ETSI TS 136 521-1 V8.3.1 (2009-11)

Technical Specification

LTE;
Evolved Universal Terrestrial Radio Access (E-UTRA);
User Equipment (UE) conformance specification;
Radio transmission and reception;
Part 1: Conformance testing
(3GPP TS 36.521-1 version 8.3.1 Release 8)

Reference
RTS/TSGR-0536521-1v831

Keywords
LTE

ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

Individual copies of the present document can be downloaded from:
http://www.etsi.org

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

Users of the present document should be aware that the document may be subject to revision or change of status. Information on the current status of this and other ETSI documents is available at
http://portal.etsi.org/tb/status/status.asp

If you find errors in the present document, please send your comment to one of the following services:
http://portal.etsi.org/chaircor/ETSI_support.asp

Copyright Notification

Intellectual Property Rights

IPRs essential or potentially essential to the present document may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: *"Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards"*, which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (http://webapp.etsi.org/IPR/home.asp).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Foreword

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

The present document may refer to technical specifications or reports using their 3GPP identities, UMTS identities or GSM identities. These should be interpreted as being references to the corresponding ETSI deliverables.

The cross reference between GSM, UMTS, 3GPP and ETSI identities can be found under http://webapp.etsi.org/key/queryform.asp.

Contents

Foreword

This Technical Specification 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:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

1 Scope

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

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

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

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*.

[<seq>] <doctype> <#>[([up to and including]{yyyy[-mm]|V<a[.b[.c]]>}[onwards])]: "<Title>".

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

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

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

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

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

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

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

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

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

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

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. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

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.

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

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

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

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

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

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

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

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

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

3.2 Symbols

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

$BW_{Channel}$	Channel bandwidth
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 received energy per RE during the useful part of the symbol, i.e. excluding the cyclic prefix, averaged across the allocated RB(s) (average power within the allocated RB(s), divided by the number of RE within this allocation, and normalized to the subcarrier spacing) at the UE antenna connector
F	Frequency
$F_{Interferer}$ (offset)	Frequency offset of the interferer
$F_{Interferer}$	Frequency of the interferer
F_C	Frequency of the carrier centre frequency
F_{DL_low}	The lowest frequency of the downlink operating band

F_{DL_high}	The highest frequency of the downlink operating band
F_{UL_low}	The lowest frequency of the uplink operating band
F_{UL_high}	The highest frequency of the uplink operating band

Editor's note: one of the two following definitions for Io will be used (TBD in RAN4)

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_o	The power spectral density of the total input signal at the UE antenna connector (power averaged over the useful part of the symbols within a given bandwidth and normalised to the said bandwidth), 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_{CRBs}	The number of resource blocks allocated in the uplink transmission bandwidth.
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 subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector
$N_{Offs\text{-}DL}$	Offset used for calculating downlink EARFCN
$N_{Offs\text{-}UL}$	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 at the eNode B transmit antenna connector
N_{RB}	Transmission bandwidth configuration, expressed in units of resource blocks
N_{UL}	Uplink EARFCN
P	Number of cell-specific antenna ports
p	Antenna port number
Rav	Minimum average throughput per RB
$P_{Interferer}$	Modulated mean power of the interferer
ΔF_{OOB}	Δ Frequency of Out Of Band emission
RB #	Position of the RB in the channel bandwidth.

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].

ACLR	Adjacent Channel Leakage Ratio
ACS	Adjacent Channel Selectivity
A-MPR	Additional Maximum Power Reduction

AWGN	Additive White Gaussian Noise
BS	Base Station
CP	Cyclic Prefix
CW	Continuous Wave
DCI	Downlink Control Information
DL	Downlink
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
FSTD	Frequency-Shift Time Diversity
HARQ	Hybrid ARQ
HD-FDD	Half- Duplex FDD
MCS	Modulation and Coding Scheme
MOP	Maximum Output Power
MPR	Maximum Power Reduction
MSR	Maximum Sensitivity Reduction
OCNG	OFDMA Channel Noise Generator
OFDMA	Orthogonal Frequency Division Multiple Access
OOB	Out-of-band
PA	Power Amplifier
PCFICH	Physical Control Format Indicator Channel
PDCCH	Physical Downlink Control Channel
PDSCH	Physical Downlink Shared Channel
PRB	Physical Resource Block
PMI	Precoding Matrix Indicator
PSS	Primary Synchronization Signal
PSS_RA	PSS-to-EPRE ratio for the channel PSS
PUCCH	Physical Uplink Control Channel
RE	Resource Element
REFSENS	Reference Sensitivity power level
r.m.s	Root Mean Square
RS	Reference Signal
SFBC	Space-Frequency Block Coding
SNR	Signal-to-Noise Ratio
SSS	Secondary Synchronization Signal
SSS_RA	SSS-to-RS EPRE ratio for the channel SSS
TDD	Time Division Duplex
TPC	Transmit Power Control
TPMI	Transmitted Precoding Matrix Indicator
UE	User Equipment
UL	Uplink
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
UTRAN	UMTS Terrestrial Radio Access Network
xCH_RA	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols not containing RS
xCH_RB	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols containing RS

4 General

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

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

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

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

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

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

In clauses 6 and 7 TX and RX test cases for FDD/TDD test cases are defined. FDD and TDD test scenarios/ requirements are included within the same test case. For test cases with any difference between the FDD and TDD branches the test description part of the test case has been separated in two sections to cover the two technologies. The applicability for the FDD and TDD branches are specified in TS 36-521-2.

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

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

For test cases in clauses 6 and 7.3, the maximum output power state in the test procedures is the state in which the UE transmits with output power within the range specified in the test requirement of Maximum Output Power (Table 6.2.2.5-1), or Maximum Power Reduction test cases (Table 6.2.3.5-1) in case MPR is allowed, according to each test configuration in the initial condition. This range of maximum output power shall not be modified for any further additional relaxation.

5 Frequency bands and channel arrangement

5.1 General

The channel arrangements presented in this clause are based on the frequency 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 Operating bands

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

Table 5.2-1 E-UTRA operating bands

E-UTRA Operating Band	Uplink (UL) eNode B receive UE transmit			Downlink (DL) eNode B transmit UE receive			Duplex Mode
	F_{UL_low}	–	F_{UL_high}	F_{DL_low}	–	F_{DL_high}	
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	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	–	1452.9 MHz	1475.9 MHz	–	1500.9 MHz	FDD
12	698 MHz	–	716 MHz	728 MHz	–	746 MHz	FDD
13	777 MHz	–	787 MHz	746 MHz	–	756 MHz	FDD
14	788 MHz	–	798 MHz	758 MHz	–	768 MHz	FDD
15	Reserved			Reserved			FDD
16	Reserved			Reserved			FDD
17	704 MHz	–	716 MHz	734 MHz	–	746 MHz	FDD
18	815 MHz	–	830 MHz	860 MHz	–	875 MHz	FDD
19	830 MHz	–	845 MHz	875 MHz	–	890 MHz	FDD
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
Note: Band 6 is not applicable.							

5.3 TX–RX frequency separation

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

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

Frequency 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

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.

5.4 Channel arrangement

5.4.1 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:

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

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.

5.4.2 Channel bandwidth

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

Table 5.4.2-1 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 5.4.2-1 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.

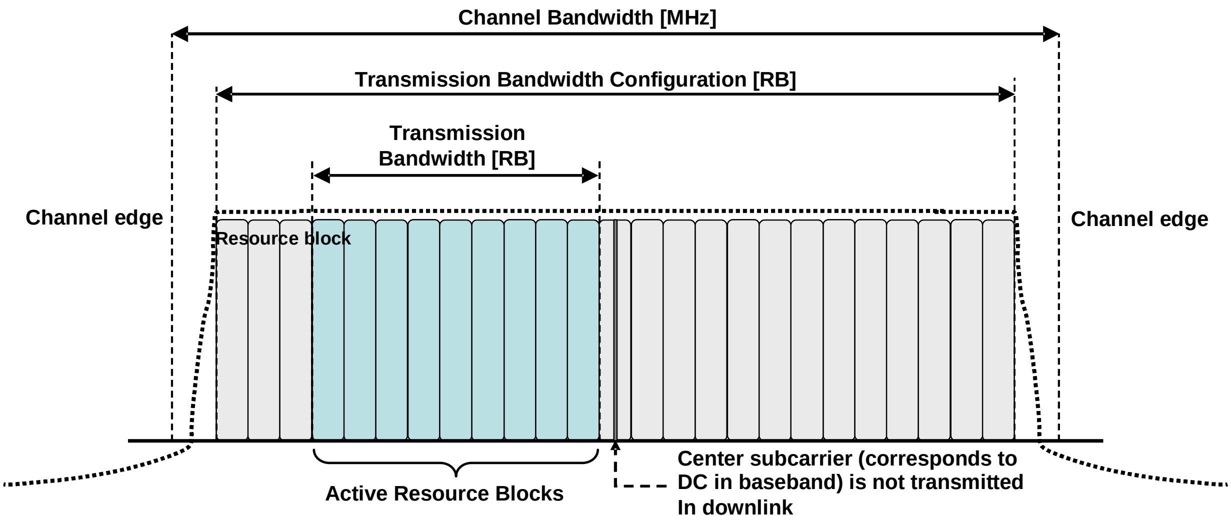

Figure 5.4.2-1 Definition of Channel Bandwidth and Transmission Bandwidth Configuration for one E-UTRA carrier.

5.4.2.1 Channel bandwidths per operating band

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

Table 5.4.2.1-1: E-UTRA channel bandwidth

E-UTRA band / channel bandwidth						
E-UTRA Band	**1.4 MHz**	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
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	Yes[1]
8	Yes	Yes	Yes	Yes[1]		
9			Yes	Yes	Yes[1]	Yes[1]
10			Yes	Yes	Yes	Yes
11			Yes	Yes[1]	Yes[1]	Yes[1]
12	Yes	Yes	Yes[1]	Yes[1]		
13	Yes	Yes	Yes[1]	Yes[1]		
14	Yes	Yes	Yes[1]	Yes[1]		
...						
17	Yes	Yes	Yes[1]	Yes[1]		
18			Yes	Yes[1]	Yes[1]	
19			Yes	Yes[1]	Yes[1]	
...						
33			Yes	Yes	Yes	Yes
34			Yes	Yes	Yes	
35	Yes	Yes	Yes	Yes	Yes	Yes
36	Yes	Yes	Yes	Yes	Yes	Yes
37			Yes	Yes	Yes	Yes
38			Yes	Yes	Yes	Yes
39			Yes	Yes	Yes	Yes
40			Yes	Yes	Yes	Yes
NOTE 1: bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (Clause 7.3) is allowed.						

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.

5.4.3 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.

5.4.4 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 $N_{Offs\text{-}DL}$ are given in table 5.4.4-1 and N_{DL} is the downlink EARFCN.

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

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

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

Table 5.4.4-1 E-UTRA channel numbers

Band	Downlink			Uplink		
	F_{DL_low} (MHz)	$N_{Offs\text{-}DL}$	Range of N_{DL}	F_{UL_low} (MHz)	$N_{Offs\text{-}UL}$	Range of N_{UL}
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 – 20449
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 – 4999	1427.9	22750	22750 – 22999
12	728	5000	5000 – 5179	698	23000	23000 – 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
…						
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
NOTE: The channel numbers that designate carrier frequencies so close to the operating band edges that the carrier extends beyond the operating band edge shall not be used. This implies that the first 7, 15, 25, 50, 75 and 100 channel numbers at the lower operating band edge and the last 6, 14, 24, 49, 74 and 99 channel numbers at the upper operating band edge shall not be used for channel bandwidths of 1.4, 3, 5, 10, 15 and 20 MHz respectively.						

6 Transmitter Characteristics

6.1 General

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

Transient periods are excluded. If the transient periods are to be included in a particular test case it will be explicitly indicated inside the particular test procedure of the test case. The transient periods due to power steps, OFF/ON and ON/OFF transititons could occur at slot or symbol boundary with transients, on one or both sides of the boundary. The measurement period and whether to exclude the transient periods are specified respective sections below.

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

The measurement period is derived by concatenating the correct number of individual uplink slots until the correct measurement period required by the test case is reached.

6.2 Transmit power

6.2.1 Void

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

6.2.2 UE Maximum Output Power

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

FDD aspects missing or not yet determined:

- *For partial RB allocation, it is not decided yet whether low range and high range frequencies should be tested.*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *The maximum output power test case description has been verified to apply for both FDD and TDD exactly as it is.*

6.2.2.1 Test purpose

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

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

6.2.2.2 Test applicability

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

6.2.2.3 Minimum conformance requirements

The following UE Power Classes defines the maximum output power. The power is the broadband transmit power of the UE, i.e. the power in the channel bandwidth (clause 5.4.2) of the radio access mode. The period of measurement shall be at least one sub frame (1ms).

Table 6.2.2.3-1: UE Power Class

EUTRA band	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
1					23	±2		
2					23	±2[2]		
3					23	±2[2]		
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[2]		
12					23	±2[2]		
13					23	±2		
14					23	±2		
…								
17					23	±2		
18					23	±2		
19					23	±2		
…								
33					23	±2		
34					23	±2		
35					23	±2		
36					23	±2		
37					23	±2		
38					23	±2		
39					23	±2		
40					23	±2		
…								
Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS Note 2: For transmission configurations (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB								

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

6.2.2.4 Test description

6.2.2.4.1 Initial condition

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

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

Table 6.2.2.4.1-1: Test Configuration Table

Initial Conditions				
Test Environment as specified in TS 36.508[7] subclause 4.1	Normal, TL/VL, TL/VH, TH/VL, TH/VH			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1	Low range, Mid range, High range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1	Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths				
	Downlink Configuration	**Uplink Configuration**		
Ch BW	N/A for Max UE output power testing	Mod'n	RB allocation	
			FDD	TDD
1.4MHz		QPSK	1	1
1.4MHz		QPSK	5	5
3MHz		QPSK	1	1
3MHz		QPSK	4	4
5MHz		QPSK	1	1
5MHz		QPSK	8	8
10MHz		QPSK	1	1
10MHz		QPSK	12	12
15MHz		QPSK	1	1
15MHz		QPSK	16	16
20MHz		QPSK	1	1
20MHz		QPSK	18	18

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

Note 2: For E-UTRA bands for which the lower tolerance limit is not relaxed:
- The 1 RB allocation shall be tested at RB#0 for low and mid range, RB #max for high range test frequency.
- The starting resource block of partial RB allocation shall be RB #0 for low and mid range, RB# (max - RB allocation) for high range test frequency.

