Note 1				
Note 1:			arbitrary number of virtual UEs wit PDSCHs shall be uncorrelated ps					
	data, which is 16QA	AM modulated. The parameter γ	$_{PRB}$ is used to scale the power of F	PDSCH.				
Note 2:	If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 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.5.1.5-1: 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	Relative power level $\gamma_{\scriptscriptstyle PRB}$ [dB	3]			
		Subframe				
	0	5	1-4,6-9			
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			
(Last allo	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 scal	he power of PDSCH.			
Note 2:	If two or more trans	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					
0 – (P	PRB $N_{Start,1}-1$)	$0 - (PRB N_{Start,1} - 1)$	$0 - (PRB N_{Start,1} - 1)$			
				PDSCH Data		
(PRB N	End,(m-1)) – (PRB	$(PRBN_{End,(m-1)}) - (PRB$	$(PRBN_{End,(m-1)}) - (PRB$	i boon bala		
Λ	$V_{Start,m} - 1$)	$N_{Start,m} - 1$)	$N_{Start,m} - 1$)			
(PRB /	$\mathbb{RB} N_{End,M}) - (PRB \qquad (PRB N_{End,M}) - (PRB)$		 (PRB N _{End,M}) – (PRB			
	$N_{RB} - 1$)	$N_{RB} - 1$)	$N_{RB} - 1$)			
	0	0	0	Note 1		
Note 1:		ource blocks are assigned to a mitted over the OCNG PDSCHs	•	•		
	modulated. The pa	he power of PDSCH.				
Note 2:	: If two or more transmit antennas with CRS are used in the test, the OCNG shall			be transmitted to the virtual		
	users by all the transmit antennas with CRS according to transmission mode 2. The parameter $\gamma_{_{PRB}}$ applies					
		ort separately, so the transmit p	•			

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: 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 discontinuous in frequency domain where there are *M* unallocated PRB blocks labled from 1-st block to *M*-th block (*M*>1) and the *m*-th block starts with PRB $N_{Start,m}$ and end with PRB $N_{End,m}$, orwhen the unallocated area is continuous in frequency domain where M=1 (one sided). The system bandwidth starts with RPB 0 and ends with $N_{RB} - 1$. $N_{End,M}$ should be equal to or less than $N_{RB} - 1$.

		Relative power level $\gamma_{\scriptscriptstyle PRB}$ [dl	B]				
		Subframe					
	0	5	1 - 4, 6 - 9				
		Allocation					
(PRB N _{Sta} m-th ui (PR PR <i>M</i> -th ui (PR	nallocated PRB $_{art,1} \sim PRB N_{End,1}$) nallocated PRB $RB N_{Start,m} \sim$ $RB N_{End,m}$) nallocated PRB $B N_{Start,M} \sim$ $RB N_{End,M}$)	1-st unallocated PRB (PRB $N_{Start,1} \sim PRB N_{End,1}$) m-th unallocated PRB (PRB $N_{Start,m} \sim$ PRB $N_{End,m}$) M-th unallocated PRB (PRB $N_{Start,M} \sim$ PRB $N_{End,M}$)	1-st unallocated PRB (PRB $N_{Start,1} \sim PRB N_{End,1}$) m-th unallocated PRB (PRB $N_{Start,m} \sim PRB N_{End,m}$) M-th unallocated PRB (PRB $N_{Start,M} \sim$ PRB $N_{End,M}$)	PDSCH Data			
	0	0	0	Note 1,2,3			
Note 1:	per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.						
Note 3:	 Note 2: The OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode10. The the transmit power is equal between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. Note 3: The detailed test set-up for TM10 transmission i.e PMI configuration is specified to each test case. 						

Table A.5.1.8-1: OP.8 FDD: Dynamic OCNG FDD Pattern

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:

$$\gamma_i = PDSCH_i _ RA / OCNG _ RA = PDSCH_i _ RB / OCNG _ RB_i$$

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 5			3, 4, 7, 8, 9 5 and 6 (as normal subframe) ^{Note 2}		PDSCH Data		
		Allo	cation				
First una	llocated 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 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:	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 ante 7.1 in 3GPP		ne test. The antenna transr	nission modes are specifi	ed in section		

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_{RB} –1.

		Relative power	level $\gamma_{\scriptscriptstyle PRB}$ [dB]		PDSCH Data		
	Subframe (only if available for DL)						
	0	5	3, 4, 6, 7, 8, 9	1,6			
			(6 as normal subframe) Note 2	(6 as special subframe) Note 2			
		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			
•	cated 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:				rtual UEs with one PDSCH p oseudo random data, which i			
	modulated. The	parameter $\gamma_{\scriptscriptstyle PRB}$ is used to set	cale the power of PDSCH.				
Note 2:	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:	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						
		ort separately, so the transm antenna transmission modes		the transmit antennas with C n 3GPP TS 36.213.	RS used		

A.5.2.3 OCNG TDD pattern 3: 49 RB OCNG allocation with MBSFN in 10 MHz

Allocation n_{PRB}			Relative power	level $\gamma_{\scriptscriptstyle PRB}$ [dB]				
			Subf	rame		PDSCH Data PMCH Data		
		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 – 4	0 – 49 N/A N/A 0 N/A				N/A	N/A	Note 3	
Note 1:	UE; tł	ne data transmitte		PDSCHs shall be	uncorrelated pse	al UEs with one PI udo random data,		
Note 2:		ames available fo PTS 36.211.	r DL transmission	depends on the L	Jplink-Downlink co	onfiguration in Tab	le 4.2-2 in	
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	Not Applicable						

Table A.5.2.3-1: OP.3 TDD: OCNG TDD Pattern 3 for 5ms downlink-to-uplink switch-point periodicity

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				
Allocation		Subframe (PDSCH Data	PMCH Data		
n _{PRB}	0 and 6 (as normal subframe)	1 (as special subframe)	5	3, 4, 7 – 9	1 Doon Data	T MOT 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	
	These physical reso virtual UE; the data						
,	which is QPSK mod	dulated. The parar	neter ${\gamma}_{_{PRB}}$ is used	to scale the powe	er of PDSCH.		
Note 3:							
N/A	Not Applicable						

A.5.2.5 OCNG TDD pattern 5: One sided dynamic 16QAM modulated OCNG TDD pattern

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data or system information) of the sub-frames available for DL transmission (depending on TDD UL/DL configuration), when the unallocated area is continuous in frequency domain (one sided).

Relative power level $arphi_{\it PRB}$ [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 una	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:	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:	Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211					
Note 3:	23: 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.

Table A.5.2.6-1: OP.6 TDD: OCNG TDD Pattern when user data is in 2 non-contiguous b	locks
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Relative power level $\gamma_{_{PRB}}$ [dB]					PDSCH Data
Subframe (only if available for DL)					Data
0				1,6 (6 as special subframe) _{Note 2}	
		Alloc	ation		
0 – (First allocated PRB of first block -1)		0 – (First allocated PRB of first block -1)	0 – (First allocated PRB of first block -1)	0 – (First allocated PRB of first block -1)	
and (Last allocated PRB of first block +1) – (First		and (Last allocated PRB of first block +1) – (First	and (Last allocated PRB of first block +1) – (First	and (Last allocated PRB of first block +1) – (First	
allocated PRB of second block -1)		allocated PRB of second block -1)	allocated PRB of second block -1)	allocated PRB of second block -1)	
0		0	0	0	Note 1
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK					
modulated. The parameter $\gamma_{_{PRB}}$ is used to scale the power of PDSCH.					
Note 2:					
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.				

A.5.2.7 OCNG TDD pattern 7: dynamic OCNG TDD pattern when user data is in multiple non-contiguous blocks

This OCNG Pattern fills with OCNG all empty PRB-s (PRB-s with no allocation of data, EPDCCH or system information) of the DL sub-frames, when the unallocated area is discontinuous in frequency domain (divided in multiple parts by the *M* allocated blocks for data transmission). The *m*-th allocated block starts with RPB $N_{Start,m}$ and

ends with PRB $N_{End,m} - 1$, where m = 1, ..., M. The system bandwidth starts with RPB 0 and ends with $N_{RB} - 1$.

Relative power level $\gamma_{_{PRB}}$ [dB]					
Subframe (only if available for DL)					
0 5 3, 4, 6, 7, 8, 9 1,6					
(6 as normal subframe) (6 as special subframe) Note 2 Note 2					
	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)		
		(000.)			
$(PRBN_{End,(m-1)}) -$	$(PRBN_{End,(m-1)})$ –	$(PRBN_{End,(m-1)})$ –	$(PRBN_{End,(m-1)})$ –		
(PRB $N_{Start,m} - 1$)	(PRB $N_{Start,m} - 1$)	(PRB $N_{Start,m} - 1$)	(PRB $N_{Start,m} - 1$)		
$(PRBN_{End,M}) - (PRB$	$(PRBN_{End,M}) - (PRB$	$(PRBN_{End,M}) - (PRB$	$(PRBN_{End,M})$ – $(PRB$		
$N_{RB} - 1$)	$N_{RB} - 1$)	$N_{RB} - 1$)	$N_{RB} - 1$)		
				Note 1	
Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.					
Note 2: Subframes available for DL transmission depends on the Uplink-Downlink configuration in Table 4.2-2 in 3GPP TS 36.211.					
Note 3: If two or more transmit antennas with CRS are used in the test, the OCNG shall be transmitted to the virtual users by all the transmit antennas with CRS according to transmission mode 2. The parameter γ_{PRB} applies to					
each antenna p	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.5.2.7-1: OP.7 TDD: OCNG TDD Pattern when user data is in multiple non-contiguous blocks

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A.5.2.8 OCNG TDD pattern 8: 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 discontinuous in frequency domain where there are *M* unallocated PRB blocks labled from 1-st block to *M*-th block (*M*>1) and the *m*-th block starts with PRB $N_{Start,m}$ and end with PRB $N_{End,m}$, or when the unallocated area is continuous in frequency domain where M=1 (one sided). The system bandwidth starts with RPB 0 and ends with $N_{RB} - 1$. $N_{End,M}$ should be equal to or less than $N_{RB} - 1$.

		Relative power level $\gamma_{\scriptscriptstyle PRB}$ [dl	B]		
Subframe					
	0 5 1-4,6-9				
		Allocation			
1-st unallocated PRB (PRB $N_{Start,1} \sim PRB N_{End,1}$) <i>m</i> -th unallocated PRB (PRB $N_{Start,m} \sim$ PRB $N_{End,m}$) <i>M</i> -th unallocated PRB (PRB $N_{Start,M} \sim$ PRB $N_{End,M}$)		1-st unallocated PRB (PRB $N_{Start,1} \sim PRB N_{End,1}$) m-th unallocated PRB (PRB $N_{Start,m} \sim$ PRB $N_{End,m}$) M-th unallocated PRB (PRB $N_{Start,M} \sim$ PRB $N_{End,M}$)	1-st unallocated PRB (PRB $N_{Start,1} \sim PRB N_{End,1}$) m-th unallocated PRB (PRB $N_{Start,m} \sim PRB N_{End,m}$) M-th unallocated PRB (PRB $N_{Start,M} \sim$ PRB $N_{End,M}$)	PDSCH Data	
	0	0	0	Note 1,2,3	
	per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is 16QAM modulated. The parameter γ_{PRB} is used to scale the power of PDSCH.				
t	 Note 2: The OCNG shall be transmitted to the virtual users by all the transmit antennas according to transmission mode10. The the transmit power is equal between all the transmit antennas used in the test. The antenna transmission modes are specified in section 7.1 in 3GPP TS 36.213. Note 3: The detailed test set-up for TM10 transmission i.e PMI configuration is specified to each test case. 				

Annex B (normative): Propagation conditions

B.1 Static propagation condition

For 1 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

For 2 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{pmatrix} 1 & j \\ 1 & -j \end{pmatrix}.$$

For 4 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & j & j \\ 1 & 1 - j & -j \end{bmatrix}$$

For 8 port transmission the channel matrix is defined in the frequency domain by

$$\mathbf{H} = \begin{bmatrix} 1 & 1 & 1 & 1 & j & j & j & j \\ 1 & 1 & 1 & 1 & -j & -j & -j & -j \end{bmatrix}$$

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	43 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

Table B.2.1-2 Extended Pedestrian A model (EPA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.0
70	-2.0
90	-3.0
110	-8.0
190	-17.2
410	-20.8

Table B.2.1-3 Extended Vehicular A model (EVA)

Excess tap delay [ns]	Relative power [dB]
0	0.0
30	-1.5
150	-1.4
310	-3.6
370	-0.6
710	-9.1
1090	-7.0
1730	-12.0
2510	-16.9

Table B.2.1-4 Extended Typical Urban model (ETL

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

MIMO Channel Correlation Matrices B.2.3

The MIMO channel correlation matrices defined in B.2.3 apply for the antenna configuration using uniform linear arrays at both eNodeB and UE.

Table B.2.3.1-1 eNodeB correlation matrix

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	$R_{eNB} = 1$	$R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & 1 \end{pmatrix}$	$R_{eNB} = \begin{pmatrix} 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} & \alpha \\ \alpha^{\frac{1}{9}^{*}} & 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} \\ \alpha^{\frac{4}{9}^{*}} & \alpha^{\frac{1}{9}^{*}} & 1 & \alpha^{\frac{1}{9}} \\ \alpha^{*} & \alpha^{\frac{4}{9}^{*}} & \alpha^{\frac{1}{9}^{*}} & 1 \end{pmatrix}$

Table B.2.3.1-2

			α^*	α^{79}	α
2 defines the correlatio	on matrix for the UE:				

Table B.2.3.1-2 UE correlation matrix

	One antenna	Two antennas	Four antennas
UE Correlation	<i>R_{UE}</i> = 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.2.3.1-3 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.

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	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} & \alpha \\ \alpha^{\frac{1}{9}} & 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} \\ \alpha^{\frac{4}{9}} & \alpha^{\frac{1}{9}} & 1 & \alpha^{\frac{1}{9}} \\ \alpha^{\ast} & \alpha^{\frac{4}{9}} & \alpha^{\frac{1}{9}} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta^{\frac{1}{9}} & \beta^{\frac{4}{9}} & \beta \\ \beta^{\frac{1}{9}} & 1 & \beta^{\frac{1}{9}} & \beta^{\frac{4}{9}} \\ \beta^{\frac{4}{9}} & \beta^{\frac{1}{9}} & 1 & \beta^{\frac{1}{9}} \\ \beta^{\ast} & \beta^{\frac{4}{9}} & \beta^{\frac{1}{9}} & 1 \end{bmatrix}$

Table B.2.3.1-3: R_{spat} correlation matrices

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.