Note 3: For E-UTRA bands for which the lower tolerance limit is relaxed:
- If the test channel bandwidth is larger than 4MHz, then the 1 RB allocation shall be tested at both RB #0 and RB #max.
- If the test channel bandwidth is smaller or equal to 4MHz, then the 1 RB allocation shall be tested at RB #0.
- If the test channel bandwidth = (FUL_high - FUL_low) specified by the operating band, then the 1 RB allocation shall be tested at RB #0, RB # $\lceil N_{RB}/2 \rceil$ and RB #max.
- For partial RB allocation, test frequency is middle range, and the starting resource block shall be RB #0.

DoCoMo CR□4250 is reflected in the table.,

Also TDD RMC is added as in draft.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508[7]
2. The parameter settings for the cell are set up according to TS 36.508 [7]
3. Downlink signals are initially set up according to Annex C.0, C.1, and C. Annex H.1 and H.3.0.
4. The UL Reference Measurement channels isset according to Table 6.2.2.4.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A according to TS 36.508 [7] clause 4.5.3A. Message contents are defined in clause 6.2.2.4.3.

6.2.2.4.2 Test procedure

1. SS sends uplink scheduling information every TTI via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.2.2.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 6.2.2.4.1-1.

3. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be one sub-frame (1ms).

6.2.2.4.3 Message contents

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

6.2.2.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2.5-1.

Table 6.2.2.5-1: UE Power Class test requirements

EUTRA band	Class 1 (dBm)	Tolerance (dB)	Class 2 (dBm)	Tolerance (dB)	Class 3 (dBm)	Tolerance (dB)	Class 4 (dBm)	Tolerance (dB)
1					23	±2.7		
2					23	±2.7[2]		
3					23	±2.7[2]		
4					23	±2.7		
5					23	±2.7		
6					23	±2.7		
7					23	±2.7[2]		
8					23	±2.7[2]		
9					23	±2.7		
10					23	±2.7		
11					23	±2.7[2]		
12					23	±2.7[2]		
13					23	±2.7		
14					23	±2.7		
…								
17					23	±2.7		
18					23	±2.7		
19					23	±2.7		
…								
33					23	±2.7		
34					23	±2.7		
35					23	±2.7		
36					23	±2.7		
37					23	±2.7		
38					23	±2.7		
39					23	±2.7		
40					23	±2.7		
…								
Note 1: The above tolerances are applicable for UE(s) that support up to 4 E-UTRA operating bands. For UE(s) that support 5 or more E-UTRA bands the maximum output power is expected to decrease with each additional band and is FFS								
Note 2: For transmission configurations (Figure 5.4.2-1, Table 5.4.4-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB (Tolerance = +2.7 / -4.2)								

6.2.3 Maximum Power Reduction (MPR)

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

FDD aspects missing or not yet determined:

- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*

- *The MPR test case description has been verified to apply for both FDD and TDD exactly as it is as part of the UE max output power verification.*

6.2.3.1 Test purpose

The number of RB identified in Table 6.2.2.3-1 is based on meeting the requirements for adjacent channel leakage ratio and the maximum power reduction (MPR) due to Cubic Metric (CM).

Simple scaling can be used to derive the requirement for other bandwidth based on the previously agreed value for 5MHz channel bandwidth.

6.2.3.2 Test applicability

The requirements of this test apply in test cases 6.6.2.1 Spectrum Emission Mask and 6.6.2.3 Adjacent Channel Leakage power Ratio to all types of E-UTRA UE release 8 and forward.

6.2.3.3 Minimum conformance requirements

For UE Power Class 3, the allowed Maximum Power Reduction (MPR) for the maximum output power in Table 6.2.2.3-1 due to higher order modulation and transmit bandwidth configuration (resource blocks) is specified in Table 6.2.3.3-1.

Table 6.2.3.3-1: Maximum Power Reduction (MPR) for Power Class 3

Modulation	Channel bandwidth / Transmission bandwidth configuration [RB]						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2

6.2.3.4 Test description

6.2.3.4.1 Initial condition

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.3.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.2.3.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			Normal, TH/VL, TH/VH			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Low range, Mid range, High range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	FULL	FULL
1.4MHz	QPSK	6	6	16QAM	5	5
1.4MHz	QPSK	6	6	16QAM	FULL	FULL
3.0MHz	QPSK	4	4	QPSK	FULL	FULL
3.0MHz	QPSK	4	4	16QAM	4	4
3.0MHz	QPSK	4	4	16QAM	FULL	FULL
5MHz	QPSK	8	8	QPSK	FULL	FULL
5MHz	QPSK	8	8	16QAM	8	8
5MHz	QPSK	8	8	16QAM	FULL	FULL
10MHz	QPSK	16	16	QPSK	FULL	FULL
10MHz	QPSK	16	16	16QAM	12	12
10MHz	QPSK	16	16	16QAM	FULL	FULL
15MHz	QPSK	25	25	QPSK	FULL	FULL
15MHz	QPSK	25	25	16QAM	16	16
15MHz	QPSK	25	25	16QAM	FULL	FULL
20MHz	QPSK	30	30	QPSK	FULL	FULL
20MHz	QPSK	30	30	16QAM	18	18
20MHz	QPSK	30	30	16QAM	FULL	FULL
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. For the uplink RB allocation the starting resource block shall be RB#0.						

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 6.2.3.4.1-1.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.2.2.4.3.

6.2.3.4.2 Test procedure

1. Send continuous uplink power control "up" commands to the UE to ensure that the UE transmits at its maximum power potentially adjusted by MPR.

2. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least one sub-frame (1ms).

6.2.3.4.3 Message contents

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

6.2.3.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.2.5-1.

Table 6.2.3.5-1: UE Power Class test requirements

E-UTRA Band	Class 1 (dBm)	Tol. (Db)	Class 2 (dBm)	Tol. (dB)	Class 3 (dBm)	QPSK full RB allocation Tol. (dB))	16QAM partial RB allocation Tol. (dB)	16QAM full RB allocation Tol. (dB)
1					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
2					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
3					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
4					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
5					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
6					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
7					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
8					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
9					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
10					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
11					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
12					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
13					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
14					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
…								
17					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
...								
33					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
34					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
35					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
36					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
37					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
38					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
39					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7
40					23	+2.7 / -3.7	+2.7 / -3.7	+2.7 / -4.7

6.2.4 Additional Maximum Power Reduction (A-MPR)

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

FDD aspects missing or not yet determined:

- *It is yet to be determined if this is a standalone test or part of ACLR andAdditional SEM Spectrum Emissions Mask and Additional Spurious Emissions test cases to verify the UE transmission power is correct.*
- *The addition of the zero A-MPR test case for NS_03 to NS_06 would also be reconsidered based on the decision above. The uplink RB allocation for the zero A-MPR test case for NS_03 to NS_06 is left in brackets.*
- *Need to clarify the proper handling of the 1.5dB relaxation in the lower tolerance limit at band corner when MPR and A-MPR are applicable.*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *The A-MPR test case description has been verified to apply for both FDD and TDD exactly as it is as part of the UE max output power verification.*

6.2.4.1 Test purpose

Additional ACLR and spectrum emission requirements can be signalled by the network to indicate that the UE shall meet also additional requirements in a specific deployment scenario. To meet these additional requirements the concept of Additional Maximum Power Reduction A-MPR is introduced for the output power in Table 6.2.2.3-1. Unless stated otherwise, an A-MPR of 0 dB shall be used.

6.2.4.2 Test applicability

This test applies to all types of E-UTRA UE release 8 and forward. [FSS if this is a standalone test or part of Additional Spectrum Emissions Mask and Additional Spurious Emissions test cases to verify the UE transmission power is correct. The addition of the zero A-MPR test case for NS_03 to NS_06 would also be reconsidered based on the decision.]

6.2.4.3 Minimum conformance requirements

For UE Power Class 3 the specific requirements and identified sub-clauses are specified in Table 6.2.4.3-1 along with the allowed A-MPR values that may be used to meet these requirements. The allowed A-MPR values specified below in Table 6.2.4.3.-1 and 6.2.4.3-2 are in addition to the allowed MPR requirements specified in clause 6.2.3.

Table 6.2.4.3-1: Additional Maximum Power Reduction (A-MPR) / Spectrum Emission requirements

Network Signalling value	Requirements (sub-clause)	E-UTRA Band	Channel bandwidth (MHz)	Resources Blocks	A-MPR (dB)
NS_01	NA	NA	NA	NA	NA
NS_03	6.6.2.2.3.1	2, 4,10, 35, 36	3	>5	≤ 1
	6.6.2.2.3.1	2, 4,10, 35,36	5	>6	≤ 1
	6.6.2.2.3.1	2, 4,10, 35,36	10	>6	≤ 1
	6.6.2.2.3.1	2, 4,10,35,36	15	>8	≤ 1
	6.6.2.2.3.1	2, 4,10,35, 36	20	>10	≤ 1
NS_04	6.6.2.2.3.2	TBD	TBD	TBD	TBD
NS_05	6.6.3.3.3.1	1	10,15,20	≥ 50 for QPSK	≤ 1
NS_06	6.6.2.2.3.3	12, 13, 14, 17	1.4, 3, 5, 10	n/a	n/a
NS_07	6.6.2.2.3.3 6.6.3.3.3.2	13	10	Table 6.2.4.3-2	Table 6.2.4.3-2
NS_08	6.6.3.3.3.3	19	10, 15	> 29	≤ 1
				> 39	≤ 2
				> 44	≤ 3
..					
NS_32	-	-	-	-	-

Table 6.2.4.3-2: A-MPR for "NS_07"

	Region A		Region B				Region C	
RB_start[1]	0 – 12		13 –18		19 – 42		43 – 49	
L_CRB[2] [RBs]	6 – 8	1 to 5 and 9-50	<8	≥8	<18	≥18	≤2	>2
A-MPR [dB]	8	12	0	12	0	6	3	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 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.

6.2.4.4 Test description

6.2.4.4.1 Initial condition

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.4.4.1-1 or table 6.2.4.4.1-2. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively as applicable. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.2.4.4.1-1: Test Configuration Table (network signalled value "NS_03" to "NS_06")

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				Normal		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				Low range, Mid range, High range		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				See Table 6.2.4.3-1		
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
3MHz	QPSK	4	4	QPSK	[4]	[4]
3MHz	QPSK	4	4	QPSK	15	15
5MHz	QPSK	8	8	QPSK	[5]	[5]
5MHz	QPSK	8	8	QPSK	25	25
10MHz	QPSK	16	16	QPSK	[5]	[5]
10MHz	QPSK	16	16	QPSK	50	50
15MHz	QPSK	25	25	QPSK	[5]	[5]
15MHz	QPSK	25	25	QPSK	75	75
20MHz	QPSK	30	30	QPSK	[5]	[5]
20MHz	QPSK	30	30	QPSK	100	100
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2: The allowed A-MPR values specified in Table 6.2.4.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3. Note 3: For low range frequency, the starting resource block of partial RB allocation shall be RB# (max – RB allocation) of the channel bandwidth. Note 4: For middle range frequency, the starting resource block of partial RB allocation shall be RB# 0 and RB# (max – RB allocation) of the channel bandwidth. Note 5: For high range frequency, the starting resource block of partial RB allocation shall be RB# 0 of the channel bandwidth.						

Table 6.2.4.4.1-2: Test Configuration Table (network signalled value "NS_07")

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				Normal		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				Mid range		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				See Table 6.2.4.3-1		
Test Parameters for NS_07 A-MPR						
		Downlink Configuration		**Uplink Configuration**		
Test Number	Ch BW	Mod'n	RB allocation FDD	Mod'n	RB allocation FDD	RB_start FDD
1	10MHz	QPSK	16	QPSK	1	0
2	10MHz	QPSK	16	QPSK	8	0
3	10MHz	QPSK	16	QPSK	6	13
4	10MHz	QPSK	16	QPSK	20	15
5	10MHz	QPSK	16	QPSK	16	19
6	10MHz	QPSK	16	QPSK	30	19
7	10MHz	QPSK	16	QPSK	6	43
8	10MHz	QPSK	16	QPSK	2	48
9	10MHz	QPSK	16	QPSK	50	0
Note 1: The allowed A-MPR values specified in Table 6.2.4.3-2 are in addition to the allowed MPR requirements specified in clause 6.2.3.						

Table 6.2.4.4.1-3: Test Configuration Table (network signalled value "NS_08")

Initial Conditions					
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				Normal	
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				Mid range	
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				See Table 6.2.4.3-1	
Test Parameters for NS_08 A-MPR					
		Downlink Configuration		**Uplink Configuration**	
Test number	Ch BW	Mod'n	RB allocation FDD	Mod'n	RB allocation FDD
1	10 MHz	QPSK	16	QPSK	29
2	10 MHz	QPSK	16	QPSK	39
3	10 MHz	QPSK	16	QPSK	44
4	10 MHz	QPSK	16	QPSK	50
5	15 MHz	QPSK	25	QPSK	29
6	15 MHz	QPSK	25	QPSK	39
7	15 MHz	QPSK	25	QPSK	44
8	15 MHz	QPSK	25	QPSK	75
Note 1: The allowed A-MPR values specified in Table 6.2.4.3-1 are in addition to the allowed MPR requirements specified in clause 6.2.3.					

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.2.4.4.1-1 or Table 6.2.4.4.1-2.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.2.4.4.3.

6.2.4.4.2 Test procedure

1. Send continuously uplink power control "up" commands to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 6.2.4.4.1-1 or Table 6.2.4.4.1-2.
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least one sub-frame (1ms).

6.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions for each network signalled value.

6.2.4.4.3.1 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.2.4.4.3.1-1: *SystemInformationBlockType2* :Additional spurious emissions test requirement for "NS_03"

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	3 (NS_03)		

6.2.4.4.3.2 Message contents exceptions (network signalled value "NS_04")

1. Information element additionalSpectrumEmission is set to NS_04. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.2.4.4.3.2-1: *SystemInformationBlockType2* :Additional spurious emissions test requirement for "NS_04"

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	4 (NS_04)		

6.2.4.4.3.3 Message contents exceptions (network signalled value "NS_05")

1. Information element additionalSpectrumEmission is set to NS_05. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.2.4.4.3.3-1: *SystemInformationBlockType2* :Additional spurious emissions test requirement for "NS_05"

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	5 (NS_05)		

6.2.4.4.3.4 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.2.4.4.3.4-1: *SystemInformationBlockType2* :Additional spurious emissions test requirement for "NS_06"

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	6 (NS_06)		

6.2.4.4.3.5 Message contents exceptions (network signalled value "NS_07")

1. Information element additionalSpectrumEmission is set to NS_07. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.2.4.4.3.5-1: *SystemInformationBlockType2* :Additional spurious emissions test requirement for "NS_07"

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	7 (NS_07)		

6.2.4.4.3.6 Message contents exceptions (network signalled value "NS_08")

1. Information element additionalSpectrumEmission is set to NS_08. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.2.4.4.3.6-1: *SystemInformationBlockType2* :Additional spurious emissions test requirement for "NS_08"

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	8 (NS_08)		

6.2.4.5 Test requirements

The maximum output power, derived in step 2 shall be within the range prescribed by the nominal maximum output power and tolerance in Table 6.2.4.5-1, Table 6.2.4.5-2, or Table 6.2.4.5-3.

Table 6.2.4.5-1: UE Power Class test requirements (network signalled value "NS_03" to "NS_06")

EUTRA band	Class 1 (dBm)	Tol. (dB)	Class 2 (dBm)	Tol. (dB)	Class 3 (dBm)	QPSK partial RB allocation Tol. (dB)	QPSK full RB allocation Tol. (dB)
1					23	+2.7 / -2.7	+2.7 / -4.7
2					23	+2.7 / -2.7[1]	+2.7 / -4.7[1]
3					23	+2.7 / -2.7[1]	+2.7 / -4.7[1]
4					23	+2.7 / -2.7	+2.7 / -4.7
5					23	+2.7 / -2.7	+2.7 / -4.7
6					23	+2.7 / -2.7	+2.7 / -4.7
7					23	+2.7 / -2.7[1]	+2.7 / -4.7[1]
8					23	+2.7 / -2.7[1]	+2. 7 / -4.7[1]
9					23	+2.7 / -2.7	+2.7 / -4.7
10					23	+2.7 / -2.7	+2.7 / -4.7
11					23	+2.7 / -2.7[1]	+2. 7 / -4.7[1]
12					23	+2.7 / -2.7[1]	+2. 7 / -3.7[1]
13					23 & See table 6.2.4.5-2	+2.7 / -2.7 & See table 6.2.4.5-2	+2.7 / -3.7 & See table 6.2.4.5-2
14					23	+2.7 / -2.7	+2.7 / -3.7
…							
17					23	+2.7 / -2.7	+2.7 / -3.7
18					23	+2.7 / -2.7	+2.7 / -4.7
19					See table 6.2.4.5-3	See table 6.2.4.5-3	See table 6.2.4.5-3
…							
33					23	+2.7 / -2.7	+2.7 / -4.7
34					23	+2.7 / -2.7	+2.7 / -4.7
35					23	+2.7 / -2.7	+2.7 / -4.7
36					23	+2.7 / -2.7	+2.7 / -4.7
37					23	+2.7 / -2.7	+2.7 / -4.7
38					23	+2.7 / -2.7	+2.7 / -4.7
39					23	+2.7 / -2.7	+2.7 / -4.7
40					23	+2.7 / -2.7	+2.7 / -4.7

[Note 1: For transmission configurations (Figure 5.4.2-1) confined within FUL_low and FUL_low + 4 MHz or FUL_high – 4 MHz and FUL_high, the power requirement is relaxed by reducing the lower tolerance limit by 1.5 dB]

Table 6.2.4.5-2: UE Power Class test requirements (network signalled value "NS_07")

Test Number	EUTRA band	Class 1 (dBm)	Tol. (dB)	Class 2 (dBm)	Tol. (dB)	Class 3 (dBm)	QPSK RB allocation Tol. (dB)
1	13					23	+2.7 / -14.7
2	13					23	+2.7 / -10.7
3	13					23	+2.7 / -2.7
4	13					23	+2.7 / -15.7
5	13					23	+2.7 / -3.7
6	13					23	+2.7 / -9.7
7	13					23	+2.7 / -2.7
8	13					23	+2.7 / -5.7
9	13					23	+2.7 / -15.7

Table 6.2.4.5-3: UE Power Class test requirements (network signalled value "NS_08")

Test Number	EUTRA band	Class 1 (dBm)	Tol. (dB)	Class 2 (dBm)	Tol. (dB)	Class 3 (dBm)	QPSK Tol. (dB)
1	19					23	+2.7 / -3.7
2	19					23	+2.7 / -4.7
3	19					23	+2.7 / 5.7
4	19					23	+2.7 / 6.7
5	19					23	+2.7 / -3.7
6	19					23	+2.7 / -4.7
7	19					23	+2.7 / -5.7
8	19					23	+2.7 / -6.7

6.2.5 Configured UE transmitted Output Power

Editor's note: This test case is incomplete.

6.2.5.1 Test purpose

To verify the UE's does not exceed the minimum between the P_{EMAX} maximum allowed UL TX Power signaled by the E-UTRAN and the P_{UMAX} maximum UE power for the UE power class.

6.2.5.2 Test applicability

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

6.2.5.3 Minimum conformance requirements

P_{CMAX} is the configured UE transmitted power defined as follows;

P_{CMAX} = MIN {P_{EMAX}, P_{UMAX}}

Where

- P_{EMAX} is the maximum allowed power configured by higher layers and defined in [TS36.331]
- P_{UMAX} is the maximum UE power for the UE power class specified in section 6.2.2 modified by section 6.2.3 and section 6.2.4. When a transmission configuration is confined within FUL_low and FUL_low + $\mathbf{\Delta_{TC}}$ or FUL_high – $\mathbf{\Delta_{TC}}$ and FUL_high, the configured transmitted power as specified in Table 6.2.5-1 is relaxed by reducing the lower limit by [1.5] dB.

The UE shall not exceed P_{CMAX} beyond with the tolerances defined in table 6.2.5.3-1

Table 6.2.5.3-1: P_{CMAX} tolerance

P_{CMAX} (dBm)	Tolerance (dB)	
	(Normal)	(Extreme)
23	± 2.0	[± 2.0]
22	± 2.5	[± TBD]
21	± 3.0	[± TBD]
20	± 3.5	[± TBD]
19	± 4.0	[TBD]
18	± 4.5	[TBD]
13 ≤P_{CMAX} < 18	± 5.0	[TBD]
8 ≤ P_{CMAX} < 13	± 6.0	[TBD]
-40 ≤ P_{CMAX} < 8	± 7.0	[TBD]

The normative reference for this requirement is TS 36.101 [2] clause 6.2.5.

6.2.5.4 Test description

6.2.5.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.2.5.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.2.5.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			Normal, [TL/VL, TL/VH, TH/VL, TH/VH]			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Mid range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	5	5
3MHz	QPSK	4	4	QPSK	4	4
5MHz	QPSK	8	8	QPSK	8	8
10MHz	QPSK	16	16	QPSK	12	12
15MHz	QPSK	25	25	QPSK	16	16
20MHz	QPSK	30	30	QPSK	18	18
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2: For the uplink RB allocation the starting resource block shall be RB #0.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 6.2.5.4.1-1

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.2.5.4.3.

6.2.5.4.2 Test procedure

1. Send continuous UP TPC commands to force the UE at its maximum output power according to the test configuration from Table 6.2.5.4.1-1.

2. According to the test configuration from Table 6.2.5.4.1-1Measure the mean power of the UE in the associated measurement bandwidth specified in Table 6.2.5.5-1 for the specific channel bandwidth under test for one sub-frame (1ms).

6.2.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions: [Editor's note: need to signal to the UE the value [X dBm] to be used as max signalled allowed TX power]

Table 6.2.5.4.3-1: SystemInformationBlockType1: Test point 1

Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1			
Information Element	**Value/remark**	**Comment**	**Condition**
p-Max	-10		

Table 6.2.5.4.3-2: SystemInformationBlockType1: Test point 2

Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1			
Information Element	**Value/remark**	**Comment**	**Condition**
p-Max	10		

Table 6.2.5.4.3-3: SystemInformationBlockType1: Test point 3

Derivation Path: TS 36.508 [7] clause 4.4.3.2, Table 4.4.3.2-3 SystemInformationBlockType1			
Information Element	**Value/remark**	**Comment**	**Condition**
p-Max	15		

6.2.5.5 Test requirement

The maximum output power measured shall not exceed the values specified in Table 6.2.5.5-1.

Table 6.2.5.5-1: P_{CMAX} configured UE output power

	Channel bandwidth / maximum output power					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Measured UE output power test point 1	-10 dBm ± 7.7					
Measured UE output power test point 2	10 dBm ± 6.7					
Measured UE output power test point 3	15 dBm ± 5.7					

6.3 Output Power Dynamics

6.3.1 Void

6.3.2 Minimum Output Power

- *Editor's note: This test case is complete.*

6.3.2.1 Test purpose

To verify the UE's ability to transmit with a broadband output power below the value specified in the test requirement when the power is set to a minimum value.

6.3.2.2 Test applicability

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

6.3.2.3 Minimum conformance requirements

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 6.3.2.3-1.

Table 6.3.2.3-1: Minimum output power

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

The normative reference for this requirement is TS 36.101 [2] clause 6.3.2.1.

Minimum output power test verifies the UE's ability to transmit with a broadband output power below the specified limit when the power is set to a minimum value. The broadband output power is defined as the power in the channel bandwidth, for all transmit bandwidth configurations (resource blocks).

An excess minimum output power potentially increases the Rise Over Thermal (RoT) and therefore reduces the cell coverage area for other UEs.

6.3.2.4 Test description

6.3.2.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.2.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annexes A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.3.2.4.1-1: Test Configuration Table

Initial Conditions				
Test Environment as specified in TS 36.508[7] subclause 4.1	Normal, TL/VL, TL/VH, TH/VL, TH/VH			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1	Low range, Mid range, High range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1	Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths				
	Downlink Configuration	**Uplink Configuration**		
Ch BW	N/A for min output power test	Mod'n	RB allocation	
			FDD	TDD
1.4MHz		QPSK	FULL	FULL
3MHz		QPSK	FULL	FULL
5MHz		QPSK	FULL	FULL
10MHz		QPSK	FULL	FULL
15MHz		QPSK	FULL	FULL
20MHz		QPSK	FULL	FULL
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.				

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels is set according to Table 6.3.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A according to TS 36.508 [7] clause 4.5.4[4.5.3.A] and receiving payload data from the SS. Message contents are defined in clause 6.3.2.4.3.

6.3.2.4.2 Test procedure

1. SS sends uplink scheduling information every TTI via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.3.2.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC

2. Send continuous uplink power control "down" commands in the uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power according to the test configuration from Table 6.3.2.4.1-1.

3. Measure the mean power of the UE in the associated measurement bandwidth specified in Table 6.3.2.5-1 for the specific channel bandwidth under test. The period of measurement shall be one sub-frame (1ms).

6.3.2.4.3 Message contents

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

6.3.2.5 Test requirement

The minimum output power measured shall not exceed the values specified in Table 6.3.2.5-1.

Table 6.3.2.5-1: Minimum output power

	Channel bandwidth / minimum output power / measurement bandwidth					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Minimum output power	-39 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.3 Transmit OFF power

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

FDD aspects missing or not yet determined:

- *The Message contents are undefined*
- *Reference Measurement Channel is undefined*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *The test case description has been verified to apply for both FDD and TDD*

6.3.3.1 Test purpose

To verify that the UE transmit OFF power is lower than the value specified in the test requirement.

6.3.3.2 Minimum conformance 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 requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3.2-1.

Table 6.3.3.2-1: Transmit OFF power

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

The normative reference for this requirement is TS 36.101 [2] clause 6.3.3.

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 measurements gaps, the UE is not considered to be OFF.

An excess transmit OFF power power potentially increases the Rise Over Thermal (RoT) and therefore reduces the cell coverage area for other UEs

6.3.3.3 Test applicability

The requirements of this test apply in test cases 6.3.4.1 General ON/OFF time mask and 6.3.4.2 PRACH and SRS time mask to all types of E-UTRA UE release 8 and forward.

6.3.3.4 Test description

This test is covered by clause 6.3.4.1 General ON/OFF time mask and 6.3.4.2 PRACH and SRS time mask.

6.3.3.5 Test requirement

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3.5-1.

Table 6.3.3.5-1: Transmit OFF power

	Channel bandwidth / minimum output power / measurement bandwidth					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Transmit OFF power	-48.5 dBm					
Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

6.3.4 ON/OFF time mask

6.3.4.1 General ON/OFF time mask

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

FDD aspects missing or not yet determined:

- *Test tolerance and measurement uncertainty are not confirmed*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *TDD DL Reference Measurement Channel is undefined*
- *Test description section needs to be verified or modified (if necessary) for TDD applicability*

6.3.4.1.1 Test purpose

To verify that the general ON/OFF time mask meets the requirements given in 6.3.4.1.5.