Tab	le	Β.	2.	3.	2-	1

Low cor	relation	Medium C	orrelation	High Correlation				
α	β	α	β	α	β			
0	0	0.3	0.9	0.9	0.9			

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 4x2 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spatial} + aI_n]/(1+a)$$

Where the value "a" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the $4x^2$ 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	$R_{high} = \begin{bmatrix} 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 & 0.8999 & 0.8099 \\ 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 & 0.8099 & 0.8999 \\ 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 \\ 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 \\ 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 \\ 0.8587 & 0.9542 & 0.8587 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 \\ 0.8999 & 0.8099 & 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8894 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8894 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8899 & 1.0000 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 \end{bmatrix}$												
4x4 case	$R_{high} = \begin{bmatrix} 1.0000\ 0.9882\ 0.9541\ 0.8999\ 0.9882\ 0.9767\ 0.9430\ 0.8894\ 0.9541\ 0.9430\ 0.9105\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8587\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.8999\ 0.8894\ 0.9430\ 0.9767\ 0.9882\ 0.9767\ 0.9430\ 0.9541\ 0.9430\$												

Table B.2.3.2-2: MIMO correlation matrices for high correlation

1x2 case								N/A								
2x2 case						R _{medius}	$m = \begin{bmatrix} 0\\0\\0 \end{bmatrix}$	1 0.9 .9 1 .3 0.27 27 0.3	0.27 7 1	0.27 0.3 0.9 1						
4x2 case		R _{medium} :	=	0000).9000).8748).7873).5856).5271).3000).2700	0.900 1.000 0.787 0.874 0.527 0.585 0.270 0.300	00 0. 73 1. 48 0. 71 0. 56 0. 00 0.	8748 7873 0000 9000 8748 7873 .5856 .5271	0.787 0.874 0.900 1.000 0.787 0.874 0.527 0.585	8 0. 0 0. 0 0. 3 1.4 8 0. 1 0.	5271 8748 7873 0000	0.527 0.5856 0.7873 0.8748 0.9000 1.0000 0.7873 0.8748	5 0.2 3 0.5 8 0.5 0 0.8 0 0.7 3 1.0	700 856 271 748 873 000	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 0.8642 0.8645 0.8747 0.8347 0.8642 0.7872 0.8347 0.5855 0.5787 0.5588 0.5787 0.5270 0.5588 0.3000 0.2965 0.2965 0.3000 0.2862 0.2965	0.9882 1.0000 0.9882 0.8347 0.8642 0.8642 0.8642 0.8642 0.5583 0.5787 0.5855 0.5787 0.5855 0.5787 0.2862 0.2965 0.2965	 0.9882 1.0000 7.0.7872 5.0.8347 7.0.8645 5.0.8747 8.0.5270 7.0.5588 5.0.5787 7.0.5855 2.0.2700 5.0.2862 0.2965 	0.8645 0.8347 0.7872 1.0000 0.9882 0.9541 0.8999 0.8747 0.8645 0.8347 0.7872 0.5855 0.5787 0.5588	0.8747 0.8645 0.8347 0.9882 1.0000 0.9882 0.9541 0.8645 0.8747 0.8645 0.8347 0.5787 0.5855 0.5787	0.8645 0.8747 0.8645 0.9541 0.9882 1.0000 0.9882 0.8347 0.8645 0.8747 0.8645 0.5588 0.5787 0.5855	0.8347 0.8645 0.8747 0.8999 0.9541 0.9882 1.0000 0.7872 0.8347 0.8645 0.8747 0.5270 0.5588 0.5787	0.5787 0.5588 0.5270 0.8747 0.8645 0.8347 0.7872 1.0000 0.9882 0.9541 0.8999 0.8747 0.8645 0.8347	 9.5855 9.5787 9.5588 9.65588 9.8645 9.8747 9.8645 9.8822 1.0000 9.9882 9.09541 9.8645 9.8747 9.8645 9.8747 9.8645 	0.5787 0.5855 0.5787 0.8347 0.8645 0.8747 0.8645 0.9541 0.9882 1.0000 0.9882 0.8347 0.8645 0.8747	0.5588 0.5787 0.5855 0.7872 0.8347 0.8645 0.8747 0.8999 0.9541 0.9882 1.0000 0.7872 0.8347 0.8645	0.2965 0.2862 0.2700 0.5855 0.5787 0.5588 0.5270 0.8747 0.8645 0.8347 0.7872 1.0000 0.9882 0.9541	0.3000 0.2965 0.2862 0.5787 0.5558 0.5787 0.5588 0.8645 0.8747 0.8645 0.8347 0.9882 1.0000 0.9882	0.2965 0.3000 0.2965 0.5588 0.5787 0.5855 0.5787 0.8347 0.8645 0.8747 0.8645 0.9541 0.9882 1.0000	0.2862 0.2965 0.3000 0.5270 0.5588 0.5787 0.5855 0.7872 0.8347 0.8645 0.8747 0.8999 0.9541 0.9882

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,
$$R_{eNB} = \begin{pmatrix} 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} & \alpha \\ \alpha^{\frac{1}{9}} & 1 & \alpha^{\frac{1}{9}} & \alpha^{\frac{4}{9}} \\ \alpha^{\frac{4}{9}} & \alpha^{\frac{1}{9}} & 1 & \alpha^{\frac{1}{9}} \\ \alpha^{\frac{4}{9}} & \alpha^{\frac{4}{9}} & \alpha^{\frac{1}{9}} & 1 \end{pmatrix}$$

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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.

1	High spatial correlation												
		0.9	0.9	0.3									
	Note 1:	Note 1: Value of α applies when more than one pair of cross-polarized antenna elements at eNB side.											
	Note 2:	Value of β applies when n	nore than one pair of cross-polarized ar	tenna elements at UE side.									

Table B.2.3A.3-1

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 correla	ation matrices for h	igh 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
		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						0.0000				0.0000			0.9883		0.9542
			0, 00		0.2000		0, 00		0.2002						0.7000	0.0000	0.0000
		-0.2862	0.0000	-0.2965	0.0000	-0.5000	0.0000	-0.2965	0.0000	0.9542	0.0000	0.9885	0.0000	1.0000	0.0000	0.9885	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.

-
$$D_{\theta_k}$$
 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.

Exte	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		

Table B.2.6-1: Propagation Conditions for Multi-Path Fading Environments for MBSFN Performance Requirements in an extended delay spread environment

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.

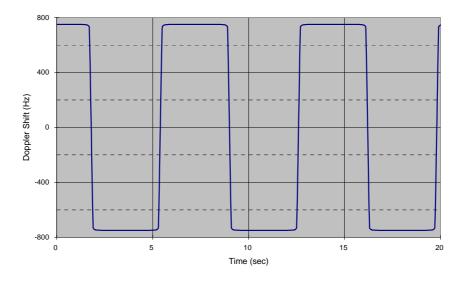


Figure B.3-1: Doppler shift trajectory

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

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W_2(i) y^{(109)}(i) \cdot$$

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^{ap} the number of modulation symbols including the user specific reference symbols (DMPS) and generates a

 $M_{\rm symb}^{\rm ap}$ 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:

$$\begin{bmatrix} y_{bf}(i) \\ \tilde{y}_{bf}(i) \end{bmatrix} = W(i) y^{(p)}(i) .$$

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.

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 $I_{\it or}$	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, unless otherwise stated.

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 = $\rho_A + \delta$	
	EPDCCH_RB = $\rho_B + \delta$	
PDSCH	PDSCH_RA = ρ_A	
	PDSCH_RB = ρ_B	
PMCH	$PMCH_RA = \rho_A$	
	$PMCH_RB = \rho_B$	
MBSFN RS	MBSFN RS_RA = ρ_A	
	MBSFN RS_RB = ρ_B	
OCNG	OCNG_RA = ρ_A + σ	
	OCNG_RB = ρ_B + σ	

NOTE 1: $\rho_A = \rho_B = 0$ dB means no RS boosting.

NOTE 2: MBSFN RS and OCNG are not defined downlink physical channels in [4].

NOTE 3: Assuming PSS and SSS transmitted on a single antenna port.

NOTE 4: ρ_A , ρ_B , σ and δ are test specific.

urpose of the test set up only.

Parameter	Unit	Value	Note
Total transmitted power spectral density I_{ar}	dBm/15 kHz	Test specific	1. I_{or} shall be kept
spectral density T_{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
			$a_{k,l}^{(p)}$ defined in [4] shall
			conform to the given EPRE value. 2. For TM8, TM9, and TM10 the reference point for EPRE is before the
			precoder in Annex B.4.

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

PBCH_RA PBCH_RB	dB	Non-ABS ρ _Α	ABS
_	dB	0A	
PBCH_RB		P7	Note 1
	dB	ρв	Note 1
PSS_RA	dB	ρΑ	Note 1
SSS_RA	dB	ρΑ	Note 1
PCFICH_RB	dB	ρв	Note 1
PHICH_RA	dB	ρΑ	Note 1
PHICH_RB	dB	ρв	Note 1
PDCCH_RA	dB	ρΑ	Note 1
PDCCH_RB	dB	ρв	Note 1
PDSCH_RA	dB	N/A	Note 1
PDSCH_RB	dB	N/A	Note 1
OCNG_RA	dB	ρΑ	Note 1
OCNG_RB	dB	ρв	Note 1
	SSS_RA PCFICH_RB PHICH_RA PHICH_RB PDCCH_RA PDCCH_RB PDSCH_RA PDSCH_RB OCNG_RA	SSS_RAdBPCFICH_RBdBPHICH_RAdBPHICH_RBdBPDCCH_RAdBPDCCH_RBdBPDSCH_RAdBPDSCH_RBdBOCNG_RAdBOCNG_RBdB	SSS_RAdBρAPCFICH_RBdBρBPHICH_RAdBρAPHICH_RBdBρBPDCCH_RAdBρAPDCCH_RBdBρBPDSCH_RAdBN/APDSCH_RBdBN/AOCNG_RAdBρBOCNG_RBdBρB

Parameters		EPRE Ratio		
	Unit	Non-ABS	ABS	
PBCH_RA	dB	ρΑ	ρΑ	
PBCH_RB	dB	ρв	ρв	
PSS_RA	dB	ρΑ	ρΑ	
SSS_RA	dB	ρΑ	ρΑ	
PCFICH_RB	dB	ρв	Note 1	
PHICH_RA	dB	ρΑ	Note 1	
PHICH_RB	dB	ρ _в	Note 1	
PDCCH_RA	dB	ρΑ	Note 1	
PDCCH_RB	dB	ρв	Note 1	
PDSCH_RA	dB	N/A	Note 1	
PDSCH_RB	dB	N/A	Note 1	
OCNG_RA	dB	ρΑ	Note 1	
OCNG_RB	dB	ρв	Note 1	
	PBCH_RA PBCH_RB PSS_RA SSS_RA PCFICH_RB PHICH_RA PHICH_RB PDCCH_RA PDCCH_RA PDSCH_RA PDSCH_RB OCNG_RA	PBCH_RAdBPBCH_RBdBPBCH_RBdBPSS_RAdBSSS_RAdBPCFICH_RBdBPHICH_RAdBPHICH_RBdBPDCCH_RAdBPDCCH_RBdBPDSCH_RAdBPDSCH_RBdBOCNG_RAdB	UnitNon-ABSPBCH_RAdBρAPBCH_RBdBρBPSS_RAdBρASSS_RAdBρAPCFICH_RBdBρBPHICH_RAdBρAPDCCH_RAdBρBPDCCH_RBdBρBPDSCH_RAdBN/APDSCH_RAdBN/AOCNG_RAdBρA	

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 = ρ_A + σ		
	PBCH_RB = ρ_B + σ		
PSS	$PSS_RA = 0$ (Note 2)		
SSS	$SSS_RA = 0$ (Note 2)		
PDSCH	PDSCH_RA = ρ_A		
	PDSCH_RB = ρ_B		
PCFICH	PCFICH_RB = $\rho_B + \sigma$		
PDCCH	PDCCH_RA = $\rho_A + \sigma$		
	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	1.4 MHz 3 MHz 5 MHz 10 MHz 15 MHz 20 MHz							
BWInterferer	1.4 MHz	3 MHz	5 MHz	5 MHz	5 MHz	5 MHz			
RB	6	15	25	25	25	25			

Table D.2-1: Description of modulated E-UTRA interferer

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).

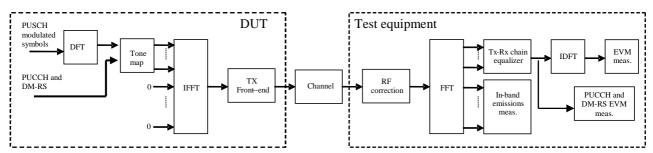


Figure F.1-1: EVM measurement points

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 and f_h are the lower and upper edge of the allocated BW, and

Y(t, f) is the frequency domain signal evaluated for in-band emissions as defined in the subsection (ii)

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = \frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s| \cdot N_{RB}} \sum_{t \in T_s} \sum_{f_l}^{f_l + (12 \cdot N_{RB} - 1)\Delta f} |Y(t, f)|^2}$$

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 carrier leakage shall be removed from the evaluated signal before calculating the EVM and the in-band emissions; however, the removed relative carrier leakage power also has to satisfy the applicable requirement.

At this stage the allocated RBs shall be separated from the non-allocated RBs. In the case of PUCCH and PUSCH EVM, the signal on the non-allocated RB(s), Y(t, f), is used to evaluate the in-band emissions.

Moreover, the following procedure applies only to the signal on the allocated RB(s).

- In the case of PUCCH and PUSCH, 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 analyses shall then

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		144	1024	72	66	91.7		
15			1536	108	102	94.4		
20			2048	144	136	94.4		
Note 2: Th	Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed.							

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	Cyclic prefix length ¹ N _{cp}	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	6240	49152	6144	98.5%		
3	21024	49152	20928	99.5%		
4	448	4096	432	96.4%		
	Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed					
	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 $\Delta \tilde{t} = \Delta \tilde{t}_{l}$ and $\overline{\text{EVM}}_{\text{PRACH,h}}$ is calculated using $\Delta \tilde{t} = \Delta \tilde{t}_{h}$.