The time mask for transmit ON/OFF defines the ramping time allowed for the UE between transmit OFF power and transmit ON power.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

6.3.4.1.2 Minimum conformance requirement

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 measurement period 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 clause 6.2.2 and clause 6.6.2.3

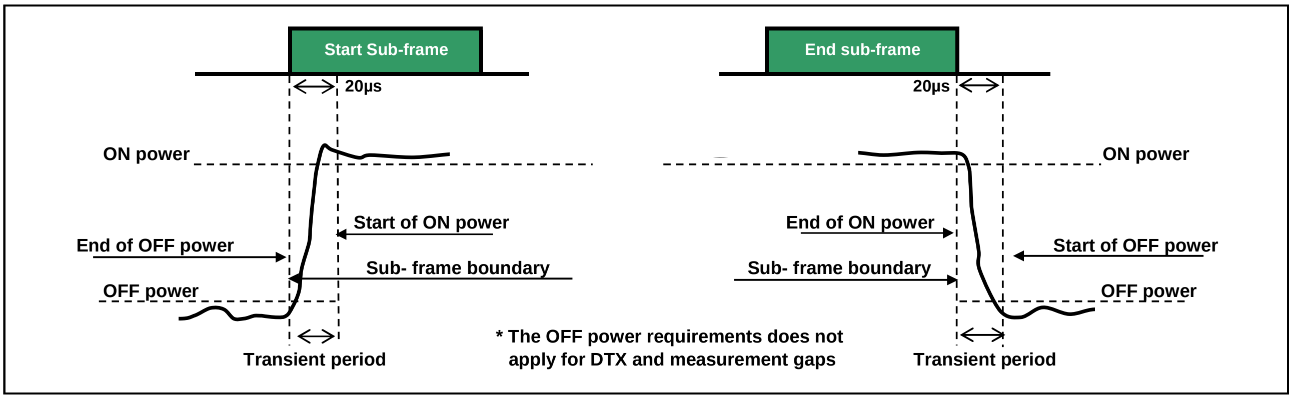

Figure 6.3.4.1.2-1: General ON/OFF time mask

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4.1.

6.3.4.1.3 Test applicability

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

6.3.4.1.4 Test description

6.3.4.1.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2

Table 6.3.4.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1	Normal, TL/VL, TL/VH, TH/VL, TH/VH					
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1	Low range, Mid range, High range					
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1	Lowest, 5MHz, Highest					
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod’n	RB allocation		Mod’n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	[FFS]	QPSK	FULL	FULL
3MHz	QPSK	4	[FSS]	QPSK	FULL	FULL
5MHz	QPSK	8	[FFS]	QPSK	FULL	FULL
10MHz	QPSK	16	[FFS]	QPSK	FULL	FULL
15MHz	QPSK	25	[FFS]	QPSK	FULL	FULL
20MHz	QPSK	30	[FFS]	QPSK	FULL	FULL
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.3.4.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A according to TS 36.508 [7] clause 4.5.4 and not receiving payload data from the SS. Message contents are defined in clause 6.3.4.1.4.3.

6.3.4.1.4.2 Test procedure

1. Mandate the UE to send data in the UL by means of an UL assignment in PDCCH. This UL assignment is such that the UE transmits every other sub-frame.
2. Measure the UE transmission OFF power during the sub-frame before a transient period of 20 µs prior to the PUSCH subframe.
3. Measure the output power of the UE PUSCH transmission during one sub-frame, excluding a transient period of 20 µs.
4. Measure the UE transmission OFF power during one sub-frame following the PUSCH subframe, excluding a transient period of 20 µs.

6.3.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

Table 6.3.4.1.4.3-1: UplinkPowerControlCommon: Test point 1

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH	-105	Test point 1 to verify a UE relative low initial power transmission	

6.3.4.1.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4.1.5-1.

Table 6.3.4.1.5-1: General ON/OFF time mask

	Channel bandwidth / minimum output power / measurement bandwidth					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Transmit OFF power	-48.5 dBm					
Transmission OFF Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
Expected Transmission ON Measured power	-20.2 ± [7.0]	-14.2 ± [7.0]	-11.2 ± [7.0]	-9.4 ± [7.0]	-8.2 ± [7.0]	-7.6 ± [7.0]

6.3.4.2 PRACH and SRS time mask

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

FDD aspects missing or not yet determined:

- *Test tolerance and measurement uncertainty are not confirmed*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *TDD DL Reference Measurement Channel is undefined*
- *Test description section needs to be verified or modified (if necessary) for TDD applicability*

6.3.4.2.1 Test purpose

To verify that the PRACH and SRS time mask meets the requirements given in 6.3.4.2.5.

The time mask for PRACH and SRS time mask defines the ramping time allowed for the UE between transmit OFF power and transmit ON power when transmitting the PRACH or the SRS.

Transmission of the wrong power increases interference to other channels, or increases transmission errors in the uplink channel.

6.3.4.2.2 Minimum conformance requirement

In the case a single SRS transmission, the ON measurement period is defined as the mean power over the entire symbol duration excluding any transient period.

For the PRACH Power / Time mask defines the observation period for PRACH transmissions. The PRACH ON power is specified as the mean power over the PRACH measurement period excluding any transient periods. The measurement period for different PRACH preamble format is specified in Table 6.3.4.2.2-1.

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

Table 6.3.4.2.2-1: PRACH ON power measurement period

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

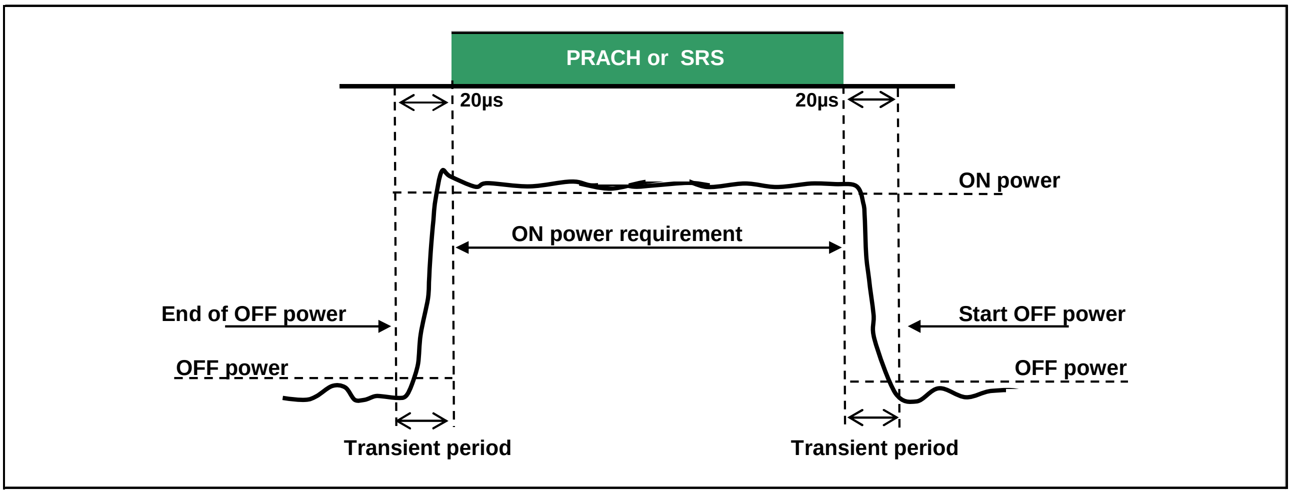

Figure 6.3.4.2.2-1: PRACH and SRS ON/OFF time mask

The normative reference for this requirement is TS 36.101 [2] clause 6.3.4.2.

6.3.4.2.3 Test applicability

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

6.3.4.2.4 Test description

6.3.4.2.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.4.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3.

Table 6.3.4.2.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			Normal, TL/VL, TL/VH, TH/VL, TH/VH			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Mid range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	[FFS]	QPSK	FULL	FULL
3MHz	QPSK	4	[FSS]	QPSK	FULL	FULL
5MHz	QPSK	8	[FFS]	QPSK	FULL	FULL
10MHz	QPSK	16	[FFS]	QPSK	FULL	FULL
15MHz	QPSK	25	[FFS]	QPSK	FULL	FULL
20MHz	QPSK	30	[FFS]	QPSK	FULL	FULL
Note 1. Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to table 6.3.4.2.4.1-1
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 2 according to TS 36.508 [7] clause 4.5.4. Message contents are defined in clause 6.3.4.2.4.3.

6.3.4.2.4.2 Test procedure

1. Measure the output power of a transmitted PRACH preamble according to Figure 6.3.4.2.2-1.

2. Measure the UE transmission OFF power during one sub-frame prior to the following PRACH preamble.

3. Measure the output power of the second transmitted PRACH preamble excluding a transient period of 20 µs, according to Figure 6.3.4.2.2-1.

4. Measure the UE transmission OFF power during one sub-frame after the PRACH preamble, excluding a transient period of 20 µs.

6.3.4.2.4.3 Message contents

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

6.3.4.2.5 Test requirement

The requirement for the power measured in steps (2), (3) and (4) of the test procedure shall not exceed the values specified in Table 6.3.4.2.5-1.

Table 6.3.4.2.5-1: PRACH time mask

	Channel bandwidth / minimum output power / measurement bandwidth					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Transmit OFF power	-48.5 dBm					
Transmission OFF Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
Expected PRACH Transmission ON Measured power	-FFS± [TT]	-FFS ± [TT]	-FFS ± [TT]	-FFS ± [TT]	-FFS ± [TT]	-FFS ± [TT]

6.3.5 Power Control

Power control is used to limit the interference level and compensate the channel fading. The UE power is defined as the mean power in a subframe or ON power duration, whichever is available.

The UE transmission can be in two contiguity modes, i.e. contiguous transmission and non-contiguous transmission. The former has a transmission gap of 0 and the later has a transmission gap larger than 0. The transmission gap is the time interval between the end of the last UE transmission subframe and the beginning of the next UE transmission subframe or the UpPTS (for TDD).

6.3.5.1 Power Control Absolute power tolerance

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

- *Relaxation of 1.5 dB for the absolute power tolerance as specified in Table 6.3.5.1.2-1 is not yet confirmed.*

6.3.5.1.1 Test purpose

To verify the ability of the UE transmitter to set its initial output power to a specific value at the start of a contiguous transmission or non-contiguous transmission with a long transmission gap, i.e. transmission gap is larger than 20 ms.

6.3.5.1.2 Minimum conformance requirement

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.

The minimum requirement on absolute power tolerance is given in Table 6.3.5.1.2-1 over the power range bounded by the Maximum output power as defined in sub-clause 6.2.2 and the Minimum output power as defined in sub clause 6.3.2.

When the transmission bandwidth is confined within FUL_low and FUL_low + ΔTC or it is confined within FUL_high – ΔTC and FUL_high, the absolute power tolerance as specified in Table 6.3.5.1.2-1 is relaxed by reducing the lower limit by [1.5] dB

Table 6.3.5.1.2-1: Absolute power tolerance

Conditions	Tolerance
Normal conditions	± 9.0 dB
Extreme conditions	± 12.0 dB

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5.1.1.

6.3.5.1.3 Test applicability

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

6.3.5.1.4 Test description

6.3.5.1.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.3.5.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1		Normal, TL/VL, TL/VH, TH/VL, TH/VH				
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1		Mid range				
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1		Lowest, 5MHz, Highest				
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	FULL	FULL
3MHz	QPSK	4	4	QPSK	FULL	FULL
5MHz	QPSK	8	8	QPSK	FULL	FULL
10MHz	QPSK	16	16	QPSK	FULL	FULL
15MHz	QPSK	25	25	QPSK	FULL	FULL
20MHz	QPSK	30	30	QPSK	FULL	FULL
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.3.5.1.4.1-1.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and not receiving payload data from the SS. Message contents are defined in clause 6.3.5.1.4.3.

6.3.5.1.4.2 Test procedure

1. Start sending payload data from the SS to the UE.
2. SS schedules UE transmission via PDCCH DCI format 0.
3. Measure the initial output power of the first subframe of UE PUSCH first transmission. The transient periods of 20us are excluded.
4. Repeat for the two test points as indicated in section 6.3.5.1.4.3. The timing of the execution between the two test points shall be larger than 20ms.

6.3.5.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

Table 6.3.5.1.4.3-1: UplinkPowerControlCommon: Test point 1

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH	-105	Test point 1 to verify a UE relative low initial power transmission	

Table 6.3.5.1.4.3-2: UplinkPowerControlCommon: Test point 2

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-25 UplinkPowerControlCommon-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlCommon-DEFAULT ::= SEQUENCE { p0-NominalPUSCH	-93	Test point 2 to verify a UE relative high initial power transmission	

6.3.5.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.5.1.5-1 and 6.3.5.1.5-2.

Table 6.3.5.1.5-1: Absolute power tolerance: test point 1

	Channel bandwidth / expected output power (dBm)					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Expected Measured power Normal conditions	-14.8 ± 10.0	-10.8 ± 10.0	-8.6 ± 10.0	-5.6 ± 10.0	-3.9 ± 10.0	-2.6 ± 10.0
Expected Measured power Extreme conditions	-14.8 ± 13.0	-10.8 ± 13.0	-8.6 ± 13.0	-5.6 ± 13.0	-3.9 ± 13.0	-2.6 ± 13.0
Note 1: The lowe power limit shall not exceed the minimum output power requirements defined in sub-clause 6.3.2.3						

Table 6.3.5.1.5-2: Absolute power tolerance: test point 2

	Channel bandwidth / expected output power (dBm)					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Expected Measured power Normal conditions	-2.8 ± 10.0	1.2 ± 10.0	3.4 ± 10.0	6.4 ± 10.0	8.2 ± 10.0	9.4 ± 10.0
Expected Measured power Extreme conditions	-2.8 ± 13.0	1.2 ± 13.0	3.4 ± 13.0	6.4 ± 13.0	8.2 ± 13.0	9.4 ± 13.0
Note 1: The upper power limit shall not exceed the maximum output power requirements defined by the power class in sub-clause 6.2.2.3						

6.3.5.2 Power Control Relative power tolerance

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

FDD aspects missing or not yet determined:

- *Meas uncertainty and Test tolerance are undefined*
- *Test case is not complete for FDD*
- *It is still undefined how to handle the allowable RF power amplifier mode change exceptions.*
- *Extreme conditions are not yet confirmed.*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *The power control relative power tolerance has been verified to apply for both FDD and TDD exactly as it is*

6.3.5.2.1 Test purpose

To verify the ability of the UE transmitter to set its output power relatively to the 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.

6.3.5.2.2 Minimum conformance requirement

The UE shall meet the requirements specified in Table 6.3.5.2.2-1.