Thus we get:

 $EVM_{PRACH} = \max(EVM_{PRACH,1}, EVM_{PRACH,h})$

F.7 Spectrum Flatness

The data shall be taken from FFT coded data symbols and the demodulation reference symbols of the allocated resource block.

Annex G (informative): Reference sensitivity level in lower SNR

This annex contains information on typical receiver sensitivity when HARQ transmission is enabled allowing operation in lower SNR regions (HARQ is disabled in conformance testing), thus representing the configuration normally used in live network operation under noise-limited conditions.

G.1 General

The reference sensitivity power level P_{SENS} with HARQ retransmission enabled (operation in lower SNR) is the minimum mean power applied to both the UE antenna ports at which the residual BLER after HARQ shall meet the requirements for the specified reference measurement channel. The residual BLER after HARQ transmission is defined as follows:

$$BLER_{residual} = 1 - \frac{A}{B}$$

A: Number of correctly decoded MAC PDUs

B: Number of transmitted MAC PDUs (Retransmitted MAC PDUs are not counted)

G.2 Typical receiver sensitivity performance (QPSK)

The residual BLER after HARQ shall be lower than 1% for the reference measurement channels as specified in Annexes G.3 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in Annex A.5.1.1/A.5.2.1) with parameters specified in Table G.2-1 and Table G.2-2

	1		annel bar				
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
1				[-102]			FDD
2				TBD			FDD
3				TBD			FDD
4				TBD			FDD
5				TBD			FDD
6				TBD			FDD
7				TBD			FDD
8				TBD			FDD
9				TBD			FDD
10				TBD			FDD
11				TBD			FDD
12				TBD			FDD
13				TBD			FDD
10				TBD			FDD
				100			
17				TBD			FDD
18				TBD			FDD
19				TBD			FDD
20				TBD			FDD
20				TBD			FDD
22				TBD			FDD
23				TBD			FDD
26				TBD			FDD
20				TBD			FDD
28				TBD			FDD
				[400]			TOD
33				[-102]			TDD
34				[-102]			TDD
35				[-102]			TDD
36				[-102]			TDD
37				[-102]			TDD
38				[-102]			TDD
39				[-102]			TDD
40				[-102]			TDD
42				[-102]			TDD
43				[-102]			TDD
44		l		[-102]	 · · · ·		TDD
Note 2: R O	ne transmitter eference meas P.1 FDD/TDD	surement cl as describe	hannel is (ed in Anne	G.3 with on ex A.5.1.1//	e sided dy		IG Patterr
Note 4: Fo	ne signal powe or the UE whic vel is FFS.				nd 9 the rei	ference ser	nsitivity
Note 5: Fo	or the UE whic vel is FFS.	h supports	both Band	d 11 and Ba	and 21 the	reference s	sensitivity

Table G.2-1: Reference s	sensitivity QPSK PSENS
--------------------------	------------------------

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	
14				[6] ¹			FDD	
				[0]			100	
17				[6] ¹			FDD	
18				[6] ¹			FDD	
19				[6] ¹			FDD	
20				[6] ¹			FDD	
20				[6] ¹			FDD	
21				[6] ¹			FDD	
23				[6] ¹			FDD	
26				[6] ¹			FDD	
27				[6] ¹			FDD	
28				[6] ¹			FDD	
				[0]			100	
				50			TDD	
33								
34				50			TDD TDD	
35				50				
36				50			TDD	
37				50			TDD	
38				50			TDD	
39				50			TDD	
40				50			TDD	
42				50			TDD	
43				50			TDD	
44			 	50 50		neesible (TDD	
 Note 1: The UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.6-1). Note 2: For the UE which supports both Band 11 and Band 21 the minimum uplink configuration for reference sensitivity is FFS. Note 3: For Band 20; in the case of 15MHz channel bandwidth, the UL resource blocks shall be located at RBstart _11 and in the case of 20MHz channel 								
	pandwidth, t							

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

G.3 Reference measurement channel for REFSENSE in lower SNR

Tables G.3-1 and G.3-2 are applicable for Annex G.2 (Reference sensitivity level in lower SNR).

Table G.3-1 Fixed Reference Channel for Receiver Requirements (FDD
--

Parameter	Unit	Value
Channel bandwidth	MHz	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 s		
		BCH allocated as per TS 36.211 [4]
		ional CRC sequence of $L = 24$ Bits is attached to
each Code Block (otherwise L = 0		
Note 4: Redundancy version coding seque	ence is {0, 1, 2	, 3} for QPSK.

Parameter	Unit	Va	alue			
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		
Note 2: For 1.4MHz, no data shall be schuinsufficient 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]					
Note 6: Redundancy version coding sequ	ence is {0, 1, 2	2, 3} for QPSK.				

Table G.3-2 Fixed Reference Channel for Receiver Requirements (TDD)

Annex H (normative): Modified MPR behavior

H.1 Indication of modified MPR behavior

This annex contains the definitions of the bits in the field *modifiedMPRbehavior* indicated in the IE UE Radio Access Capability [7] by a UE supporting an MPR or A-MPR modified in a later release of this specification.

Index of field	Definition	Notes
(bit number)	(description of the supported functionality if indicator	
	set to one)	
0 (leftmost bit)	- The MPR for intra-band contiguous carrier aggregation bandwidth class C with non-contiguous resource allocation specified in Clause 6.2.3A in version 12.5.0 of this specification	- This bit can be set to 1 by a UE supporting intra-band contiguous CA bandwidth class C
1	- The A-MPR associated with NS_05 for Band 1 in Clause 6.2.4 in version 12.10.0 of this specification.	- This bit can be set to 1 by a UE supporting A-MPR associated to NS_05 for Band 1.
2	The A-MPR associated with NS_04 for Band 41 in Table 6.2.4-4 in version 14.1.0 of this specification.	This bit can be set to 1 by a power class 3 UE supporting A-MPR associated to NS_04 for Band 41.

Table H.1-1: Definitions of the bits in the field modifiedMPRbehavior

8.4.0

Annex I (informative): Change history

12-2008

RP#42

RP-080911

80

Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
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	8.0.0
03-2008	RP#39	RP-080123	3			TS36.101 - Combined updates of E-UTRA UE requirements	8.1.0
05-2008	RP#40	RP-080325	4			TS36.101 - Combined updates of E-UTRA UE requirements	8.2.0
09-2008	RP#41	RP-080638	5r1			Addition of Ref Sens figures for 1.4MHz and 3MHz Channel bandwiidths	8.3.0
09-2008	RP#41	RP-080638	7r1			Transmitter intermodulation requirements	8.3.0
)9-2008	RP#41	RP-080638	10			CR for clarification of additional spurious emission requirement	8.3.0
)9-2008	RP#41	RP-080638	15			Correction of In-band Blocking Requirement	8.3.0
)9-2008	RP#41	RP-080638	18r1			TS36.101: CR for section 6: NS_06	8.3.0
)9-2008	RP#41	RP-080638	19r1			TS36.101: CR for section 6: Tx modulation	8.3.0
)9-2008	RP#41	RP-080638	20r1			TS36.101: CR for UE minimum power	8.3.0
)9-2008	RP#41	RP-080638	21r1			TS36.101: CR for UE OFF power	8.3.0
)9-2008	RP#41	RP-080638	24r1			TS36.101: CR for section 7: Band 13 Rx sensitivity	8.3.0
9-2008	RP#41	RP-080638	26			UE EVM Windowing	8.3.0
)9-2008	RP#41	RP-080638	29			Absolute ACLR limit	8.3.0
)9-2008	RP#41	RP-080731	23r2			TS36.101: CR for section 6: UE to UE co-existence	8.3.0
9-2008	RP#41	RP-080731	30			Removal of [] for UE Ref Sens figures	8.3.0
9-2008	RP#41	RP-080731	31			Correction of PA, PB definition to align with RAN1 specification	8.3.0
9-2008	RP#41	RP-080731	37r2			UE Spurious emission band UE co-existence	8.3.0
9-2008	RP#41	RP-080731	44			Definition of specified bandwidths	8.3.0
)9-2008	RP#41	RP-080731	48r3			Addition of Band 17	8.3.0
9-2008	RP#41	RP-080731	50			Alignment of the UE ACS requirement	8.3.0
9-2008	RP#41	RP-080731	52r1			Frequency range for Band 12	8.3.0
9-2008	RP#41	RP-080731	54r1			Absolute power tolerance for LTE UE power control	8.3.0
)9-2008	RP#41	RP-080731	55			TS36.101 section 6: Tx modulation	8.3.0
)9-2008	RP#41	RP-080732	6r2			DL FRC definition for UE Receiver tests	8.3.0
)9-2008	RP#41	RP-080732	46			Additional UE demodulation test cases	8.3.0
)9-2008	RP#41	RP-080732	47			Updated descriptions of FRC	8.3.0
)9-2008	RP#41	RP-080732	49			Definition of UE transmission gap	8.3.0
)9-2008	RP#41	RP-080732	51			Clarification on High Speed train model in 36.101	8.3.0
)9-2008	RP#41	RP-080732	53			Update of symbol and definitions	8.3.0
)9-2008	RP#41	RP-080743	56			Addition of MIMO (4x2) and (4x4) Correlation Matrices	8.3.0
2-2008	RP#42	RP-080908	94r2			CR TX RX channel frequency separation	8.4.0
2-2008	RP#42	RP-080909	105r1			UE Maximum output power for Band 13	8.4.0
2-2008	RP#42	RP-080909	60			UL EVM equalizer definition	8.4.0
12-2008	RP#42	RP-080909	63			Correction of UE spurious emissions	8.4.0
2-2008	RP#42	RP-080909	66			Clarification for UE additional spurious emissions	8.4.0
12-2008	RP#42	RP-080909	72			Introducing ACLR requirement for coexistance with UTRA 1.6MHZ channel from 36.803	8.4.0
2-2008	RP#42	RP-080909	75			Removal of [] from Section 6 transmitter characteristcs	8.4.0
12-2008	RP#42	RP-080909	81			Clarification for PHS band protection	8.4.0
12-2008	RP#42	RP-080909	101			Alignement for the measurement interval for transmit signal quality	8.4.0
2-2008	RP#42	RP-080909	98r1			Maximum power	8.4.0
2-2008	RP#42	RP-080909	57r1			CR UE spectrum flatness	8.4.0
2-2008	RP#42	RP-080909	71r1			UE in-band emission	8.4.0
2-2008	RP#42	RP-080909	58r1			CR Number of TX exceptions	8.4.0
12-2008	RP#42	RP-080951	99r2			CR UE output power dynamic	8.4.0
12-2008	RP#42	RP-080951	79r1			LTE UE transmitter intermodulation	8.4.0
12-2008	RP#42	RP-080910	91			Update of Clause 8	8.4.0
12-2008	RP#42	RP-080950	106r1			Structure of Clause 9 including CSI requirements for PUCCH mode 1-0	8.4.0
12-2008	RP#42	RP-080911	59		1	CR UE ACS test frequency offset	8.4.0
12-2008	RP#42	RP-080911	65		1	Correction of spurious response parameters	8.4.0
12 2009	DD#42	DD 090011	80		1	Bomoval of LTE LIE parrowband intermedulation	840

Table H-1: Change History

Removal of LTE UE narrowband intermodulation

03-2009 RP#4: 05-2009 RP#4: 05-2009 RP#4:	RP-090172 RP-090173 RP-090369 RP-090369	16011 163r1 162 110 114 121 125 138r1 161 164 111 164 111 165 167 168	MBSFN-Unicast demodulation test case for TDD Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes Update of Clause 9 Clarification on OCNG CQI reference measurement channels PUCCH 1-1 Static Test Case Reference Measurement Channel for TDD Editorial correction in Table 6.2.4-1 Boundary between E-UTRA fOOB and spurious emission domain for 1.4 MHz and 3 MHz bandwiths. (Technically Endorsed CR in R4-50bis - R4-091205) EARFCN correction for TDD DL bands. (Technically Endorsed CR in R4-50bis - R4-091206)	8.5.0 8.5.1 8.6.0 8.6.0
03-2009 RP#4:	RP-090172 RP-090173 RP-090369	163r1 162 110 114 121 125 138r1 161 164 111 164 111 167	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes Update of Clause 9 Clarification on OCNG CQI reference measurement channels PUCCH 1-1 Static Test Case Reference Measurement Channel for TDD Editorial correction in Table 6.2.4-1 Boundary between E-UTRA fOOB and spurious emission domain for 1.4 MHz and 3 MHz bandwiths. (Technically Endorsed CR in R4-50bis - R4-091205)	8.5.0 8.5.0
03-2009 RP#4:	RP-090172 RP-090173 RP-090369	163r1 162 110 114 121 125 138r1 161 164 111	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes Update of Clause 9 Clarification on OCNG CQI reference measurement channels PUCCH 1-1 Static Test Case Reference Measurement Channel for TDD Editorial correction in Table 6.2.4-1 Boundary between E-UTRA fOOB and spurious emission	8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.1
03-2009 RP#4:	RP-090172 RP-090173 RP-090369	163r1 162 110 114 121 125 138r1 161 164	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes Update of Clause 9 Clarification on OCNG CQI reference measurement channels PUCCH 1-1 Static Test Case Reference Measurement Channel for TDD Editorial correction in Table 6.2.4-1	8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0
03-2009 RP#4:	RP-090172 RP-090173 RP-090369	163r1 162 110 114 121 125 138r1 161 164	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes Update of Clause 9 Clarification on OCNG CQI reference measurement channels PUCCH 1-1 Static Test Case	8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0
03-2009 RP#4:	RP-090172 RP-090173 RP-090369 RP-090369 RP-090369 RP-090369 RP-090369 RP-090369 RP-090369 RP-090369	163r1 162 110 114 121 125 138r1 161 164	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes Update of Clause 9 Clarification on OCNG CQI reference measurement channels	8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0
03-2009 RP#4:	RP-090172 RP-090173 RP-090369 RP-090369 RP-090369 RP-090369 RP-090369	163r1 162 110 114 121 125 138r1 161	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes Update of Clause 9 Clarification on OCNG	8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0
03-2009 RP#43 03-2009 RP#43 03-2009 RP#43 03-2009 RP#443	 RP-090172 RP-090173 RP-090369 RP-090369 RP-090369 RP-090369 	163r1 162 110 114 121 125 138r1	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes Update of Clause 9	8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0
03-2009 RP#4:	 RP-090172 RP-090173 RP-090369 RP-090369 RP-090369 RP-090369 	163r1 162 110 114 121 125	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix Correction of 36.101 DL RMC table notes	8.5.0 8.5.0 8.5.0 8.5.0 8.5.0 8.5.0
03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4:	RP-090172 RP-090173 RP-090369 RP-090369	163r1 162 110 114 121	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel Addition of MIMO (4x4, medium) Correlation Matrix	8.5.0 8.5.0 8.5.0 8.5.0
03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4:	RP-090172 RP-090173 RP-090369 RP-090369	163r1 162 110 114	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel	8.5.0 8.5.0 8.5.0 8.5.0
03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4:	RP-090172 RP-090173 RP-090369	163r1 162 110	Clarification of EARFCN for 36.101 Correction to UL Reference Measurement Channel	8.5.0 8.5.0 8.5.0
03-2009 RP#4: 03-2009 RP#4: 03-2009 RP#4:	8 RP-090172 8 RP-090173	163r1 162	Clarification of EARFCN for 36.101	8.5.0 8.5.0
03-2009 RP#4: 03-2009 RP#4:	8 RP-090172	163r1		8.5.0
03-2009 RP#4			MDCEN Unicost demodulation text sees for TDD	
		10011	MBSFN-Unicast demodulation test case	
02 2000	6 KP-090172	160r1		8.5.0
00 2003 NF#4		14211	reference symbols Number of information bits in DwPTS	8.5.0
03-2009 RP#4		139r1	Performance requirement structure for TDD PDSCH Performance requirements and reference measurement channels for TDD PDSCH demodulation with UE-specific	8.5.0
03-2009 RP#43 03-2009 RP#43		124 139r1	Update of Clause 8: additional test cases	8.5.0 8.5.0
03-2009 RP#4		109	AWGN level for UE DL demodulation performance tests	8.5.0
03-2009 RP#4		141	Correction of reference sensitivity power level of Band 9	8.5.0
03-2009 RP#43		137r1	Wide band intermodulation	8.5.0
03-2009 RP#4		127	In-band blocking and sensitivity requirement for band 17	8.5.0
03-2009 RP#4		113	In-band blocking	8.5.0
03-2009 RP#4		140	Removal of ACLR2bis requirements	8.5.0
03-2009 RP#4	RP-090170	134	UL DM-RS EVM	8.5.0
03-2009 RP#4		132r2	PUCCH EVM	8.5.0
03-2009 RP#4		130	Spectrum flatness	8.5.0
03-2009 RP#4		120	Transmission BW Configuration	8.5.0
03-2009 RP#4		126	Leading UE uplink power control	8.5.0
03-2009 RP#4	RP-090170	120	Removal of "Out-of-synchronization handling of output power"	8.5.0
03-2009 RP#4		119	Spectrum emission mask for 1.4 MHz and 3 MHz bandwidhts	8.5.0
03-2009 RP#4		116	Clarification of PHS band including the future plan	8.5.0
03-2009 RP#4		155	E-UTRA ACLR for below 5 MHz bandwidths	8.5.0
03-2009 RP#4		108	Removal of [] from Transmitter Intermodulation	8.5.0
03-2009 RP#43 03-2009 RP#43		156r2 170	A-MPR table for NS_07 Corrections of references (References to tables and figures)	8.5.0 8.5.0
12-2008 RP#4		84r1	Clarification of HST propagation conditions	8.4.0 8.5.0
12-2008 RP#4		102	Introduction of Bands 12 and 17 in 36.101	8.4.0
12-2008 RP#4		85r1	New Clause 5 outline	8.4.0
12-2008 RP#42		77	Modification to EARFCN	8.4.0
12-2008 RP#42	RP-080915	67	Correction to the figure with the Transmission Bandwidth configuration	8.4.0
12-2008 RP#42	RP-080913	68	MIMO Correlation Matrix Corrections	8.4.0
12-2008 RP#42	RP-080912	104	Reference measurement channels for PDSCH performance requirements (TDD)	8.4.0
12-2008 RP#42	RP-080912	74r1	Addition of UL Reference Measurement Channels	8.4.0
12-2008 RP#42		73r1	Addition of 64QAM DL referenbce measurement channel	8.4.0
12-2008 RP#4		78	TDD Reference Measurement channel for RX characterisctics	8.4.0
12-2008 RP#42		62	Alignement of TB size n Ref Meas channel for RX characteristics	8.4.0
12-2008 RP#42 12-2008 RP#42		90r1 103	Introduction of Maximum Sensitivity Degradation Removal of [] from Section 7 Receiver characteristic	8.4.0 8.4.0

				Endorsed CR in R4-50bis - R4-091238)	
05-2009	RP#44	RP-090540	171	CR PRACH EVM. (Technically Endorsed CR in R4-50bis - R4- 091308)	8.6.0
)5-2009	RP#44	RP-090540	172	CR EVM correction. (Technically Endorsed CR in R4-50bis - R4- 091309)	8.6.0
5-2009	RP#44	RP-090540	177	CR power control accuracy. (Technically Endorsed CR in R4- 50bis - R4-091418)	8.6.0
)5-2009	RP#44	RP-090540	179	Correction of SRS requirements. (Technically Endorsed CR in R4-50bis - R4-091426)	8.6.0
)5-2009	RP#44	RP-090540	186	Clarification for EVM. (Technically Endorsed CR in R4-50bis - R4-091512)	8.6.0
)5-2009	RP#44	RP-090540	187	Removal of [] from band 17 Refsens values and ACS offset frequencies	8.6.0
)5-2009	RP#44	RP-090540	191	Completion of band17 requirements	8.6.0
5-2009	RP#44	RP-090540	192	Removal of 1.4 MHz and 3 MHz bandwidths from bands 13, 14 and 17.	8.6.0
5-2009	RP#44	RP-090540	223	CR: 64 QAM EVM	8.6.0
)5-2009	RP#44	RP-090540	201	CR In-band emissions	8.6.0
05-2009	RP#44	RP-090540	203	CR EVM exclusion period	8.6.0
)5-2009	RP#44	RP-090540	204	CR In-band emissions timing	8.6.0
)5-2009	RP#44	RP-090540	206	CR Minimum Rx exceptions	8.6.0
)5-2009	RP#44	RP-090540	207	CR UL DM-RS EVM	8.6.0
)5-2009	RP#44	RP-090540	218r1	A-MPR table for NS_07	8.6.0
)5-2009	RP#44	RP-090540	205r1	CR In-band emissions in shortened subframes	8.6.0
)5-2009	RP#44	RP-090540	200r1	CR PUCCH EVM	8.6.0
05-2009	RP#44	RP-090540	178r2	No additional emission mask indication. (Technically Endorsed CR in R4-50bis - R4-091421)	8.6.0
05-2009	RP#44	RP-090540	220r1	Spectrum emission requirements for band 13	8.6.0
05-2009	RP#44	RP-090540	197r2	CR on aggregate power tolerance	8.6.0
05-2009	RP#44	RP-090540	196r2	CR: Rx IP2 performance	8.6.0
)5-2009	RP#44	RP-090541	198r1	Maximum output power relaxation	8.6.0
)5-2009	RP#44	RP-090542	166	Update of performance requirement for TDD PDSCH with MBSFN configuration. (Technically Endorsed CR in R4-50bis - R4-091180)	8.6.0
05-2009	RP#44	RP-090542	175	Adding AWGN levels for some TDD DL performance requirements. (Technically Endorsed CR in R4-50bis - R4- 091406)	8.6.0
05-2009	RP#44	RP-090542	182	OCNG Patterns for Single Resource Block FRC Requirements. (Technically Endorsed CR in R4-50bis - R4-091504)	8.6.0
05-2009	RP#44	RP-090542	170r1	Update of Clause 8: PHICH and PMI delay. (Technically Endorsed CR in R4-50bis - R4-091275)	8.6.0
05-2009	RP#44	RP-090543	183	Requirements for frequency-selective fading test. (Technically Endorsed CR in R4-50bis - R4-091505)	8.6.0
05-2009	RP#44	RP-090543	199	CQI requirements under AWGN conditions	8.6.0
05-2009	RP#44	RP-090543	188r1	Adaptation of UL-RMC-s for supporting more UE categories	8.6.0
05-2009	RP#44	RP-090543	193r1	Correction of the LTE UE downlink reference measurement channels	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)	8.6.0
05-2009	RP#44	RP-090543	185r1	Requirements for PMI reporting. (Technically Endorsed CR in R4-50bis - R4-091510)	8.6.0
05-2009	RP#44	RP-090543	221r1	Correction to DL RMC-s for Maximum input level for supporting more UE-Categories	8.6.0
05-2009	RP#44	RP-090543	216	Addition of 15 MHz and 20 MHz bandwidths into band 38	8.6.0
05-2009	RP#44	RP-090559	180	Introduction of Extended LTE800 requirements. (Technically Endorsed CR in R4-50bis - R4-091432)	9.0.0
09-2009	RP#45	RP-090826	239	A-MPR for Band 19	9.1.0
09-2009	RP#45	RP-090822	225	LTE UTRA ACLR1 centre frequency definition for 1.4 and 3 MHz BW	9.1.0
09-2009	RP#45	RP-090822	227	Harmonization of text for LTE Carrier leakage	9.1.0
09-2009	RP#45	RP-090822	229	Sensitivity requirements for Band 38 15 MHz and 20 MHz bandwidths	9.1.0
09-2009	RP#45	RP-090822	236	Operating band edge relaxation of maximum output power for Band 18 and 19	9.1.0
09-2009	RP#45	RP-090822	238	Addition of 5MHz channel bandwidth for Band 40	9.1.0
09-2009	RP#45	RP-090822	245	Removal of unnecessary requirements for 1.4 and 3 MHz	9.1.0
09-2009	RP#45	RP-090877	261	bandwidths on bands 13 and 17	9.1.0
09-2009	RP#45	RP-090877 RP-090877	261 263R1	Correction of LTE UE ACS test parameter Correction of LTE UE ACLR test parameter	9.1.0
09-2009	RP#45	RP-090877 RP-090877	286	Uplink power and RB allocation for receiver tests	9.1.0
09-2009	RP#45	RP-090877	320	CR Sensitivity relaxation for small BW	9.1.0

09-2009	RP#45	RP-090877	324	Correction of Band 3 spurious emission band UE co-existence	9.1.0
09-2009	RP#45	RP-090877	249R1	CR Pcmax definition (working assumption)	9.1.0
09-2009	RP#45	RP-090877	330	Spectrum flatness clarification	9.1.0
09-2009	RP#45	RP-090877	332	Transmit power: removal of TC and modification of REFSENS note	9.1.0
09-2009	RP#45	RP-090877	282R1	Additional SRS relative power requirement and update of measurement definition	9.1.0
09-2009	RP#45	RP-090877	284R1	Power range applicable for relative tolerance	9.1.0
09-2009	RP#45	RP-090878	233	TDD UL/DL configurations for CQI reporting	9.1.0
09-2009	RP#45	RP-090878	235	Further clarification on CQI test configurations	9.1.0
09-2009	RP#45	RP-090878	243	Corrections to UL- and DL-RMC-s	9.1.0
09-2009	RP#45	RP-090878	247	Reference measurement channel for multiple PMI requirements	9.1.0
09-2009	RP#45	RP-090878	290	CQI reporting test for a scenario with frequency-selective interference	9.1.0
09-2009	RP#45	RP-090878	265R2	CQI reference measurement channels	9.1.0
09-2009	RP#45	RP-090878	321R1	CR RI Test	9.1.0
09-2009	RP#45	RP-090875	231	Correction of parameters for demodulation performance requirement	9.1.0
09-2009	RP#45	RP-090875	241R1	UE categories for performance tests and correction to RMC references	9.1.0
09-2009	RP#45	RP-090875	333	Clarification of Ês definition in the demodulation requirement	9.1.0
09-2009	RP#45	RP-090875	326	Editorial corrections and updates to PHICH PBCH test cases.	9.1.0
09-2009	RP#45	RP-090875	259R3	Test case numbering in section 8 Performance tests	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)	9.2.0
12-2009	RP-46	RP-091261	337	Adding beamforming model for user-specfic reference signal (Technically endorsed at RAN 4 52bis in R4-093525)	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)	9.2.0
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)	9.2.0
12-2009	RP-46	RP-091261	343	Correction to the modulated E-UTRA interferer (Technically endorsed at RAN 4 52bis in R4-093662)	9.2.0
12-2009	RP-46	RP-091264	345R1	OCNG: Patterns and present use in tests (Technically endorsed at RAN 4 52bis in R4-093664)	9.2.0
12-2009	RP-46	RP-091264	347	OCNG: Use in receiver and performance tests (Technically endorsed at RAN 4 52bis in R4-093666)	9.2.0
12-2009	RP-46	RP-091263	349	Miscellaneous corrections on CSI requirements (Technically endorsed at RAN 4 52bis in R4-093676)	9.2.0
12-2009	RP-46	RP-091261	351	Removal of RLC modes (Technically endorsed at RAN 4 52bis in R4-093677)	9.2.0
12-2009	RP-46	RP-091261	353	CR Rx diversity requirement (Technically endorsed at RAN 4 52bis in R4-093703)	9.2.0
12-2009	RP-46	RP-091261	355	A-MPR notation in NS_07 (Technically endorsed at RAN 4 52bis in R4-093706)	9.2.0
12-2009	RP-46	RP-091263	359	Single- and multi-PMI requirements (Technically endorsed at RAN 4 52bis in R4-093846)	9.2.0
12-2009	RP-46	RP-091263	363	CQI reference measurement channel (Technically endorsed at RAN 4 52bis in R4-093970)	9.2.0
12-2009	RP-46	RP-091292	364	LTE MBSFN Channel Model (Technically endorsed at RAN 4 52bis in R4-094020)	9.2.0
12-2009	RP-46	RP-091264	367	Numbering of PDSCH (User-Specific Reference Symbols) Demodulation Tests	9.2.0
12-2009	RP-46	RP-091264	369	Numbering of PDCCH/PCFICH, PHICH, PBCH Demod Tests	9.2.0
12-2009	RP-46	RP-091261	371	Remove [] from Reference Measurement Channels in Annex A	9.2.0
12-2009	RP-46	RP-091264	373R1	Corrections to RMC-s for Maximum input level test for low UE categories	9.2.0
12-2009	RP-46	RP-091261	377	Correction of UE-category for R.30	9.2.0
12-2009	RP-46	RP-091286	378	Introduction of Extended LTE1500 requirements for TS36.101	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	9.2.0
12-2009	RP-46	RP-091262	386R3	Clarification of measurement conditions of spurious emission requirements at the edge of spurious domain	9.2.0
12-2009	RP-46	RP-091262	390	Spurious emission table correction for TDD bands 33 and 38.	9.2.0
12-2009	RP-46	RP-091262	392R2	36.101 Symbols and abreviations for Pcmax	9.2.0
12-2009	RP-46	RP-091262	394	UTRAACLR1 requirement definition for 1.4 and 3 MHz BW completed	9.2.0
12-2009	RP-46	RP-091263	396	Introduction of the ACK/NACK feedback modes for TDD requirements	9.2.0
12-2009	RP-46	RP-091262	404R3	CR Power control exception R8	9.2.0
12-2009	RP-46	RP-091262	416R1	Relative power tolerance: special case for receiver tests	9.2.0
12-2009	RP-46	RP-091263	420R1	CSI reporting: test configuration for CQI fading requirements	9.2.0