To account for RF Power amplifier mode changes TBD exceptions are allowed. For these exceptions the power tolerance limit is a maximum of [±6.0 dB] in Table 6.3.5.2.2-1.

Table 6.3.5.2.2-1 Relative Power Tolerance for Transmission (normal conditions)

Power step ΔP (Up or down) [dB]	All combinations of PUSCH and PUCCH transitions [dB]	All combinations of PUSCH/PUCCH and SRS transitions between sub-frames [dB]	PUSCH to SRS transition within a sub-frame [dB]	PRACH [dB]
ΔP < 2	±2.5	±[2.5 + 0.5]	±[2.5 + 0.5]	±2.5
2 ≤ ΔP < 3	±3.0	±[3.0 + 1.0]	±[3.0 + 0.5]	±3.0
3 ≤ ΔP < 4	±3.5	±[3.5 + 1.5]	±[3.5 + 0.5]	±3.5
4 ≤ ΔP ≤ 10	±4.0	±[4.0 + 2.0]	±[4.0 + 1.0]	±4.0
10 ≤ ΔP < 15	±5.0	±[5.0 + 3.0]	±[5.0 + 1.0]	±5.0
15 ≤ ΔP	±6.0	±[6.0 + 3.0]	±[6.0 + 1.0]	±6.0
Note 1: For extreme conditions an additional ± 2.0 dB relaxation is allowed Note 2: For operating bands under Note 2 in Table 6.2.2-1, the relative power tolerance is relaxed by reducing the lower limit by 1.5 dB if the transmission bandwidth of either the reference or target sub-frames is confined within F_{UL_low} and F_{UL_low} + 4 MHz or F_{UL_high} – 4 MHz and F_{UL_high}. For PUSCH to SRS transition within a subframe, this relaxation applies if either the PUSCH or the SRS transmission is confined within these frequency ranges for the said operating bands.				

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 Clause 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.

The normative reference for this requirement is TS 36.101 clause 6.3.5.2.

6.3.5.2.3 Test applicability

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

6.3.5.2.4 Test description

6.3.5.2.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5.4.2.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.3.5.2.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			Normal, [TL/VL, TL/VH, TH/VL, TH/VH]			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Mid range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	See table 6.3.5.2.5-1	See table 6.3.5.2.5-1
3MHz	QPSK	4	4	QPSK	See table 6.3.5.2.5-2	See table 6.3.5.2.5-2
5MHz	QPSK	8	8	QPSK	See table 6.3.5.2.5-3	See table 6.3.5.2.5-3
10MHz	QPSK	16	16	QPSK	See table 6.3.5.2.5-4	See table 6.3.5.2.5-4
15MHz	QPSK	25	25	QPSK	See table 6.3.5.2.5-5	See table 6.3.5.2.5-5
20MHz	QPSK	30	30	QPSK	See table 6.3.5.2.5-6	See table 6.3.5.2.5-6
Note 1. Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to table 6.3.5.4.2.1-1

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.3.5.2.4.3.

6.3.5.2.4.2 Test procedure

The procedure is separated in various subtests to verify different aspects of relative power control. The power patterns of the subtests are described in figure 6.3.5.2.4.2-1.

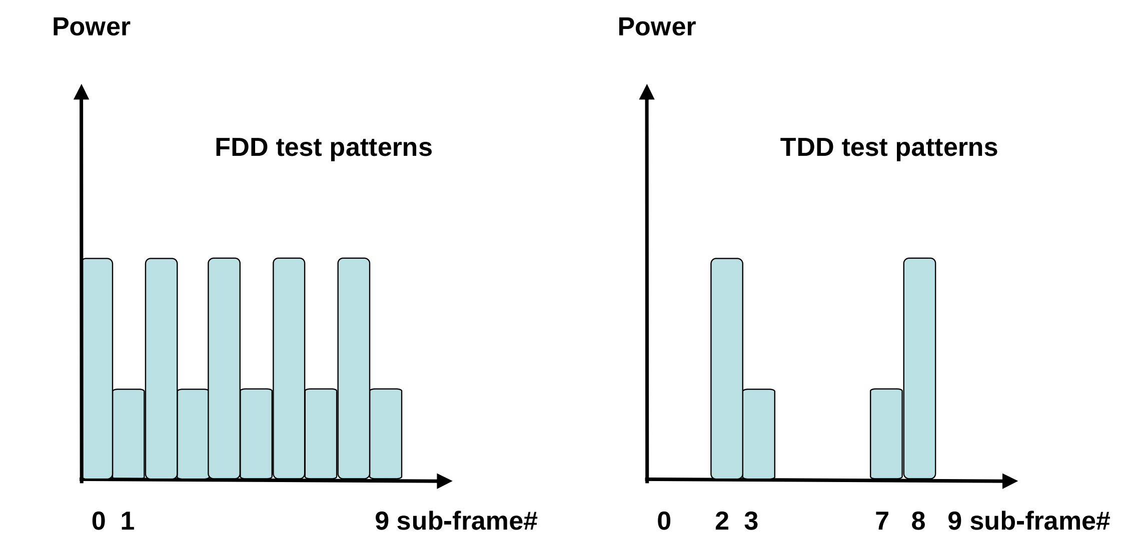

Figure 6.3.5.2.4.2-1 Test Power patterns

1. Sub test A

1.1 Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- [2.5 + TT dB]

1.2. Schedule the UE's PUSCH data transmission for 10 sub-frames and transmit an alternating +1dB/-1dB TPC command for PUSCH every TTI via the PDCCH as described in Figure 6.3.5.2.4.2-1.

1.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements 6.3.5.2.5.

2. Sub tests B, C, D, E, F

2.1 Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- [2.5 + TT dB]

2.2. Schedule the UE's PUSCH data transmission as described in Figure 6.3.5.2.4.2-1for 10 sub-frames with an uplink RB allocation alternating pattern as defined in tables 6.3.5.2.5-1 6.3.5.2.5-2, 6.3.5.2.5-3, 6.3.5.2.5-4, 6.3.5.2.5-5 , 6.3.5.2.5-6 depending on channel bandwidth while transmitting 0dB TPC command for PUSCH via the PDCCH.

2.3. Measure the power of PUSCH transmissions to verify the UE relative power control meet test requirements specified in clause 6.3.5.2.5.

6.3.5.2.4.3 Message contents

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

6.3.5.2.5 Test requirement

Each UE power step measured in the test procedure 6.3.5.2.4.2 should satisfy the test requirements specified in Table 6.3.5.2.5-1.

Table 6.3.5.2.5-1 Test Requirements Relative Power Tolerance for Transmission (normal conditions) channel bandwidth 1.4MHz

Sub-test	Uplink RB allocation	TPC command	Expected power step size (Up or down) ΔP [dB]	Power step size range (Up or down) ΔP [dB]	PUSCH/ [dB]	SRS [dB]
A	Fixed = 4	Alternating TPC = +/-1dB	1	ΔP < 2	1 ± (2.5 + TT)	±[2.5 + 0.5 + TT]
B	Alternating 3 and 5 every TTI	TPC=0dB	2.22	2 ≤ ΔP < 3	2.22 ± (3.0 + TT)	±[3.0 + 1.0 + TT]
C	Alternating 2 and 6 every TTI	TPC=0dB	3.77	3 ≤ ΔP < 4	3.77 ± (3.5 + TT)	±[3.5 + 1.5 + TT]
D	Alternating 1 and 6 every TTI	TPC=0dB	7.78	4 ≤ ΔP ≤ 10	7.78 ± (4.0 + TT)	±[4.0 + 2.0 + TT]

Table 6.3.5.2.5-2 Test Requirements Relative Power Tolerance for Transmission (normal conditions) channel bandwidth 3MHz

Sub-test	Uplink RB allocation	TPC command	Expected power step size (Up or down) ΔP [dB]	Power step size range (Up or down) ΔP [dB]	Allowed power step size PUSCH/ [dB]	SRS [dB]
A	Fixed = 10	Alternating TPC = +/-1dB	1	ΔP < 2	1 ± (2.5 + TT)	±[2.5 + 0.5 + TT]
B	Alternating 3 and 5 every TTI	TPC=0dB	2.22	2 ≤ ΔP < 3	2.22 ± (3.0 + TT)	±[3.0 + 1.0 + TT]
C	Alternating 2 and 6 every TTI	TPC=0dB	3.77	3 ≤ ΔP < 4	3.77 ± (3.5 + TT)	±[3.5 + 1.5 + TT]
D	Alternating 1 and 6 every TTI	TPC=0dB	7.78	4 ≤ ΔP ≤ 10	7.78 ± (4.0 + TT)	±[4.0 + 2.0 + TT]
E	Alternating 1 and 15 every TTI	TPC=0dB	11.76	10 ≤ ΔP ≤ 15	11.76 ± (5.0 + TT)	±[5.0 + 3.0 + TT]

Table 6.3.5.2.5-3 Test Requirements Relative Power Tolerance for Transmission (normal conditions) channel bandwidth 5MHz

Sub-test	Uplink RB allocation	TPC command	Expected power step size (Up or down) ΔP [dB]	Power step size range (Up or down) ΔP [dB]	PUSCH/ [dB]	SRS [dB]
A	Fixed = 15	Alternating TPC = +/- 1dB	1	ΔP < 2	1 ± (2.5 + TT)	±[2.5 + 0.5 + TT]
B	Alternating 10 and 18 every TTI	TPC=0dB	2.55	2 ≤ ΔP < 3	2.55 ± (3.0 + TT)	±[3.0 + 1.0 + TT]
C	Alternating 10 and 24 every TTI	TPC=0dB	3.80	3 ≤ ΔP < 4	3.80 ± (3.5 + TT)	±[3.5 + 1.5 + TT]
D	Alternating 2 and 8 every TTI	TPC=0dB	6.02	4 ≤ ΔP ≤ 10	6.02 ± (4.0 + TT)	±[4.0 + 2.0 + TT]
E	Alternating 1 and 25 every TTI	TPC=0dB	13.98	10 ≤ ΔP ≤ 15	13.98 ± (5.0 + TT)	±[5.0 + 3.0 + TT]

Table 6.3.5.2.5-4 Test Requirements Relative Power Tolerance for Transmission (normal conditions) channel bandwidth 10MHz

Sub-test	Uplink RB allocation	TPC command	Expected power step size (Up or down) ΔP [dB]	Power step size range (Up or down) ΔP [dB]	PUSCH/ [dB]	SRS [dB]
A	Fixed = 25	Alternating TPC = +/- 1dB	1	ΔP < 2	1 ± (2.5 + TT)	±[2.5 + 0.5 + TT]
B	Alternating 10 and 18 every TTI	TPC=0dB	2.55	2 ≤ ΔP < 3	2.55 ± (3.0 + TT)	±[3.0 + 1.0 + TT]
C	Alternating 10 and 24 every TTI	TPC=0dB	3.80	3 ≤ ΔP < 4	3.80 ± (3.5 + TT)	±[3.5 + 1.5 + TT]
D	Alternating 2 and 8 every TTI	TPC=0dB	6.02	4 ≤ ΔP ≤ 10	6.02 ± (4.0 + TT)	±[4.0 + 2.0 + TT]
E	Alternating 1 and 25 every TTI	TPC=0dB	13.98	10 ≤ ΔP ≤ 15	13.98 ± (5.0 + TT)	±[5.0 + 3.0 + TT]
F	Alternating 1 and 50 every TTI	TPC=0dB	16.99	15 ≤ ΔP	16.99 ± (6.0 + TT)	±[6.0 + 3.0 + TT]

Table 6.3.5.2.5-5 Test Requirements Relative Power Tolerance for Transmission (normal conditions) channel bandwidth 15MHz

Sub-test	Uplink RB allocation	TPC command	Expected power step size (Up or down) ΔP [dB]	Power step size range (Up or down) ΔP [dB]	PUSCH/ [dB]	SRS [dB]
A	Fixed = 40	Alternating TPC = +/-1dB	1	ΔP < 2	1 ± (2.5 + TT)	±[2.5 + 0.5 + TT]
B	Alternating 10 and 18 every TTI	TPC=0dB	2.55	2 ≤ ΔP < 3	2.55 ± (3.0 + TT)	±[3.0 + 1.0 + TT]
C	Alternating 10 and 24 every TTI	TPC=0dB	3.80	3 ≤ ΔP < 4	3.80 ± (3.5 + TT)	±[3.5 + 1.5 + TT]
D	Alternating 2 and 8 every TTI	TPC=0dB	6.02	4 ≤ ΔP ≤ 10	6.02 ± (4.0 + TT)	±[4.0 + 2.0 + TT]
E	Alternating 1 and 25 every TTI	TPC=0dB	13.98	10 ≤ ΔP ≤ 15	13.98 ± (5.0 + TT)	±[5.0 + 3.0 + TT]
F	Alternating 1 and 75 every TTI	TPC=0dB	18.75	15 ≤ ΔP	18.75 ± (6.0 + TT)	±[6.0 + 3.0 + TT]

Table 6.3.5.2.5-6 Test Requirements Relative Power Tolerance for Transmission (normal conditions) channel bandwidth 20MHz

Sub-test	Uplink RB allocation	TPC command	Expected power step size (Up or down) ΔP [dB]	Power step size range (Up or down) ΔP [dB]	PUSCH/ [dB]	SRS [dB]
A	Fixed = 50	Alternating TPC = +/-1dB	1	ΔP < 2	1 ± (2.5 + TT)	±[2.5 + 0.5 + TT]
B	Alternating 10 and 18 every TTI	TPC=0dB	2.55	2 ≤ ΔP < 3	2.55 ± (3.0 + TT)	±[3.0 + 1.0 + TT]
C	Alternating 10 and 24 every TTI	TPC=0dB	3.80	3 ≤ ΔP < 4	3.80 ± (3.5 + TT)	±[3.5 + 1.5 + TT]
D	Alternating 2 and 8 every TTI	TPC=0dB	6.02	4 ≤ ΔP ≤ 10	6.02 ± (4.0 + TT)	±[4.0 + 2.0 + TT]
E	Alternating 1 and 25 every TTI	TPC=0dB	13.98	10 ≤ ΔP ≤ 15	13.98 ± (5.0 + TT)	±[5.0 + 3.0 + TT]
F	Alternating 1 and 100 every TTI	TPC=0dB	20.00	15 ≤ ΔP	20.00 ± (6.0 + TT)	±[6.0 + 3.0 + TT]

6.3.5.3 Aggregate power control tolerance

- *Editor's note: This test case is complete.*

6.3.5.3.1 Test purpose

To verify the ability of the UE to maintain its power level 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.