12-2009	RP-46	RP-091284	421R1	Inclusion of Band 20 UE RF parameters	9.2.0
12-2009	RP-46	RP-091264	425	Editorial corrections and updates to Clause 8.2.1 FDD	9.2.0
12-2009	RP-46	RP-091262	427	demodulation test cases CR: time mask	9.2.0
12-2009	RP-46	RP-091264	430	Correction of the payload size for PDCCH/PCFICH performance	9.2.0
12-2009	RP-46	RP-091263	432	requirements Transport format and test point updates to RI reporting test	9.2.0
12-2009	RP-46	RP-091263	434	cases Transport format and test setup updates to frequency-selective	9.2.0
12-2009	RP-46	RP-091263	436	interference CQI tests CR RI reporting configuration in PUCCH 1-1 test	9.2.0
12-2009	RP-46 RP-46	RP-091263	438	Addition of R.11-1 TDD references	9.2.0
12-2009	RP-46	RP-091292	439	Performance requirements for LTE MBMS	9.2.0
12-2009	RP-46	RP-091262	442R1	In Band Emissions Requirements Correction CR	9.2.0
12-2009	RP-46	RP-091262	444R1	PCMAX definition	9.2.0
03-2010	RP-47	RP-100246	453r1	Corrections of various errors in the UE RF requirements	9.3.0
03-2010	RP-47	RP-100246	462r1	UTRA ACLR measurement bandwidths for 1.4 and 3 MHz	9.3.0
03-2010 03-2010	RP-47 RP-47	RP-100246	493 489r1	Band 8 Coexistence Requirement Table Correction Rel 9 CR for Band 14	9.3.0 9.3.0
03-2010	RP-47 RP-47	RP-100246 RP-100246	485r1	CR Band 1- PHS coexistence	9.3.0
03-2010	RP-47	RP-100240	501	Fading CQI requirements for FDD mode	9.3.0
03-2010	RP-47	RP-100247	499	CR correction to RI test	9.3.0
03-2010	RP-47	RP-100249	451	Reporting mode, Reporting Interval and Editorial corrections for demodulation	9.3.0
03-2010	RP-47	RP-100249	464r1	Corrections to 1PRB PDSCH performance test in presence of MBSFN.	9.3.0
03-2010	RP-47	RP-100249	458r1	OCNG corrections	9.3.0
03-2010	RP-47	RP-100249	467	Addition of ONCG configuration in DRS performance test	9.3.0
03-2010	RP-47	RP-100249	465r1	PDSCH performance tests for low UE categories	9.3.0
03-2010	RP-47	RP-100250	460r1	Use of OCNG in CSI tests	9.3.0
03-2010	RP-47 RP-47	RP-100250 RP-100250	491r1 469r1	Corrections to CQI test configurations Corrections of some CSI test parameters	9.3.0 9.3.0
03-2010	RP-47	RP-100250 RP-100251	456r1	TBS correction for RMC UL TDD 16QAM full allocation BW 1.4 MHz	9.3.0
03-2010	RP-47	RP-100262	449	Editorial corrections on Band 19 REFSENS	9.3.0
03-2010	RP-47	RP-100263	470r1	Band 20 UE RF requirements	9.3.0
03-2010	RP-47	RP-100264	446r1	A-MPR for Band 21	9.3.0
03-2010	RP-47	RP-100264	448	RF requirements for UE in later releases	9.3.0
03-2010	RP-47	RP-100268	445	36.101 CR: Editorial corrections on LTE MBMS reference measurement channels	9.3.0
03-2010	RP-47	RP-100268	454	The definition of the Doppler shift for LTE MBSFN Channel Model	9.3.0
03-2010	RP-47	RP-100239	478r3	Modification of the spectral flatness requirement and some editorial corrections	9.3.0
06-2010	RP-48	RP-100619	559	Corrections of tables for Additional Spectrum Emission Mask	9.4.0
06-2010	RP-48	RP-100619	538	Correction of transient time definition for EVM requirements	9.4.0
06-2010 06-2010	RP-48	RP-100619	557r2	CR on UE coexistence requirement Correction of antenna configuration and beam-forming model for	9.4.0
06-2010	RP-48	RP-100619	547r1	DRS CR: Corrections on MIMO demodulation performance	9.4.0
00 2010	RP-48	RP-100619	536r1	requirements	9.4.0
06-2010	RP-48	RP-100619	528r1	Corrections on the definition of PCMAX	9.4.0
06-2010				Relaxation of the PDSCH demodulation requirements due to	9.4.0
06 0040	RP-48	RP-100619	568	control channel errors	
06-2010 06-2010	RP-48 RP-48	RP-100619 RP-100620	566 505r1	Correction of the UE output power definition for RX tests Fading CQI requirements for TDD mode	9.4.0 9.4.0
06-2010	RP-48 RP-48	RP-100620 RP-100620	521	Correction to FRC for CQI index 0	9.4.0
06-2010	RP-48	RP-100620	516r1	Correction to CQI test configuration	9.4.0
06-2010	RP-48	RP-100620	532	Correction of CQI and PMI delay configuration description for TDD	9.4.0
06-2010	RP-48	RP-100620	574	Correction to FDD and TDD CSI test configurations	9.4.0
06-2010	RP-48	RP-100620	571	Minimum requirements for Rank indicator reporting	9.4.0
06-2010	RP-48	RP-100628	563	LTE MBMS performance requirements (FDD)	9.4.0
06-2010	RP-48	RP-100628	564	LTE MBMS performance requirements (TDD)	9.4.0
06-2010	RP-48	RP-100629	553r2	Performance requirements for dual-layer beamforming	9.4.0
06-2010 06-2010	RP-48 RP-48	RP-100630 RP-100630	524r2 519	CR: low Category CSI requirement Correction of FRC reference and test case numbering	9.4.0 9.4.0
06-2010	RP-48	RP-100630	526	Correction of FRC reference and test case numbering Correction of carrier frequency and EARFCN of Band 21 for TS36.101	9.4.0
06-2010	RP-48	RP-100630	508r1	Addition of PDSCH TDD DRS demodulation tests for Low UE categories	9.4.0
06-2010				Specification of minimum performance requirements for low UE	9.4.0
00 2010	RP-48	RP-100630	539	category	

				category TDD CRS single-antenna port tests	
06-2010				Introduction of sustained downlink data-rate performance	9.4.0
	RP-48	RP-100631	549r3	requirements	
06-2010	RP-48	RP-100683	530r1	Band 20 Rx requirements	9.4.0
09-2010	RP-49	RP-100920	614r2	Add OCNG to MBMS requirements	9.5.0
09-2010	RP-49 RP-49	RP-100916	599	Correction of PDCCH content for PHICH test	9.5.0
09-2010 09-2010	RP-49 RP-49	RP-100920 RP-100920	597r1 600r1	Beamforming model for transmission on antenna port 7/8 Correction of full correlation in frequency-selective CQI test	9.5.0 9.5.0
	KF-49	KF-100920	00011	Correction on single-antenna transmission fixed reference	9.5.0
09-2010	RP-49	RP-100920	601	channel	9.5.0
		14 100020	001	Reference sensitivity requirements for the 1.4 and 3 MHz	0.0.0
09-2010	RP-49	RP-100914	605	bandwidths	9.5.0
09-2010	RP-49	RP-100920	608r1	CR for DL sustained data rate test	9.5.0
09-2010				Correction of references in section 10 (MBMS performance	
	RP-49	RP-100919	611	requirements)	9.5.0
09-2010	RP-49	RP-100914	613	Band 13 and Band 14 spurious emission corrections	9.5.0
09-2010	RP-49	RP-100919	617r1	Rx Requirements	9.5.0
09-2010	RP-49	RP-100926	576r1	Clarification on DL-BF simulation assumptions	9.5.0
09-2010 09-2010	RP-49 RP-49	RP-100920 RP-100925	582r1 575r1	Introduction of additional Rel-9 scenarios Correction to band 20 ue to ue Co-existence table	9.5.0 9.5.0
09-2010	RP-49 RP-49	RP-100925 RP-100916	57511 581r1	Test configuration corrections to CQI reporting in AWGN	9.5.0
09-2010	RP-49	RP-100916	595	Corrections to RF OCNG Pattern OP.1 and 2	9.5.0
09-2010	RP-49	RP-100919	583	Editorial corrections of 36.101	9.5.0
09-2010			000	Addition of minimum performance requirements for low UE	0.0.0
30 2010	RP-49	RP-100920	586	category TDD tests	9.5.0
09-2010	RP-49	RP-100914	590r1	Downlink power for receiver tests	9.5.0
09-2010	RP-49	RP-100920	591	OCNG use and power in beamforming tests	9.5.0
09-2010	RP-49	RP-100916	593	Throughput for multi-datastreams transmissions	9.5.0
09-2010	RP-49	RP-100914	588	Missing note in Additional spurious emission test with NS_07	9.5.0
09-2010	RP-49	RP-100927	596r2	CR LTE_TDD_2600_US spectrum band definition additions to	10.0.0
				TS 36.101	
12-2010	RP-50	RP-101309	680	Demodulation performance requirements for dual-layer	10.1.0
40.0040	DD 50	DD 404005	070	beamforming	40.4.0
12-2010	RP-50	RP-101325	672	Correction on the statement of TB size and subband selection in	10.1.0
12-2010	RP-50	RP-101327	652	CSI tests Correction to Band 12 frequency range	10.1.0
12-2010	RP-50	RP-101329	630	Removal of [] from TDD Rank Indicator requirements	10.1.0
12-2010	RP-50	RP-101329	635r1	Test configuration corrections to CQI TDD reporting in AWGN	10.1.0
12 2010		101020	00011	(Rel-10)	10.110
12-2010	RP-50	RP-101330	645	EVM window length for PRACH	10.1.0
12-2010	RP-50	RP-101330	649	Removal of NS signalling from TDD REFSENS tests	10.1.0
12-2010	RP-50	RP-101330	642r1	Correction of Note 4 In Table 7.3.1-1: Reference sensitivity	10.1.0
				QPSK PREFSENS	
12-2010	RP-50	RP-101341	627	Add 20 RB UL Ref Meas channel	10.1.0
12-2010 12-2010	RP-50 RP-50	RP-101341 RP-101341	654r1 678	Additional in-band blocking requirement for Band 12	10.1.0
		RP-101341 RP-101341		Further clarifications for the Sustained Downlink Data Rate Test Correction on MBMS performance requirements	10.1.0
12-2010 12-2010	RP-50 RP-50	RP-101341	673r1 667r3	Correction on MBMS performance requirements CR Removing brackets of Band 41 reference sensitivity to TS	10.1.0
12-2010	KF-50	KF-101349	00/13	36.101	10.1.0
12-2010	RP-50	RP-101356	666r2	Band 42 and 43 parameters for UMTS/LTE 3500 (TDD) for TS	10.1.0
12 2010	14 00		00012	36.101	10.110
12-2010	RP-50	RP-101359	646r1	CR for CA, UL-MIMO, eDL-MIMO, CPE	10.1.0
12-2010	RP-50	RP-101361	620r1	Introduction of L-band in TS 36.101	10.1.0
12-2010	RP-50	RP-101379	670r1	Correction on the PMI reporting in Multi-Laye Spatial	10.1.0
				Multiplexing performance test	
12-2010	RP-50	RP-101380	679r1	Adding antenna configuration in CQI fading test case	10.1.0
01-2011	DD 51		005	Clause numbering correction	10.1.1
03-2011	RP-51	RP-110359	695	Removal of E-UTRA ACLR for CA	10.2.0
03-2011	RP-51	RP-110338	699 706r1	PDCCH and PHICH performance: OCNG and power settings	10.2.0
03-2011 03-2011	RP-51 RP-51	RP-110336 RP-110352	706r1 707r1	Spurious emissions measurement uncertainty REFSENSE in lower SNR	10.2.0
03-2011	RP-51	RP-110352 RP-110338	710	PMI performance: Power settings and precoding granularity	10.2.0
03-2011	RP-51	RP-110359	710 715r2	Definition of configured transmitted power for Rel-10	10.2.0
03-2011	RP-51	RP-110359	717	Introduction of requirement for adjacent intraband CA image	10.2.0
50 2011				rejection	
03-2011	RP-51	RP-110343	719	Minimum requirements for the additional Rel-9 scenarios	10.2.0
03-2011	RP-51	RP-110343	723	Corrections to power settings for Single layer beamforming with	10.2.0
				simultaneous transmission	
03-2011	RP-51	RP-110343	726r1	Correction to the PUSCH3-0 subband tests for Rel-10	10.2.0
03-2011	RP-51	RP-110338	730	Removing the square bracket for TS36.101	10.2.0
03-2011	RP-51	RP-110349	739	Removal of square brackets for dual-layer beamforming	10.2.0
02 0044		DD 440050	754	demodulation performance requirements	10.0.0
03-2011	RP-51	RP-110359	751	CR: Maximum input level for intra band CA	10.2.0
03-2011	RP-51	RP-110349	754r2	UE category coverage for dual-layer beamforming	10.2.0

03-2011	RP-51	RP-110343	756r1	Further clarifications for the Sustained Downlink Data Rate Test	10.2.0
03-2011	RP-51	RP-110343	759	Removal of square brackets in sustained data rate tests	10.2.0
03-2011	RP-51	RP-110343	762r1	Clarification to LTE relative power tolerance table	10.2.0
03-2011	RP-51	RP-110343	764	Introducing UE-selected subband CQI tests	10.2.0
03-2011	RP-51	RP-110343	765	Verification framework for PUSCH 2-2 and PUCCH 2-1 reporting	10.2.0
04-2011	-			Editorial: Spec Title correction, removal of "Draft"	10.2.1
06-2011	RP-52	RP-110804	766	Add Expanded 1900MHz Band (Band 25) in 36.101	10.3.0
06-2011	RP-52	RP-110795	768	Fixing Band 24 inclusion in TS 36.101	10.3.0
06-2011	RP-52	RP-110788	772	CR: Corrections for UE to UE co-existence requirements of Band	10.3.0
06 2011	DD 50	DD 110010	774	3 Add 2GHz S-Band (Band 23) in 36.101	10.2.0
06-2011 06-2011	RP-52 RP-52	RP-110812 RP-110789	782	CR: Band 19 A-MPR refinement	10.3.0 10.3.0
06-2011	RP-52	RP-110796	787	REFSENS in lower SNR	10.3.0
06-2011	RP-52	RP-110789	805	Clarification for MBMS reference signal levels	10.3.0
06-2011	RP-52	RP-110792	810	FDD MBMS performance requirements for 64QAM mode	10.3.0
06-2011	RP-52	RP-110787	814	Correction on CQI mapping index of RI test	10.3.0
06-2011	RP-52	RP-110789	824	Corrections to in-band blocking table	10.3.0
06-2011	RP-52	RP-110794	826	Correction of TDD Category 1 DRS and DMRS RMCs	10.3.0
06-2011	RP-52	RP-110794	828	TDD MBMS performance requirements for 64QAM mode	10.3.0
06-2011	RP-52	RP-110796	829	Correction of TDD RMC for Low SNR Demodulation test	10.3.0
06-2011	RP-52	RP-110796	830	Informative reference sensitivity requirements for Low SNR for TDD	10.3.0
06-2011	RP-52	RP-110787	778r1	Minor corrections to DL-RMC-s for Maximum input level	10.3.0
06-2011	RP-52 RP-52	RP-110789	832	PDCCH and PHICH performance: OCNG and power settings	10.3.0
06-2011	RP-52	RP-110789	818r1	Correction on 2-X PMI test for R10	10.3.0
06-2011	RP-52	RP-110791	816r1	Addition of performance requirements for dual-layer	10.3.0
06.004.4	RP-52	DD 440700	834	beamforming category 1 UE test	10.0.0
06-2011	RP-52	RP-110789	834	Performance requirements for PUCCH 2-0, PUCCH 2-1 and PUSCH 2-2 tests	10.3.0
06-2011	RP-52	RP-110807	835r1	CR for UL MIMO and CA	10.3.0
09-2011	RP-53	RP-111248	862r1	Removal of unnecessary channel bandwidths from REFSENS	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	10.4.0
09-2011	RP-53	RP-111248	872r1	CR for B14Rx requirement Rrel 10	10.4.0
09-2011	RP-53	RP-111248	890r1	CR to TS36.101: Correction on the accuracy test of CQI.	10.4.0
09-2011	RP-53	RP-111248	893	CR to TS36.101: Correction on CQI mapping index of TDD RI test	10.4.0
09-2011	RP-53	RP-111248	904	Correction of code block numbers for some RMCs	10.4.0
09-2011	RP-53	RP-111248	907	Correction to UL RMC for FDD and TDD	10.4.0
09-2011	RP-53	RP-111248	914r1	Adding codebook subset restriction for single layer closed-loop spatial multiplexing test	10.4.0
09-2011	RP-53	RP-111251	883	Sustained data rate: Correction of the ACK/NACK feedback	10.4.0
				mode	
09-2011	RP-53	RP-111251	929	36.101 CR on MBSFN FDD requirements(R10)	10.4.0
09-2011	RP-53	RP-111251	938	TDD MBMS performance requirements for 64QAM mode	10.4.0
09-2011	RP-53	RP-111252	895	Further clarification for the dual-layer beamforming demodulation requirements	10.4.0
09-2011	RP-53	RP-111255	908r1	Introduction of Band 22	10.4.0
09-2011	RP-53	RP-111255	939	Modifications of Band 42 and 43	10.4.0
09-2011	RP-53	RP-111260	944	CR for TS 36.101 Annex B: Static channels for CQI tests	10.4.0
09-2011	RP-53	RP-111262	878r1	Correction of CSI reference channel subframe description	10.4.0
09-2011	RP-53	RP-111262	887	Correction to UL MIMO	10.4.0
09-2011	RP-53	RP-111262	926r1	Power control accuracy for intra-band carrier aggregation	10.4.0
09-2011	RP-53	RP-111262	927r1	In-band emissions requirements for intra-band carrier aggregation	10.4.0
09-2011	RP-53	RP-111262	930r1	Adding the operating band for UL-MIMO	10.4.0
09-2011	RP-53	RP-111265	848	Corrections to intra-band contiguous CA RX requirements	10.4.0
09-2011	RP-53	RP-111265	863	Intra-band contiguos CA MPR requirement refinement	10.4.0
09-2011	RP-53	RP-111265	866r1	Intra-band contiguous CA EVM	10.4.0
09-2011	RP-53	RP-111266	935	Introduction of the downlink CA demodulation requirements	10.4.0
09-2011	RP-53	RP-111266	936r1	Introduction of CA UE demodulation requirements for TDD	10.4.0
12-2011	RP-54	RP-111684	947	Corrections of UE categories of Rel-10 reference channels for RF requirements	10.5.0
12-2011	RP-54			Alternative way to define channel bandwidths per operating band	10.5.0
10.0044		RP-111684	948	for CD for TS26 101: Adding note to the function of MDD	10 5 0
12-2011	RP-54 RP-54	RP-111686	949	CR for TS36.101: Adding note to the function of MPR	10.5.0
12-2011	-	RP-111680	950	Clarification on applying CSI reports during rank switching in RI FDD test - Rel-10	10.5.0
12-2011	RP-54	RP-111734	953r1	Corrections for Band 42 and 43 introduction	10.5.0
12-2011	RP-54	RP-111680	956	UE spurious emissions	10.5.0
12-2011	RP-54	RP-111682	959	Add scrambling identity n_SCID for MU-MIMO test	10.5.0
	RP-54	RP-111690	960r1	P-MPR definition	10.5.0
12-2011 12-2011	RP-54	RP-111693	962	Pcmax,c Computation Assumptions	10.5.0

12-2011	RP-54			Correction of frequency range for spurious emission	10.5.0
10.0011		RP-111733	963r1	requirements	10 - 0
12-2011	RP-54 RP-54	RP-111680	966	General review of the reference measurement channels	10.5.0
12-2011	RP-54	RP-111691	945	Corrections of Rel-10 demodulation performance requirements This CR is only partially implemented due to confliction with CR 966	10.5.0
12-2011	RP-54	RP-111684	946	Corrections of UE categories for Rel-10 CSI requirements This CR is only partially implemented due to confliction with CR 966	10.5.0
12-2011	RP-54	RP-111691	982r2	Introduction of SDR TDD test scenario for CA UE demodulation This CR is only partially implemented due to confliction with CR	10.5.0
12-2011	RP-54	RP-111693	971r1	966 CR on Colliding CRS for non-MBSFN ABS	10.5.0
12-2011	RP-54	RP-111693	972r1	Introduction of eICIC demodulation performance requirements for FDD and TDD	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	10.5.0
12-2011	RP-54	RP-111684	998	Correction and maintenance on CQI and PMI requirements (Rel- 10)	10.5.0
12-2011	RP-54	RP-111735	1004	MPR for CA Multi-cluster	10.5.0
12-2011	RP-54	RP-111691	1005	CA demodulation performance requirements for LTE FDD	10.5.0
12-2011	RP-54	RP-111692	1006	CQI reporting accuracy test on frequency non-selective scheduling on eDL MIMO	10.5.0
12-2011	RP-54	RP-111692	1007	CQI reporting accuracy test on frequency-selective scheduling on eDL MIMO	10.5.0
12-2011	RP-54	RP-111692	1008	PMI reporting accuracy test for TDD on eDL MIMO	10.5.0
12-2011	RP-54	RP-111692	1009r1	CR for TS 36.101: RI performance requirements	10.5.0
12-2011	RP-54	RP-111692	1010r1	CR for TS 36.101: Introduction of static CQI tests (Rel-10)	10.5.0
03-2012	RP-55	RP-120291	1014	RF: Updates and corrections to the RMC-s related annexes (Rel- 10)	10.6.0
03-2012 03-2012	RP-55	RP-120300	1015r1	On elCIC ABS pattern On elCIC interference models	10.6.0
03-2012	RP-55 RP-55	RP-120300 RP-120299	1016r1 1017r1	TS36.101 CR: on eDL-MIMO channel model using cross- polarized antennas	10.6.0 10.6.0
03-2012	RP-55	RP-120304	1020r1	TS36.101 CR: Correction to MBMS Performance Test Parameters	10.6.0
03-2012	RP-55	RP-120303	1021	Harmonic exceptions in LTE UE to UE co-ex tests	10.6.0
03-2012	RP-55	RP-120304	1023	Unified titles for Rel-10 CSI tests	10.6.0
03-2012	RP-55	RP-120300	1033r1	Introduction of reference channel for eICIC demodulation	10.6.0
03-2012	RP-55	RP-120304	1040r1	Correction of Actual code rate for CSI RMCs	10.6.0
03-2012	RP-55	RP-120304	1041r1	Definition of synchronized operation	10.6.0
03-2012	RP-55	RP-120296	1048r1	Intra band contiguos CA Ue to Ue Co-ex	10.6.0
03-2012	RP-55	RP-120296	1049r1	REL-10 CA specification editorial consistency	10.6.0
03-2012	RP-55	RP-120299	1053	Beamforming model for TM9	10.6.0
03-2012	RP-55	RP-120296	1054	Requirement for CA demodulation with power imbalance	10.6.0
03-2012	RP-55	RP-120298	1057	Updating Band 23 duplex specifications	10.6.0
03-2012	RP-55	RP-120298	1058r1	Correcting UE Coexistence Requirements for Band 23	10.6.0
03-2012	RP-55	RP-120304	1059r1	CA demodulation performance requirements for LTE TDD	10.6.0
03-2012	RP-55	RP-120304	1061 1064r1	Requirement for CA SDR FDD test scenario	10.6.0 10.6.0
03-2012 03-2012	RP-55 RP-55	RP-120293 RP-120299	1064r1	TS36.101 RF editorial corrections Rel 10 Introduction of TM9 demodulation performance requirements	10.6.0
03-2012	RP-55	RP-120299 RP-120304	1071r1	Introduction of a CA demodulation test for UE soft buffer management testing	10.6.0
03-2012	RP-55	RP-120296	1072	MPR formula correction For intra-band contiguous CA Bandwidth Class C	10.6.0
03-2012	RP-55	RP-120303	1077r1	CR for 36.101: B41 REFSENS and MOP changes to accommodate single filter architecture	10.6.0
03-2012	RP-55	RP-120300	1082	TM3 tests for eICIC	10.6.0
03-2012	RP-55	RP-120300	1083r1	Introduction of requirements of CQI reporting definition for ecICIC	10.6.0
03-2012	RP-55	RP-120304	1084	eDL MIMO CSI requirements	10.6.0
03-2012	RP-55	RP-120306	1070r1	Introduction of Band 26/XXVI to TS 36.101	11.0.0
03-2012	RP-55	RP-120310	1074	Band 41 CA CR for TS36.101, section 5	11.0.0
03-2012	RP-55	RP-120310	1075r1	Band 41 CA CR for TS36.101, section 6	11.0.0
03-2012	RP-55	RP-120310	1076	Band 41 CA CR for TS36.101, section 7	11.0.0
06-2012	RP-56	RP-120795	1085r2	Modulator specification tightening	11.1.0
06-2012	RP-56	RP-120777	1087r1	Carrier aggregation Relative power tolerance, removal of TBD.	11.1.0
06-2012	RP-56	RP-120783	1089	UE spurious emissions for Band 7 and Band 38 coexistence	11.1.0
06-2012 06-2012	RP-56 RP-56	RP-120780 RP-120779	1092	Deleting square brackets in Reference Measurement Channels CR to TS36.101: Correction on parameters for the eDL-MIMO CQI and PMI tests	11.1.0 11.1.0
00-2012	NF-30	NF-120/19	1097	CR to TS36.101: Fixed reference channel for PDSCH demodulation performance requirements on eDL-MIMO – NOT	11.1.0
06-2012	RP-56	RP-120780	1098r1	implemented as it is based on a wrong version of the spec	11.1.0