6.3.5.3.2 Minimum conformance requirement

The UE shall meet the requirements specified in Table 6.3.5.3.2-1 for relative power control over the power range bounded by the minimum output power as defined in sub clause 6.3.2 and the maximum output power in sub-clause 6.2.2.

Table 6.3.5.3.2-1: Power control tolerance

TPC command	UL channel	Aggregate power tolerance within 21 ms
0 dB	PUCCH	±2.5 dB
0 dB	PUSCH	±3.5 dB
Note: 1: The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission.		

The normative reference for this requirement is TS 36.101 [2] clause 6.3.5.3.1.

6.3.5.3.3 Test applicability

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

6.3.5.3.4 Test description

6.3.5.3.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.3.5.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.3.5.3.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1		Normal				
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1		Mid range				
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1		Lowest, 5MHz, Highest				
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	1	1
3MHz	QPSK	4	4	QPSK	4	4
5MHz	QPSK	8	8	QPSK	8	8
10MHz	QPSK	16	16	QPSK	12	12
15MHz	QPSK	25	25	QPSK	16	16
20MHz	QPSK	30	30	QPSK	18	18
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 6.3.5.3.4.1-1

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.3.5.3.4.3.

6.3.5.3.4.2 Test procedure

The procedure is separated in two subtests to verify PUCCH and PUSCH aggregate power control tolerance respectively. The uplink transmission patterns are described in figure 6.3.5.3.4.2-1.

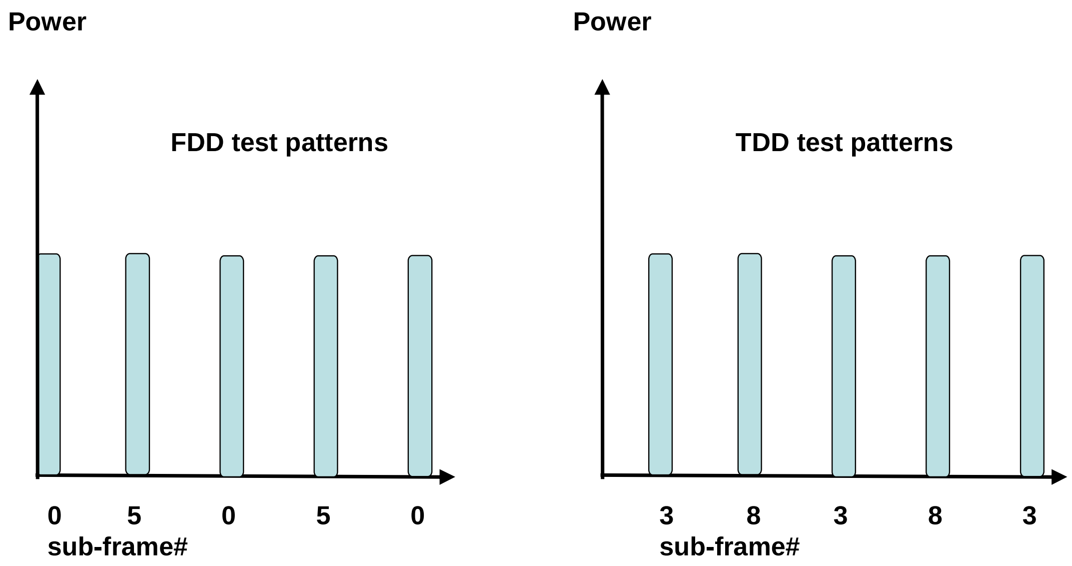

Figure 6.3.5.3.4.2-1 Test uplink transmission

1. Starting PUCCH sub test. Send the appropriate TPC commands for PUCCH to the UE to ensure that the UE transmits PUCCH at 0dBm +/- 3.2 dB.

1.2. Every 5 subframes transmit to the UE downlink PDSCH data as well as 0 dB TPC command for PUCCH via the PDCCH to make the UE transmit ACK/NACK on the PUCCH with transmission gap of 4 subframes. The uplink transmission patterns are described in figure 6.3.5.3.4.2-1.

1.3. Measure the power of 5 consecutive PUCCH transmissions to verify the UE transmitted PUCCH power is maintained within 21 ms.

2.1. Starting PUSCH sub test. Send the appropriate TPC commands for PUSCH to the UE to ensure that the UE transmits PUSCH at 0dBm +/- 3.2.dB

2.2. Every 5 subframes schedule the UE's PUSCH data transmission and transmit 0 dB TPC command for PUSCH via the PDCCH to make the UE transmit PUSCH with 4 subframes gag. The uplink transmission patterns are described in figure 6.3.5.3.4.2-1.

2.3. Measure the power of 5 consecutive PUSCH transmissions to verify the UE transmitted PUSCH power is maintained within 21 ms.

6.3.5.3.4.3 Message contents

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

6.3.5.3.5 Test requirement

The requirement for the power measurements made in step (1.3) and (2.3) of the test procedure shall not exceed the values specified in Table 6.3.5.3.5-1. The power measurement period shall be 1 sub-frame excluding transient periods.

Table 6.3.5.3.5-1: Power control tolerance

TPC command	UL channel	Test requirement measured power
0 dB	PUCCH	0 dBm ± 3.2 dB
0 dB	PUSCH	0 dBm ± 4.2 dB
Note: 1. The UE transmission gap is 4 ms. TPC command is transmitted via PDCCH 4 subframes preceding each PUCCH/PUSCH transmission.		

6.4 Void

6.5 Transmit signal quality

Editor's note: The test cases for Frequency error, EVM, IQ-component and In-band emission are *incomplete. The following aspects are either missing or not yet determined:*

FDD aspects missing or not yet determined:

- *Reference Measurement Channels for 64QAM are undefined*
- *The fixed power allocation for the RB(s) is undefined*
- *The UE call setup details are undefined*
- *The details on how to move from the different measurement points are undefined*
- *The Test system uncertainties and test tolerance applicable to this test are not confirmed*
- *Global In-Channel Tx-Test is not complete*
- *Measurement points (test vectors) are missing*
- *Downlink Cell power levels for the frequency error test procedure are not defined*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
    - *The transmission signal test cases descriptions have been verified to apply for both FDD and TDD exactly as they are*

In this clause a multitude of results are derived, all using one common algorithm returning these results: Global In-Channels TX-Test (Annex E). Each sub clause of this clause contain a procedure and test requirements described for a specific measurement. If all relevant test parameters in different sub clauses are the same, then the results, returned by the Global In-Channel TX-Test, may be used across the applicable sub clauses.

6.5.1 Frequency Error

6.5.1.1 Test purpose

This test verifies the ability of both, the receiver and the transmitter, to process frequency correctly.

Receiver: to extract the correct frequency from the stimulus signal, offered by the System simulator, under ideal propagation conditions and low level.

Transmitter: to derive the correct modulated carrier frequency from the results, gained by the receiver.

6.5.1.2 Test applicability

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

6.5.1.3 Minimum conformance requirements

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

The normative reference for this requirement is TS 36.101 clause 6.5.1

6.5.1.4 Test description

6.5.1.4.1 Initial condition

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.1.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				NC, TL/VL, TL/VH, TH/VL, TH/VH		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				Low range, Mid range, High range		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				Lowest, 5MHz, Highest		
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
3MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
5MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
10MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
15MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
20MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.						

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.5.1.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.5.1.4.3.

6.5.1.4.2 Test procedure

1. Cell downlink power levels are set according to Table 7.3.5-1 according to the appropriate operating band and channel bandwidth with no boosting being applied as specified in Table C.3.1-1
2. Send continuously uplink power control "up" commands to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 6.5.1.4.1-1.
3. Measure the Frequency Error using Global In-Channel Tx-Test (Annex E)

6.5.1.4.3 Message contents

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

6.5.1.5 Test requirement

The 20 frequency error Δf results must fulfil the test requirement:

$|\Delta f| \leq (0.1 \text{ PPM} + 15 \text{ Hz})$

6.5.2 Transmit modulation

Transmit modulation defines the modulation quality for expected in-channel RF transmissions from the UE. This transmit modulation limit is specified in terms of; an Error Vector Magnitude (EVM) for the allocated resources blocks (RB), an I/Q component and an in-band emissions for the non-allocated RB and a spectrum flatness across the subcarriers of allocated resource blocks (RB)..

6.5.2.1 Error Vector Magnitude (EVM)

6.5.2.1.1 Test Purpose

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

The purpose of this test is to exercise the UE transmitter to verify its modulation quality in terms of Error Vector Magnitude (EVM).

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 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 μs 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.

6.5.2.1.2 Test applicability

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

6.5.2.1.3 Minimum conformance requirements

EVM measurements are evaluated for 10 uplink sub-frames excluding any transient period for the average EVM case,and 60 subframes excluding any transient period for the reference signal EVM case, the different modulations schemes shall not exceed the values specified in Table 6.5.2.1.3-1 for the parameters defined in Table 6.5.2.1.3-2. For EVM evaluation purposes, [all PRACH preamble formats 0-4 and]all PUCCH formats 1, 1a, 1b, 2, 2a and 2b are considered to have the same EVM requirement as QPSK modulated.

Table 6.5.2.1.3-1: Minimum requirements for Error Vector Magnitude

Parameter	Unit	Average EVM Level	Reference Signal EVM Level
QPSK or BPSK	%	17.5	[17.5]
16QAM	%	12.5	[12.5]

Table 6.5.2.1.3-2: Parameters for Error Vector Magnitude

Parameter	Unit	Level
UE Output Power	dBm	≥ [-40]
Operating conditions		Normal conditions
Basic measurement period		slot

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2.1.1.

6.5.2.1.4 Test description

6.5.2.1.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.1.4.1-1. The details of the uplink reference measurement channels (RMCs) are specified in Annex A.2. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.2.1.4.1-1: Test Configuration Table for PUSCH

Initial Conditions				
Test Environment (as specified in TS 36.508 [7] subclause 4.1)		**NC**		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)		**See Table 6.5.1.4.1-1**		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)		**See Table 6.5.1.4.1-1**		
Test Parameters for Channel Bandwidths				
	Downlink Configuration	**Uplink Configuration**		
Ch BW	N/A for PUSCH EVM testing	Mod'n	RB allocation	
			FDD	TDD
1.4MHz		QPSK	Full	Full
1.4MHz		QPSK	1	1
1.4MHz		16QAM	Full	Full
1.4MHz		16QAM	1	1
3MHz		QPSK	Full	Full
3MHz		QPSK	4	4
3MHz		16QAM	Full	Full
3MHz		16QAM	4	4
5MHz		QPSK	Full	Full
5MHz		QPSK	8	8
5MHz		16QAM	Full	Full
5MHz		16QAM	8	8
10MHz		QPSK	Full	Full
10MHz		QPSK	12	12
10MHz		16QAM	Full	Full
10MHz		16QAM	12	12
15MHz		QPSK	Full	Full
15MHz		QPSK	16	16
15MHz		16QAM	Full	Full
15MHz		16QAM	16	16
20MHz		QPSK	Full	Full
20MHz		QPSK	18	18
20MHz		16QAM	Full	Full
20MHz		16QAM	18	18
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2: For partial RB allocation, the starting resource block shall be RB #0 and RB# (max - RB allocation) of the channel bandwidth.				

Table 6.5.2.1.4.1-2: Test Configuration Table for PUCCH

Initial Conditions	
Test Environment (as specified in TS 36.508 [7] subclause 4.1)	NC
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)	See Table 6.5.1.4.1-1
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)	See Table 6.5.1.4.1-1
PUCCH format	Format 1a, Format 1b

Table 6.5.2.1.4.1-3: Test Configuration for PRACH

Initial Conditions		
Test Environment (as specified in TS 36.508 [7] subclause 4.1)	NC	
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)	See Table 6.5.1.4.1-1	
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)	See Table 6.5.1.4.1-1	
PRACH preamble format		
	FDD	TDD
PRACH Configuration Index	4	53
RS EPRE setting for test point 1 (dBm/15kHz)	-71	--63
RS EPRE setting for test point 2 (dBm/15kHz)	-86	-78

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL Reference Measurement channels are set according to in Table 6.5.2.1.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 3A according to TS 36.508 [7] clause 3A. Message contents are defined in clause 6.5.2.1.4.3.

6.5.2.1.4.2 Test procedure

Test procedure for PUSCH:

1.1. The UL and DL Reference Measurement channels are set according to in Table 6.5.2.1.4.1-1, SS sends uplink scheduling information every TTI via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.

1.2 Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at its maximum output power state.

1.3 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E).

1.4 Send power control "down" commands to the UE until UE output power is –36.8dBm, with ±3.2dB tolerance.

1.5 Measure the EVM and $\overline{EVM}_{DMRS}$ using Global In-Channel Tx-Test (Annex E).

Test procedure for PUCCH:

2.1. PUCCH are set according to Table 6.5.2.1.4.1-2.

2.2. SS send downlink PDSCH to UE to let the UE send uplink ACK/NACK using PUCCH.and there is no PUSCH transmission.

2.3.SS send appropriate TPC commands for PUCCH to the UE until the UE transmit PUCCH at its maximum output power.2.4.Measure PUCCH EVM using Global In-Channel Tx-Test (Annex E).

2.5.SS send appropriate TPC commands for PUCCH to the UE until the UE transmits PUCCH at -36.8dbm,with ±3.2dB tolerance.2.6. Measure PUCCH EVM using Global In-Channel Tx-Test (Annex E).

Test procedure for PRACH:

3.1.The SS shall set RS EPRE according to Table 6.5.2.1.4.1-3,

3.2.PRACH are set according to Table 6.5.2.1.4.1-3.