06-2012	RP-56	RP-120774	1107	RMC correction on eDL-MIMO RI test	11.1.0
06-2012	RP-56	RP-120774	1108r1	FRC correction on frequency selective CQI and PMI test (Rel-	11.1.0
00.0040	DD 50	DD 400774		11)	44.4.0
06-2012 06-2012	RP-56 RP-56	RP-120774 RP-120784	1111 1114r1	Correction on test point for PMI test (Rel-11) Corrections and clarifications on eICIC demodulation test	11.1.0 11.1.0
06-2012	RP-56	RP-120784	1117r1	Corrections and clarifications on elCIC CSI tests	11.1.0
06-2012	RP-56	RP-120783	1119r1	Corrections on UE performance requirements	11.1.0
06-2012	RP-56	RP-120773	1120	Introduction of CA band combination Band1 + Band19 to TS	11.1.0
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06-2012 06-2012	RP-56 RP-56	RP-120769 RP-120773	1127 1140	Addition of ETU30 channel model Addition of Maximum Throughput for R.30-1 TDD RMC	11.1.0 11.1.0
06-2012	RP-56	RP-120779	1140	CR for 36.101: The clarification of MPR and A-MPR for CA	11.1.0
06-2012	RP-56	RP-120784	1142	Corrections for eICIC demod test case with MBSN ABS	11.1.0
06-2012	RP-56	RP-120785	1144	Removing brackets of contiguous allocation A-MPR for CA_NS_04	11.1.0
06-2012	RP-56	RP-120784	1149r1	Introduction of PDCCH test with colliding RS on MBSFN-ABS	11.1.0
06-2012	RP-56	RP-120784	1153r1	Some clarifications and OCNG pattern for eICIC demodulation requirements	11.1.0
06-2012	RP-56	RP-120773	1155	Introduction of TDD CA Soft Buffer Limitation	11.1.0
06-2012	RP-56	RP-120795	1156	B26 and other editorial corrections	11.1.0
06-2012 06-2012	RP-56 RP-56	RP-120779 RP-120780	1161 1163	Corrections on CQI and PMI test FRC for TDD PMI test	11.1.0 11.1.0
06-2012	RP-56	RP-120778	1165r1	Clean-up of UL-MIMO for TS36.101	11.1.0
06-2012	RP-56	RP-120782	1171	Removal of unnecessary references to single carrier	11.1.0
				requirements from Interband CA subclauses	
06-2012	RP-56	RP-120781	1174	PDCCH wrong detection in receiver spurious emissions test	11.1.0
06-2012 06-2012	RP-56 RP-56	RP-120776 RP-120793	1184 1189r2	Corrections to 3500 MHz Introduction of Band 44	11.1.0 11.1.0
06-2012	RP-56 RP-56	RP-120793 RP-120784	1189r2 1193r1	Target SNR setting for eICIC demodulation requirement	11.1.0
06-2012	RP-56	RP-120780	1196	Editorial simplification to CA REFSENS UL allocation table	11.1.0
06-2012	RP-56	RP-120778	1199	Correction of wrong table refernces in CA receiver tests	11.1.0
06-2012	RP-56	RP-120791	1200r1	Introduction of e850_LB (Band 27) to TS 36.101	11.1.0
06-2012	RP-56	RP-120764	1212	Correction of PHS protection requirements for TS 36.101	11.1.0
06-2012 06-2012	RP-56 RP-56	RP-120793 RP-120781	1213r1 1215r1	Introduction of Band 28 into TS36.101 Proposed revision of subclause 4.3A for TS36.101	11.1.0 11.1.0
06-2012	RP-56	RP-120781	1217r1	Proposed revision of subclause 4.3.4 for TS36.101 Proposed revision on subclause 6.3.4A for TS36.101	11.1.0
06-2012	RP-56	RP-120795	1219r1	Aligning requirements between Band 18 and Band 26 in TS36.101	11.1.0
06-2012	RP-56	RP-120782	1221	SNR definition	11.1.0
06-2012	RP-56	RP-120778	1223	Correction of CSI configuration for CA TM4 tests R11	11.1.0
06-2012	RP-56	RP-120773	1225	CR on CA UE receiver timing window R11	11.1.0
06-2012	RP-56	RP-120784	1226	Extension of static elCIC CQI test	11.1.0
09-2012	RP-57	RP-121294	1230	Correct Transport Block size in 9RB 16QAM Uplink Reference Measurement Channel	11.2.0
09-2012	RP-57	RP-121313	1233r1	RF: Corrections to power allocation parameters for transmission mode 8 (Rel-11)	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)	11.2.0
09-2012	RP-57	RP-121305	1237	ACK/NACK feedback modes for FDD and TDD TM4 CA demodulation requirements (Rel-11)	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)	11.2.0
09-2012	RP-57	RP-121302	1241	ABS pattern setup for MBSFN ABS test (resubmission of R4- 63AH-0204 for Rel-11)	11.2.0
09-2012	RP-57	RP-121302	1243	CR on elCIC CQI definition test (resubmission of R4-63AH-0205 for Rel-11)	11.2.0
09-2012 09-2012	RP-57 RP-57	RP-121302 RP-121302	1245 1247	Transmission of CQI feedback and other corrections (Rel-11) Target SNR setting for eICIC MBSFN-ABS demodulation	11.2.0 11.2.0
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09-2012 09-2012	RP-57 RP-57	RP-121335 RP-121300	1248 1251	Introduction of CA_1_21 RF requirements into TS36.101 Corrections of spurious emission band UE co-existence	11.2.0 11.2.0
			1253	applicable in Japan Correction on RMC for frequency non-selective CQI test	11.2.0
09-2012 09-2012	RP-57 RP-57	RP-121306 RP-121306	1253	Requirements for the eDL-MIMO CQI test	11.2.0
09-2012	RP-57	RP-121302	1255	Clarification on PDSCH test setup under MBSFN ABS	11.2.0
09-2012	RP-57	RP-121316	1258	Update of Band 28 requirements	11.2.0
09-2012	RP-57	RP-121313	1262	Applicability of statement allowing RBW < Meas BW for spurious	11.2.0
09-2012	RP-57	RP-121298	1265	Clarification of RB allocation for DRS demodulation tests	11.2.0
09-2012 09-2012	RP-57 RP-57	RP-121304 RP-121337	1267 1268r1	Removal of brackets for CA Tx TS 36.101 CR for CA_38	11.2.0 11.2.0
09-2012	RP-57 RP-57	RP-121337 RP-121327	126811	Introduction of CA_B7_B20 in 36.101	11.2.0
09-2012	RP-57	RP-121313	1271	Corrections of FRC subframe allocations and other minor problems	11.2.0

09-2012	RP-57	RP-121307	1276	Correction of eDL-MIMIO CSI RMC tables and references	11.2.0
09-2012	RP-57	RP-121307	1278	Correction of MIMO channel model for polarized antennas	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)	11.2.0
09-2012	RP-57	RP-121334	1283r1	Add requirements for inter-band CA of B_1-18 and B_11-18 in TS36.101	11.2.0
09-2012	RP-57	RP-121304	1285r1	CR for MPR mask for multi-clustered simultaneous transmission in single CC in Rel-11	11.2.0
09-2012	RP-57	RP-121447	1288r2	Introduction of Japanese Regulatory Requirements to LTE Band 8(R11)	11.2.0
09-2012	RP-57	RP-121315	1289	CR for Band 27 MOP	11.2.0
09-2012	RP-57	RP-121315	1290	CR for Band 27 A-MPR	11.2.0
09-2012	RP-57	RP-121316	1291	CR to replace protected frequency range with new band number 27	11.2.0
09-2012	RP-57	RP-121215	1292r1	Introduction of CA band combination Band3 + Band5 to TS 36.101	11.2.0
09-2012	RP-57	RP-121306	1300r1	Requirements for eDL-MIMO RI test	11.2.0
09-2012	RP-57	RP-121306	1304	Corrections to TM9 demodulation tests	11.2.0
09-2012	RP-57	RP-121313	1306	Correction to PCFICH power parameter setting	11.2.0
09-2012	RP-57	RP-121306	1310r1	Correction on frequency non-selective CQI test	11.2.0
09-2012	RP-57	RP-121306	1313r1	eDL-MIMO CQI/PMI test	11.2.0
09-2012	RP-57	RP-121313 RP-121304	1316	Correction of the definition of unsynchronized operation	11.2.0
09-2012	RP-57 RP-57		1320r1 1324r2	Correction to Transmit Modulation Quality Tests for Intra-Band CA 36.101 CR for LTE_CA_B7	11.2.0 11.2.0
09-2012 09-2012	RP-57 RP-57	RP-121338 RP-121331	1324r2 1325	Introduction of CA_3_20 RF requirements into TS36.101	11.2.0
09-2012	RP-57	RP-121331	1325	A-MPR table correction for NS_18	11.2.0
09-2012	RP-57	RP-121304	1332r1	Bandwidth combination sets for intra-band and inter-band carrier aggregation	11.2.0
09-2012	RP-57	RP-121325	1339	Introduction of LTE Advanced Carrier Aggregation of Band 4 and Band 13	11.2.0
09-2012	RP-57	RP-121326	1340r1	Introduction of CA configurations CA-12A-4A and CA-17A-4A	11.2.0
09-2012	RP-57	RP-121324	1341	Introduction of CA_B3_B7 in 36.101	11.2.0
09-2012	RP-57	RP-121328	1343	Introduction of Band 2 + Band 17 inter-band CA configuration into 36.101	11.2.0
09-2012	RP-57	RP-121306	1351	FRC for TM9 FDD	11.2.0
09-2012	RP-57	RP-121295	1352	Random precoding granularity in PMI tests	11.2.0
09-2012	RP-57	RP-121302	1358	Introduction of RI test for eICIC	11.2.0
09-2012	RP-57	RP-121304	1360	Notes for deltaTib and deltaRib tables	11.2.0
09-2012	RP-57	RP-121304	1361	CR for A-MPR masks for NS_CA_1C	11.2.0
12-2012	RP-58	RP-121884	1362	Introduction of CA_3_8 RF requirements to TS 36.101	11.3.0
12-2012 12-2012	RP-58 RP-58	RP-121870 RP-121861	1363 1366	Removal of square brackets for Band 27 in Table 5.6.1-1 Some changes related to CA tests and overview table of DL measurement channels	11.3.0 11.3.0
12-2012	RP-58	RP-121860	1368	Correction of eICIC CQI tests	11.3.0
12-2012	RP-58	RP-121860	1370	Correction of eICIC demodulation tests	11.3.0
12-2012	RP-58	RP-121862	1374	Correction on CSI-RS subframe offset parameter	11.3.0
12-2012	RP-58	RP-121862	1376	Correction on FRC table in CSI test	11.3.0
12-2012	RP-58	RP-121862	1382	Correction of reference channel table for TDD eDL-MIMIO RI test	11.3.0
12-2012	RP-58	RP-121850	1386	OCNG patterns for Sustained Data rate testing	11.3.0
12-2012	RP-58	RP-121867	1388r1	Introduction of one periodic CQI test for CA deployments	11.3.0
12-2012	RP-58	RP-121894	1396	Introduction of CA_B5_B12 in 36.101	11.3.0
12-2012	RP-58	RP-121850	1401	Introducing the additional frequency bands of 5 MHz x 2 in 1.7 GHz in Japan to Band 3	11.3.0
<u>12-2012</u> 12-2012	RP-58	RP-121887	1406r1	Reference sensitivity for the small bandwidth of CA_4-12	11.3.0
12-2012	RP-58 RP-58	RP-121860 RP-121862	1407 1409	CR on eICIC RI test Cleaning of 36.101 Performance sections Rel-11	11.3.0 11.3.0
12-2012	RP-58 RP-58	RP-121862 RP-121861	1416	Out-of-band blocking requirements for inter-band carrier aggregation	11.3.0
12-2012	RP-58	RP-121861	1418	Adding missed SNR reference values for CA soft buffer tests	11.3.0
12-2012	RP-58	RP-121890	1422	Introduction of CA_4A-5A into 36.101	11.3.0
12-2012	RP-58	RP-121867	1431	Clean up of specification R11	11.3.0
12-2012	RP-58	RP-121867	1436	Band 1 to Band 33 and Band 39 UE coexistence requirements	11.3.0
12-2012	RP-58	RP-121871	1437r1	Editorial corrections for Band 26	11.3.0
12-2012	RP-58	RP-121896	1438	Introduction of Band 5 + Band 17 inter-band CA configuration into 36.101	11.3.0
12-2012	RP-58	RP-121862	1442	Correction of eDL-MIMO RI test and RMC table for the CSI test	11.3.0
12-2012	RP-58	RP-121861	1444	Minor correction to ceiling function example - rel11	11.3.0
12-2012	RP-58	RP-121862	1449	Correction of SNR definition	11.3.0
12-2012	RP-58	RP-121860	1450	Brackets clean up for eICIC CSI/demodulation	11.3.0
12-2012	RP-58	RP-121860	1455	CR on elCIC RI testing (Rel-11)	11.3.0
12-2012 12-2012	RP-58 RP-58	RP-121862 RP-121879	1459 1461r1	Correction on FRC table CR for LTE B14 HPUE (Power Class 1)	11.3.0 11.3.0
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12-2012	RP-58	RP-121862	1464	Adding references to the appropriate beamforming model (Rel- 11)	11.3.0
12-2012	RP-58	RP-121898	1465r1	Introduction of CA_8_20 RF requirements into TS36.101	11.3.0
12-2012	RP-58	RP-121882	1468r1	Introduction of inter-band CA_11-18 into TS36.101	11.3.0
12-2012	RP-58	RP-121903	1472r1	Introduction of advanced receivers demodulation performance (FDD)	11.3.0
12-2012	RP-58	RP-121903	1473r1	Introduction of performance requirements for verifying the receiver type for advanced receivers (FDD/TDD)	11.3.0
12-2012	RP-58	RP-121886	1474	CR to remove the square bracket of A-MPR in TS36.101	11.3.0
12-2012	RP-58	RP-121861	1476	Correction of some errors in reference sensitivity for CA in TS	11.3.0
12-2012	RP-58	RP-121903	1480r1	36.101 (R11) Introduction of Advanced Receivers Test Cases for TDD	11.3.0
12-2012	RP-58	RP-121903	1490r1	Introduction of Band 29	11.3.0
2-2012	RP-58	RP-121901	14901	Low-channel Band 1 coexistence with PHS	11.3.0
2-2012	RP-58	RP-121861	1494 1498r1	Completion of the tables of bandwidth combinations specified for	11.3.0
				CA	
2-2012	RP-58	RP-121861	1499r1	Exceptions to REFSENS requrirements for class A2 CA combinations	11.3.0
2-2012	RP-58	RP-121892	1500	Introduction of carrier aggregation configuration CA_4-7	11.3.0
2-2012	RP-58	RP-121870	1504	Editorial corrections to Band 27 specifications	11.3.0
2-2012	RP-58	RP-121878	1505	Band 28 AMPR for DTV protection	11.3.0
2-2012	RP-58	RP-121852	1509r1	UE-UE coexistence between bands with small frequency separation	11.3.0
2-2012	RP-58	RP-121911	1510	Adding UE-UE Coexistence Requirement for Band 3 and Band	11.3.0
0.0040	DD 52		4540	26	44.0.0
2-2012 2-2012	RP-58	RP-121866	1513	Maintenance of Band 23 UE Coexistence	11.3.0
2-2012 2-2012	RP-58 RP-58	RP-121851 RP-121861	1515 1517	Corrections to TM4 rank indicator Test 3	11.3.0 11.3.0
				Correction of test configuraitons and FRC for CA demodulation with power imbalance	
2-2012	RP-58	RP-121860	1518	Applicable OFDM symbols of Noc_2 for PDCCH/PCFICH ABS- MBSFN test cases	11.3.0
3-2013	RP-59	RP-130279	1519	OCNG patterns for Enhanced Performance Requirements Type A	11.4.0
3-2013	RP-59	RP-130277	1520	Corrections on in-band blocking for Band 29 for carrier aggregation	11.4.0
3-2013	RP-59	RP-130268	1523	Brackets removal in Rel-11 TM4 rank indicator Test 3	11.4.0
)3-2013	RP-59	RP-130279	1524r1	Cleanup of Advanced Receivers requirement scenarios for	11.4.0
0 2010	111-00	100275	102411	demodulation and CSI (FDD/TDD)	11.4.0
3-2013	RP-59	RP-130258	1528	Corrections to CQI reporting	11.4.0
3-2013	RP-59	RP-130262	1536	Corrections for eICIC performance requirements (rel-11)	11.4.0
3-2013	RP-59	RP-130264	1539	Correction of CA power imbalance performance requirements	11.4.0
3-2013	RP-59	RP-130287	1543	Correction of a symbol for MPR in single carrier for TS 36.101(R11)	11.4.0
)3-2013	RP-59	RP-130287	1544r1	Correction of some inter-band CA requiements for TS 36.101 (R11)	11.4.0
03-2013		DD 400070	4540	Correction of contigous allocation A-MPR for CA_NS_05	44.4.0
)3-2013)3-2013	RP-59 RP-59	RP-130276 RP-130263	1546 1547r1	Clarification of spurious emission domain for CA_NS_05	11.4.0
3-2013		KF-130203	-	(R11)	
3-2013	RP-59	RP-130264	1548	CR for CA performance requirements	11.4.0
3-2013	RP-59	RP-130284	1553r1	Introduction of downlink non-contiguous CA into REL -11 TS 36.101	11.4.0
3-2013	RP-59	RP-130263	1557	CA_1C: CA_NS_02 and CA_NS_03 A-MPR REL-11	11.4.0
3-2013	RP-59	RP-130287	1560	Editorial corrections to subclause 5	11.4.0
3-2013	RP-59	RP-130267	1562	Addition of UE Regional Requirements to Band 23 Based on New Regulatory Order in the US	11.4.0
3-2013	RP-59	RP-130272	1567	Band 26: modification of A-MPR for 'NS_15'	11.4.0
3-2013	RP-59	RP-130287	1571r1	Band 41 requirements for operation in China and Japan	11.4.0
3-2013	RP-59	RP-130260	1574	Remove [] from CSI test case parameters	11.4.0
3-2013	RP-59	RP-130287	1575	Corrections to UE co-existence	11.4.0
3-2013	RP-59	RP-130287	1579	UE-UE co-existence between Band 1 and Band 33/39	11.4.0
3-2013	RP-59	RP-130287	1580	Correction on reference to note for Band 7 and 38 co-existence	11.4.0
3-2013	RP-59	RP-130263	1584r1	Cleanup for CA UE RF requirements	11.4.0
3-2013	RP-59	RP-130263	1586	Corrections on UL configuration for CA UE receiver requirements	11.4.0
)3-2013	RP-59	RP-130263	1588	Correction of Transmit modulation quality requirements for CA	11.4.0
)3-2013)3-2013	RP-59	RP-130268	1590	Revision of Common Test Parameters for User-specific	11.4.0
0.0040	DD 52	DD 400070	4505	Demodulation Tests	44.4.5
3-2013	RP-59	RP-130278	1595	Correction for a Band 27 A-MPR table	11.4.0
3-2013	RP-59	RP-130264	1597	Correction of CA CQI test setup	11.4.0
3-2013	RP-59	RP-130287	1600r1	Correction of B12 DL Specification in Table 5.5A-2	11.4.0
3-2013	RP-59	RP-130263	1602	Correction of table reference	11.4.0
6-2013	RP-60	RP-130765	1604r1	Complementary description for definition of MIMO Correlation Matrices using cross polarized antennas	11.5.0
06-2013	RP-60	RP-130763	1607	Correction of transport format parameters for CQI index 10 (15	11.5.0