3.3. The SS shall signal a Random Access Preamble ID via a PDCCH order to the UE and initiate a Non-contention based Random Access procedure

3.4.The UE shall send the signalled preamble to the SS.

3.5.In response to the preamble, the SS shall transmit a random access response not corresponding to the transmitted random access preamble, or send no response.

3.6.The UE shall consider the random access response reception not successful then re-transmit the preamble with the calculated PRACH transmission power .

3.7.Repeat step 5 and 6 until the SS collect enough PRACH preambles(2 preambles for format 0,1,2,3 and 10 preambles for format 4).Measure the EVM in PRACH channel using Global In-Channel Tx-Test (Annex E).

6.5.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exceptions:

Table 6.5.2.1.4.3-1: *PRACH-ConfCommonDEFAULT*: PRACH EVM measurement for FDD

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-7 PRACH-ConfCommonDEFAULT			
Information Element	Value/remark	Comment	Condition
PRACH-ConfigInfo SEQUENCE {			
prach-ConfigIndex	4		

Table 6.5.2.1.4.3-2: *PRACH-ConfCommonDEFAULT*: PRACH EVM measurement for TDD

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-7 PRACH-ConfCommonDEFAULT			
Information Element	Value/remark	Comment	Condition
PRACH-ConfigInfo SEQUENCE {			
prach-ConfigIndex	53		

Table 6.5.2.1.4.3-4: *RACH-ConfigCommon-DEFAULT:* PRACH EVM measurement

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-12 RACH-ConfigCommon-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
RACH-ConfigCommon-DEFAULT ::= SEQUENCE {			
preambleInfo SEQUENCE {			
numberOfRA-Preambles	n52		
preamblesGroupAConfig SEQUENCE {}	Not present		
}			
powerRampingParameters SEQUENCE {			
powerRampingStep	db0		
preambleInitialReceivedTargetPower	dBm-120 Test point 1 dBm-90 Test point 2		
}			
ra-SupervisionInfo SEQUENCE {			
preambleTransMax	n10		
ra-ResponseWindowSize	sf2		
mac-ContentionResolutionTimer	sf48		
}			
ra-SupervisionInfo SEQUENCE {			

6.5.2.1.5 Test requirement

The PUSCH EVM derived in E.4.2 shall not exceed 17,5 % +TT for QPSK and BPSK, 12,5% +TT for 16 QAM.

The PUSCH $\overline{EVM}_{DMRS}$ derived in E.4.8.2 shall not exceed [17,5 %] +TT when embedded with data symbols of QPSK and BPSK, [12,5%] +TT for 16 QAM.

The PUCCH EVM and derived in E.5.9.2 shall not exceed 17,5 % +TT.

The PRACH EVM derived in FFS shall not exceed 17.5%+TT.

6.5.2.2 IQ-component.

6.5.2.2.1 Test Purpose

I/Q origin offset is an interference caused by crosstalk or DC offset and expresses itself as unmodulated sine wave with the carrier frequency. It is an interference of approximately constant amplitude and independent of the amplitude of the wanted signal. I/Q origin offset interferes with the centre sub carriers of the UE under test (if allocated), especially, when their amplitude is small. The measurement interval is defined over one slot in the time domain.

The purpose of this test is to exercise the UE transmitter to verify its modulation quality in terms of IQ origin offset.

6.5.2.2.2 Test applicability

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

6.5.2.2.3 Minimum conformance requirements

The relative carrier leakage power (IQ origin offset power) shall not exceed the values specified in Table 6.5.2.2.3-1.

Table 6.5.2.2.3-1: Minimum requirements for Relative Carrier Leakage Power

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

The normative reference for this requirement is TS 36.101 clause 6.5.2.2.1

6.5.2.2.4 Test description

6.5.2.2.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.2.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.2.2.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				See Table 6.5.1.4.1-1		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				See Table 6.5.1.4.1-1		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				See Table 6.5.1.4.1-1		
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	[FFS]	[FFS]	[FFS]	QPSK	1	1
3MHz	[FFS]	[FFS]	[FFS]	QPSK	4	4
5MHz	[FFS]	[FFS]	[FFS]	QPSK	8	8
10MHz	[FFS]	[FFS]	[FFS]	QPSK	12	12
15MHz	[FFS]	[FFS]	[FFS]	QPSK	16	16
20MHz	[FFS]	[FFS]	[FFS]	QPSK	18	18
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2: For partial RB allocation, the starting resource block shall be RB #0 and RB# (max - RB allocation) of the channel bandwidth.						

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508[7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to in Table 6.5.2.2.4.1-1.
5. Propagation conditions are set according to Annex B.0
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.5.2.2.4.3.

6.5.2.2.4.2 Test procedure

1. Set the power level of UE to [2]dBm, with [±2dB] tolerance..
2. Measure IQ offset using Global In-Channel Tx-Test (Annex E).
3. Set the power level of UE to [-28] dBm,or send power control "down" commands to the UE until UE output power is [–28] dBm,with [±2dB] tolerance.
4. Measure IQ offset using Global In-Channel Tx-Test (Annex E).
5. Set the power level of UE to [-38]dBm,or send power control "down" commands to the UE until UE output power is [–38] dBm,with [±2dB] tolerance.

6. Measure IQ offset using Global In-Channel Tx-Test (Annex E).

6.5.2.2.4.3 Message contents

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

6.5.2.2.5 Test requirement

Each of the 20 IQ offset results, derived in Annex E.3.1,shall not exceed the values in table 6.5.2.2.5-1

Table 6.5.2.2.5-1: Test requirements for Relative Carrier Leakage Power

LO Leakage	Parameters	Relative Limit (dBc)
	[2] dBm ±[2dB]	-25+[tbd]
	[-28] dBm ±[2dB]	-20+[tbd]
	[-38] dBm ±[2dB]	-10+[tbd]

6.5.2.3 In-band emissions for non allocated RB

6.5.2.3.1 Test Purpose

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks

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.

6.5.2.3.2 Test applicability

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

6.5.2.3.3 Minimum conformance requirements

The relative in-band emission shall not exceed the values specified in Table 6.5.2.3.3-1.

Table 6.5.2.3.3-1: Minimum requirements for in-band emissions

Parameter Description	Unit	Limit (Note 1)		Applicable Frequencies
General	dB	$\max\{-30,\ -25-10\cdot\log_{10}(N_{RB}/L_{CRBs}),\ 20\cdot\log_{10} EVM - 3 - 5\cdot(\Delta_{RB}-1)/L_{CRBs},\ -57\ dBm/180\ kHz - P_{RB}\}$		Any non-allocated (Note 2)
IQ Image	dB	-25		Image frequencies (Notes 2, 3)
DC	dBc	-25	Output power > 0 dBm	LO frequency (Notes 4, 5)
		-20	-30 dBm ≤ Output power ≤ 0 dBm	
		-10	-40 dBm ≤ Output power < -30 dBm	

Note 1: The minimum requirement is calculated from any of the listed requirements, whichever is the highest power.
Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.
Note 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.
Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.
Note 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if N_{RB} is odd, or in the two RBs immediately adjacent to the DC frequency if N_{RB} is even, but excluding any allocated RB.
Note 6: L_{CRBs} is the Transmission Bandwidth (see Figure 5.4.2-1).
Note 7: N_{RB} is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).
Note 8: EVM is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.
Note 9: Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB}=1$ or $\Delta_{RB}=-1$ for the first adjacent RB outside of the allocated bandwidth.
Note 10: P_{RB} is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

The normative reference for this requirement is TS 36.101 [2] clause 6.5.2.3.1.

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.

6.5.2.3.4 Test description

6.5.2.3.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.5.2.3.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.2.2.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				See Table 6.5.1.4.1-1		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				See Table 6.5.1.4.1-1		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				See Table 6.5.1.4.1-1		
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	[FFS]	[FFS]	[FFS]	QPSK	1	1
3MHz	[FFS]	[FFS]	[FFS]	QPSK	4	4
5MHz	[FFS]	[FFS]	[FFS]	QPSK	8	8
10MHz	[FFS]	[FFS]	[FFS]	QPSK	12	12
15MHz	[FFS]	[FFS]	[FFS]	QPSK	16	16
20MHz	[FFS]	[FFS]	[FFS]	QPSK	18	18
Note 1. Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. For partial RB allocation, the starting resource block shall be RB #0 and RB# (max - RB allocation) of the channel bandwidth.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.1.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to in Table 6.5.2.3.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.5.2.3.4.3.

6.5.2.3.4.2 Test procedure

1. Set the power level of UE to [2]dBm, with [±2dB] tolerance.
2. Measure In-band emission using Global In-Channel Tx-Test (Annex E)
3. Set the power level of UE to [-28]dBm,or send power control "down" commands to the UE until UE output power is [–28]dBm,with [±2dB] tolerance.
4. Measure In-band emission using Global In-Channel Tx-Test (Annex E)
5. Set the power level of UE to [-38]dBm, or send power control "down" commands to the UE until UE output power is [–38]dBm, with [±2dB] tolerance.
6. Measure In-band emission using Global In-Channel Tx-Test (Annex E)

6.5.2.3.4.3 Message contents

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

6.5.2.3.5 Test requirement

Each of the 20 In-band emissions results, derived in Annex E.4.3 shall not exceed the corresponding values in Table 6.5.2.3.5-1

Table 6.5.2.3.5-1: Test requirements for in-band emissions

Parameter Description	Unit	Limit (Note 1)		Applicable Frequencies
General	dB	$\max\left\{-30,\ -25-10\cdot\log_{10}(N_{RB}/L_{CRBs}),\ 20\cdot\log_{10}EVM-3-5\cdot(\lvert\Delta_{RB}\rvert-1)/L_{CRBs},\ -57\,dBm/180\,kHz-P_{RB}\right\}$ +TT		Any non-allocated (Note 2)
IQ Image	dB	-25+TT		Image frequencies (Notes 2, 3)
DC	dBc	-23+[tbd]	Output power =[2] dBm [±2dB]	LO frequency (Notes 4, 5)
		-20+[tbd]	Output power =[-28] dBm [±2dB]	
		-10+[tbd]	Output power =[-38] dBm [±2dB]	

Note 1: The minimum requirement is calculated from any of the listed requirements, whichever is the highest power.
Note 2: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured average power per allocated RB, where the averaging is done across all allocated RBs.
Note 3: The applicable frequencies for this limit are those that are enclosed in the reflection of the allocated bandwidth, based on symmetry with respect to the centre carrier frequency, but excluding any allocated RBs.
Note 4: The measurement bandwidth is 1 RB and the limit is expressed as a ratio of measured power in one non-allocated RB to the measured total power in all allocated RBs.
Note 5: The applicable frequencies for this limit are those that are enclosed in the RBs containing the DC frequency if N_{RB} is odd, or in the two RBs immediately adjacent to the DC frequency if N_{RB} is even, but excluding any allocated RB.
Note 6: L_{CRBs} is the Transmission Bandwidth (see Figure 5.4.2-1).
Note 7: N_{RB} is the Transmission Bandwidth Configuration (see Figure 5.4.2-1).
Note 8: EVM is the limit specified in Table 6.5.2.1.1-1 for the modulation format used in the allocated RBs.
Note 9: Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB}=1$ or $\Delta_{RB}=-1$ for the first adjacent RB outside of the allocated bandwidth.
Note 10: P_{RB} is the transmitted power per 180 kHz in allocated RBs, measured in dBm.

6.5.2.4 Spectrum flatness

6.5.2.4.1 Test Purpose

The spectrum flatness is a measure of the relative power variation across the subcarriers of the RB of the allocated UL blocks. The basic spectrum flatness measurement interval is defined over one slot in the time domain.

6.5.2.4.2 Test applicability

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

6.5.2.4.3 Minimum conformance requirements

The spectrum flatness shall not exceed the values specified in Table 6.5.2.4.3-1 for normal conditions and Table 6.5.2.4.3-2 for extreme conditions.

Table 6.5.2.4.3-1: Minimum requirements for spectrum flatness (normal conditions)

Spectrum Flatness	Relative Limit (dB)
If $F_{UL\_measurement} - F_{UL\_low} \geq 3MHz$ and If $F_{UL\_high} - F_{UL\_measurement} \geq 3$ MHz	+2/-2
If $F_{UL\_measurement} - F_{UL\_low} < 3$ MHz or If $F_{UL\_high} - F_{UL\_measurement} < 3$ MHz	+3/-5
Note 1: F_{UL_low} and F_{UL_high} refers to each E-UTRA frequency band specified in Table 5.2-1 Note 2: $F_{UL\_measuremen}$ refers to frequency of the subcarrier being evaluated	

Table 6.5.2.4.3-2: Minimum requirements for spectrum flatness (extreme conditions)

Spectrum Flatness	Relative Limit (dB)
If $F_{UL\_measurement} - F_{UL\_low} \geq 5$ MHz and If $F_{UL\_high} - F_{UL\_measurement} \geq 5$ MHz	+2/-2
If $F_{UL\_measurement} - F_{UL\_low} < 5$ MHz or If $F_{UL\_high} - F_{UL\_measurement} < 5$ MHz	+4/-8
Note 1: F_{UL_low} and F_{UL_high} refers to each E-UTRA frequency band specified in Table 5.2-1 Note 2: $F_{UL\_measurement}$ refers to frequency of the subcarrier being evaluated	

The normative reference for this requirement is TS 36.101 clause 6.5.2.4.1.

6.5.2.4.4 Test description

6.5.2.4.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.4.2.4.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.5.2.4.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				See Table 6.5.1.4.1-1		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				See Table 6.5.1.4.1-1		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				See Table 6.5.1.4.1-1		
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
3MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
5MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
10MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
15MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
20MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
Note 1. Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.1.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to in Table 6.5.2.4.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.5.2.4.4.3.

6.5.2.4.4.2 Test procedure

1. Send continuously uplink power control "up" commands to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 6.5.2.4.4.1-1.

2. Measure spectrum flatness using Global In-Channel Tx-Test (Annex E)

6.5.2.4.4.3 Message contents

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

6.5.2.4.5 Test requirement

Each of the 20 spectrum flatness functions, derived in Annex E.4.4, shall not exceed the values in Table 6.5.2.4.5-1 for normal conditions and Table 6.5.2.4.5-2 for extreme conditions.