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06-2013	RP-60	RP-130765	1610	Maintenance of Band 23 A-MPR (NS_11) in TS 36.101 (Rel-11)	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	11.5.0
06-2013	RP-60	RP-130770	1619	CR for introducing UE TM3 demodulation performance requirements under high speed	11.5.0
06-2013	RP-60	RP-130765	1623	Correction of test parameters for eICIC performance requirements	11.5.0
06-2013	RP-60	RP-130765	1625	Correction of test parameters for eICIC CSI requirements	11.5.0
06-2013	RP-60	RP-130765	1627	Correction of resource allocation for the multiple PMI Cat 1 UE test	11.5.0
06-2013	RP-60	RP-130766	1629	Removal of note 2 from band 28	11.5.0
06-2013	RP-60	RP-130770	1641	Correction of the CSI-RS parameter configuration	11.5.0
06-2013	RP-60	RP-130770	1650r1	Addition of Band 41 for intra-band non-contiguous CA for 36.101	11.5.0
06-2013	RP-60	RP-130770	1654r1	MPR for intra-band non-contiguous CA	11.5.0
06-2013	RP-60	RP-130765	1656	Modification of configured output power to account for larger tolerance	11.5.0
06-2013	RP-60	RP-130769	1658r1	Missing symbols in the NS_15 table	11.5.0
06-2013	RP-60	RP-130766	1673	Corrections to Rx requirements for inter-band CA configurations with REFSENS exceptions	11.5.0
06-2013	RP-60	RP-130770	1681r1	Correction for TS 36.101	11.5.0
06-2013	RP-60	RP-130763	1684	RF: Corrections to RMC-s for sustained data rate test	11.5.0
06-2013	RP-60	RP-130770	1685	Non-contiguous intraband CA channel spacing	11.5.0
06-2013	RP-60	RP-130766	1689	Carrier aggregation in multi RAT and multiple band combination terminals	11.5.0
06-2013	RP-60	RP-130766	1691	Completion of out-of-band blocking requirements for inter-band CA with one UL	11.5.0
06-2013	RP-60	RP-130767	1695r1	CR on the bandwidth coverage issue of CA demodulation performance (Rel-11)	11.5.0
06-2013	RP-60	RP-130765	1697	Correction on UE maximum output power for intra-band CA (R11)	11.5.0
06-2013	RP-60	RP-130770	1698r1	CR for introduction of FelCIC demodulation performance requirements	11.5.0
06-2013	RP-60	RP-130770	1701	Removing bracket from CA_11A-18A requirments	11.5.0
06-2013	RP-60	RP-130767	1703	CR on the bandwidth coverage issue of CA CQI performance (Rel-11)	11.5.0
06-2013	RP-60	RP-130766	1705	Corrections to ACLR for Rel-11 CA	11.5.0
06-2013	RP-60	RP-130765	1716	Corrections to NS_11 A-MPR Table	11.5.0
06-2013	RP-60	RP-130769	1717	Corrections to NS_12 A-MPR Table	11.5.0
09-2013	RP-61	RP-131285	1731r1	CR on performance requirements of CA soft buffer managemen (Rel-11)	11.6.0
09-2013	RP-61	RP-131281	1735	CR on applicability of CA sustained data rate tests (Rel-11)	11.6.0
09-2013	RP-61	RP-131293	1738r1	Performance requirement for UE under EVA200	11.6.0
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09-2013	RP-61	RP-131293	1812r1	Remianed Transmitter requirements for intra-band non- contiguous CA	11.6.0
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12-2013	RP-62	RP-131937	1939r2	CR to Introduce fading CQI test for CoMP (FDD)	11.7.0
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12-2013	RP-62	RP-131931	1960	CA performance requirements for TDD intra-band NC CA	11.7.0
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12-2013	RP-62	RP-131938	2000r1	Distributed EPDCCH Demodulation Test	11.7.0
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06-2014	RP-64	RP-140911	2246r1	Remove [] from eICIC TDD RI requirement	11.9.0
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06-2014	RP-64	RP-140911	2336r1	Add missing Uplink downlink configuration to eICIC TDD RI requirement	11.9.0
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06-2014	RP-64	RP-140911	2350	Test configuration for intra-band contiguous carrier aggregation power control	11.9.0
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09-2014	RP-65	RP-141525	2503	Perf: Cleanup and better description of DL-RMC-s with dynamic coding rate for CSI requirements (Rel-11)	11.10.0
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-	RP-66	RP-142147	2633	Editorial CR for UL configuration table for intra-band contiguous and non-contiguous CA in 36.101, Rel-11	11.11.0
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	RP-66	RP-142147	2619r1	CQI reporting in AWGN: CQI indices in set	11.11.0
	RP-66	RP-142147	2670r1	Correction of CoMP TDD CSI tests (Rel-11)	11.11.0
12-2014	RP-66	RP-142147	2640r1	Applicability of in-gap and out-of-gap measurements for intra- band NC CA	11.11.0
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12-2014	RP-66	RP-142148	2707r1	Introduction of minimum requirements for intra-band NC CA with timing offset	11.11.0
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12 2014	RP-66	RP-142144	2709r1	Clarification of UL and DL CA configuration	11.11.0
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12-2014 12-2014 12-2014 12-2014 12-2014	RP-66 RP-66 RP-66	RP-142144 RP-142144 RP-142144	2757 2750r1 2687r1	Correction to Note 2 of Harmonic Signal Exceptions in Spurious Emissions Removal of brackets and TBD from CA feature Removal of bracket for UL MIMO	11.11.0 11.11.0 11.11.0
12-2014 12-2014 12-2014 12-2014 12-2014 12-2014	RP-66 RP-66 RP-66 RP-66	RP-142144 RP-142144 RP-142144 RP-142144	2757 2750r1 2687r1 2696r1	Correction to Note 2 of Harmonic Signal Exceptions in Spurious Emissions Removal of brackets and TBD from CA feature Removal of bracket for UL MIMO Maintenance of CA performance requirements (Rel-11)	11.11.0 11.11.0 11.11.0 11.11.0
12-2014 12-2014 12-2014 12-2014 12-2014 12-2014 12-2014	RP-66 RP-66 RP-66 RP-66	RP-142144 RP-142144 RP-142144 RP-142144 RP-142144	2757 2750r1 2687r1 2696r1 2703r2	Correction to Note 2 of Harmonic Signal Exceptions in Spurious Emissions Removal of brackets and TBD from CA feature Removal of bracket for UL MIMO Maintenance of CA performance requirements (Rel-11) UE to UE co-existence between B42/B43	11.11.0 11.11.0 11.11.0 11.11.0 11.11.0
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12-2014 12-2014 12-2014 12-2014 12-2014 12-2014 03-2015 03-2015	RP-66 RP-66 RP-66 RP-66	RP-142144 RP-142144 RP-142144 RP-142144 RP-142144	2757 2750r1 2687r1 2696r1 2703r2	Correction to Note 2 of Harmonic Signal Exceptions in Spurious Emissions Removal of brackets and TBD from CA feature Removal of bracket for UL MIMO Maintenance of CA performance requirements (Rel-11) UE to UE co-existence between B42/B43 Correction for timing offset test for intraband non-contiguous CA Modification of CSI reference measurement channel Rel-11 Editorial correction on symbols for enhanced performance	11.11.0 11.11.0 11.11.0 11.11.0 11.11.0
12-2014 12-2014 12-2014 12-2014 12-2014 12-2014 03-2015 03-2015 03-2015	RP-66 RP-66 RP-66 RP-66 RP-66 RP-67 RP-67	RP-142144 RP-142144 RP-142144 RP-142144 RP-142144 RP-150384 RP-150384	2757 2750r1 2687r1 2696r1 2703r2 2763 2778	Correction to Note 2 of Harmonic Signal Exceptions in Spurious Emissions Removal of brackets and TBD from CA feature Removal of bracket for UL MIMO Maintenance of CA performance requirements (Rel-11) UE to UE co-existence between B42/B43 Correction for timing offset test for intraband non-contiguous CA Modification of CSI reference measurement channel Rel-11 Editorial correction on symbols for enhanced performance requirements type A UL HARQ in PDSCH and PDCCH/PCFICH demod test cases for	11.11.0 11.11.0 11.11.0 11.11.0 11.11.0 11.12.0 11.12.0
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03-2015	RP-67	RP-150392	2841	Editorial CR for CA UE performance tests in 36.101 in Rel-11	11.12.0
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07-2015	RP-68	RP-150958	3001	CR for updating CA applicability rule in 36.101 in Rel-11	11.13.0
07-2015	RP-68	RP-150954	3017	EVM for Intra-band contiguous UL CA for non-equal Channel BWs	11.13.0
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09-2015	RP-69	RP-151483	3048			UE co-existence requirements between Band 42 and Japanese bands	11.14.0
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09-2015	RP-69	RP-151475	3100			Correction on UE maximum output power class of Band 22 for UL MIMO	11.14.0
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12-2015	RP-70	RP-152132	3169a			Corrections to applicability of CSI requirements for low UE categories (Rel-11)	11.15.0
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03-2016	RP-71	RP-160488	3471		-	CR of editorial change on PHICH group and Ng in Rel-11	11.16.0
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12/2016	RP-74	RP-162411	4019		Α	RMCs and applicabilility of core RF requirements	11.19.0
12/2016	RP-74	RP-162411	4028		A	Correction of spurious emissions requirements for Band 9 range and intra-band CA	11.19.0
12/2016	RP-74	RP-162413	4062	1	F	Corrections to CA table reference and header	11.19.0
12/2016	RP-74	RP-162406	4099	<u> </u>	A	Versioning indicator bit for NS_04 A-MPR table	11.19.0
12/2016	RP-74	RP-162413	4155	1	F	RF: Beamforming model missing in chapter 9 TM9 receiver Type A tests (Rel-11)	11.19.0
01/2017	RP-74		L			Page header information update	11.19.1
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09/2017	RP-77	RP-171966	4636		F	Update to CA_NS_04 SEM and additional spurious emissions	11.21.0

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