Table 6.5.2.4.5-1: Test requirements for spectrum flatness (normal conditions)

Spectrum Flatness	Relative Limit (dB)
If $F_{UL\_measurement} - F_{UL\_low} \geq 3MHz$ and If $F_{UL\_high} - F_{UL\_measurement} \geq 3$ MHz	+2+[tbd]/-2+[tbd]
If $F_{UL\_measurement} - F_{UL\_low} < 3$ MHz or If $F_{UL\_high} - F_{UL\_measurement} < 3$ MHz	+3+[tbd]/-5+[tbd]
Note 1: F_{UL_low} and F_{UL_high} refers to each E-UTRA frequency band specified in Table 5.2-1 Note 2: $F_{UL\_measurement}$ refers to frequency of the subcarrier being evaluated	

Table 6.5.2.4.5-2: Test requirements for spectrum flatness (extreme conditions)

Spectrum Flatness	Relative Limit (dB)
If $F_{UL\_measurement} - F_{UL\_low} \geq 5MHz$ and If $F_{UL\_high} - F_{UL\_measurement} \geq 5$ MHz	+2+[tbd]/-2+[tbd]
If $F_{UL\_measurement} - F_{UL\_low} < 5$ MHz or If $F_{UL\_high} - F_{UL\_measurement} < 5$ MHz	+4+[tbd]/-8+[tbd]
Note 1: F_{UL_low} and F_{UL_high} refers to each E-UTRA frequency band specified in Table 5.2-1 Note 2: $F_{UL\_measurement}$ refers to frequency of the subcarrier being evaluated	

6.6 Output RF spectrum emissions

Unwanted emissions are divided into "Out-of-band emission" and "Spurious emissions" in 3GPP RF specifications. This notation is in line with ITU-R recommendations such as SM.329 [2] and the Radio Regulations [3].

ITU defines:

Out-of-band emission = Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions.

Spurious emission = Emission on a frequency, or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products but exclude out-of-band emissions.

Unwanted emissions = Consist of spurious emissions and out-of-band emissions.

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

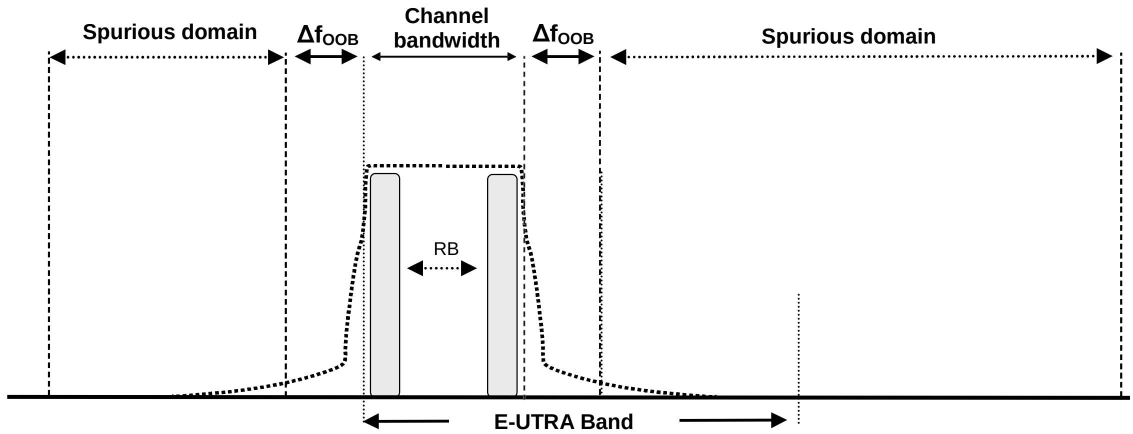

Figure 6.6-1: Transmitter RF spectrum

6.6.1 Occupied bandwidth

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

FDD aspects missing or not yet determined:

- *The fixed power allocation for the RB(s) is undefined*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *Test Case in this clause has been verified to apply for both FDD and TDD.*

6.6.1.1 Test purpose

To verify that the UE occupied bandwidth for all transmission bandwidth configurations supported by the UE are less than their specific limits

6.6.1.2 Test applicability

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

6.6.1.2 Minimum conformance requirements

Occupied bandwidth is a measure of the bandwidth containing 99 % of the total integrated mean power of the transmitted spectrum on the assigned channel. The occupied channel bandwidth for all transmission bandwidth configurations (Resources Blocks) should be less than the channel bandwidth specified in Table 6.6.1.2-1

Table 6.6.1.2-1: Occupied channel bandwidth

	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

The normative reference for this requirement is TS 36.101 [2] clause 6.6.1.

6.6.1.4 Test description

6.6.1.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6. 1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.6.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			Normal			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Mid range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			All			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	6	6
3MHz	QPSK	4	4	QPSK	15	15
5MHz	QPSK	8	8	QPSK	25	25
10MHz	QPSK	16	16	QPSK	50	50
15MHz	QPSK	25	25	QPSK	75	75
20MHz	QPSK	30	30	QPSK	100	100
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.

4. The UL and DL Reference Measurement channels are set according to Table 6.6.1.4.1-1.

5. Propagation conditions are set according to Annex B.0

6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.6.1.4.3

6.6.1.4.2 Test procedure

1. Send continuously power control “up”commands to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 6.6.1.4.1-1..

2. Measure the power spectrum distribution within two times or more range over the requirement for Occupied Bandwidth specification centring on the current carrier frequency. The characteristic of the filter shall be approximately Gaussian (typical spectrum analyzer filter). Other methods to measure the power spectrum distribution are allowed. The measuring duration is one active uplink slot.

3. Calculate the total power within the range of all frequencies measured in '2)' and save this value as "Total Power".

4. Sum up the power upward from the lower boundary of the measured frequency range in '2)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Lower Frequency".

5. Sum up the power downward from the upper boundary of the measured frequency range in '2)' and seek the limit frequency point by which this sum becomes 0,5 % of "Total Power" and save this point as "Upper Frequency".

6. Calculate the difference ("Upper Frequency" − "Lower Frequency" = "Occupied Bandwidth") between two limit frequencies obtained in '4)' and '5)'.

6.6.1.4.3 Message contents

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

6.6.1.5 Test requirement

The measured Occupied Bandwidth shall not exceed values in Table 6.6.1.5-1.

Table 6.6.1.5-1: Occupied channel bandwidth

	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

6.6.2 Out of band emission

Out of band emissions are unwanted emissions immediately outside the nominal channel 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 Adjacent Channel Leakage power Ratio.

6.6.2.1 Spectrum Emission Mask

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

FDD aspects missing or not yet determined:

- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *The test cases in this clause have been verified to apply for both FDD and TDD*

6.6.2.1.1 Test purpose

To verify that the power of any UE emission shall not exceed specified lever for the specified channel bandwidth.

6.6.2.1.2 Test applicability

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

6.6.2.1.3 Minimum conformance requirements

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 6.6.2.1.3-1 the spurious requirements in clause 6.6.3 are applicable.

The power of any UE emission shall not exceed the levels specified in Table 6.6.2.1.3-1 for the specified channel bandwidth.

Table 6.6.2.1.3-1: General E-UTRA spectrum emission mask

Spectrum emission limit (dBm)/ Channel bandwidth							
Δf_{OOB} (MHz)	**1.4 MHz**	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**Measurement bandwidth**
± 0-1	-10	-13	-15	-18	-20	-21	30 kHz
± 1-2.5	-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

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.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.1.

6.6.2.1.4 Test description

6.6.2.1.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.1.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.6.2.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)			NC			
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)			Low range, Mid range, High range			
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)			Lowest, 5MHz, 10MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	2	[FFS]	QPSK	Full	Full
1.4MHz	QPSK	2	[FFS]	QPSK	5	5
1.4MHz	QPSK	2	[FFS]	16QAM	5	5
1.4MHz	QPSK	2	[FFS]	16QAM	Full	Full
3MHz	QPSK	4	[FFS]	QPSK	Full	Full
3MHz	QPSK	4	[FFS]	QPSK	4	4
3MHz	QPSK	4	[FFS]	16QAM	4	4
3MHz	QPSK	4	[FFS]	16QAM	Full	Full
5MHz	QPSK	8	[FFS]	QPSK	Full	Full
5MHz	QPSK	8	[FFS]	QPSK	8	8
5MHz	QPSK	8	[FFS]	16QAM	8	8
5MHz	QPSK	8	[FFS]	16QAM	Full	Full
10MHz	QPSK	16	[FFS]	QPSK	Full	Full
10MHz	QPSK	16	[FFS]	QPSK	12	12
10MHz	QPSK	16	[FFS]	16QAM	12	12
10MHz	QPSK	16	[FFS]	16QAM	Full	Full
15MHz	QPSK	25	[FFS]	QPSK	Full	Full
15MHz	QPSK	25	[FFS]	QPSK	16	16
15MHz	QPSK	25	[FFS]	16QAM	16	16
15MHz	QPSK	25	[FFS]	16QAM	Full	Full
20MHz	QPSK	30	[FFS]	QPSK	Full	Full
20MHz	QPSK	30	[FFS]	QPSK	18	18
20MHz	QPSK	30	[FFS]	16QAM	18	18
20MHz	QPSK	30	[FFS]	16QAM	Full	Full
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2: The allowed MPR for maximum output power UE might apply is described in clause 6.2.3.3. Note 3: For low range frequency, the starting resource block of partial RB allocation shall be RB# (max – RB allocation) of the channel bandwidth. Note 4: For middle range frequency, the starting resource block of partial RB allocation shall be RB# 0 and RB# (max – RB allocation) of the channel bandwidth. Note 5: For high range frequency, the starting resource block of partial RB allocation shall be RB# 0 of the channel bandwidth.						

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.6.2.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.6.2.1.4.3.

6.6.2.1.4.2 Test procedure

1. Send continuously power control "up" commands to the UE until the UE transmits at maximum output power state according to the test configuration from Table 6.6.2.1.4.1-1.

2. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2.2.5-1 and 6.2.3.5-1. The period of the measurement shall be at least one sub-frame (1ms).

3. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.1.5-1. The center frequency of the filter shall be stepped in contiguous steps according to table 6.6.2.1.5-1. The measured power shall be recorded for each step.

6.6.2.1.4.3 Message contents

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

6.6.2.1.5 Test requirements

The power of any UE emission shall fullfil requirements in Table.6.6.2.1.5-1.

Table 6.6.2.1.5-1: General E-UTRA spectrum emission mask

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf_{OOB} (MHz)	**1.4 MHz**	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**Measurement bandwidth**
0-1	-8.5	-11.5	-13.5	-16.5	-18.5	-19.5	30 kHz
1-2.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	1 MHz
2.5-2.8	-23.5	-8.5	-8.5	-8.5	-8.5	-8.5	1 MHz
2.8-5		-8.5	-8.5	-8.5	-8.5	-8.5	1 MHz
5-6		-23.5	-11.5	-11.5	-11.5	-11.5	1 MHz
6-10			-23.5	-11.5	-11.5	-11.5	1 MHz
10-15				-23.5	-11.5	-11.5	1 MHz
15-20					-23.5	-11.5	1 MHz
20-25						-23.5	1 MHz
NOTE 1: The first and last measurement position with a 30 kHz filter is at Δf_{OOB} equals to 0.015 MHz and 0.985 MHz. NOTE 2: The first and last measurement position with a 1 MHz filter for 1-2.5 MHz offset range is at Δf_{OOB} equals to 1.5 MHz and 2.0 MHz. Similarly for other Δf_{OOB} ranges NOTE 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel NOTE 4: For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at Δf_{OOB} equals to 3 MHz.							

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 Additional Spectrum Emission Mask

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

FDD aspects missing or not yet determined:

- *Test procedure should be verified so that UE transmit with appropriate output power according to each test configuration*
- *Reference Measurement Channel is undefined*
- *The specific position of partial RBs should be verified*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *The test cases in this clause have been verified to apply for both FDD and TDD*

6.6.2.2.1 Test purpose

To verify that the power of any UE emission shall not exceed specified level for the specified channel bandwidth under the deployment scenarios where additional requirements are specified.

6.6.2.2.2 Test applicability

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

6.6.2.2.3 Minimum conformance requirements

6.6.2.2.3.1 Minimum requirement (network signalled value "NS_03")

When "NS_03" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3.1-1.

Table 6.6.2.2.3.1-1: Additional requirements (network signalled value "NS_03")

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf_{OOB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
± 0-1	-10	-13	-15	-18	-20	-21	30 kHz
± 1-2.5	-13	-13	-13	-13	-13	-13	1 MHz
± 2.5-5	-25	-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

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.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.2.1.

6.6.2.2.3.2 Minimum requirement (network signalled value "NS_04")

When "NS_04" is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 6.6.2.2.3.2-1.

Table 6.6.2.2.3.2-1: Additional requirements (network signalled value "NS_04")

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf_{OOB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
± 0-1	-10	-13	-15	-18	-20	-21	30 kHz
± 1-2.5	-13	-13	-13	-13	-13	-13	1 MHz
± 2.5-5	-25	-13	-13	-13	-13	-13	1 MHz
± 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

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.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.2.2.

6.6.2.2.3.3 Minimum requirement (network signalled value "NS_06" or NS_07)

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 6.6.2.2.3.3-1.

Table 6.6.2.2.3.3-1: Additional requirements (network signalled value "NS_06" or "NS_07")

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

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.

The normative reference for this requirement is TS 36.101 [2] clause 6.6.2.2.3.

6.6.2.2.4 Test description

6.6.2.2.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.2.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.6.2.2.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				NC		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				Low range, Mid range, High range		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				Lowest, 5MHz, 10MHz, Highest		
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
1.4MHz	[FFS]	[FFS]	[FFS]	QPSK	5	5
1.4MHz	[FFS]	[FFS]	[FFS]	16QAM	5	5
3MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
3MHz	[FFS]	[FFS]	[FFS]	QPSK	4	4
3MHz	[FFS]	[FFS]	[FFS]	16QAM	4	4
5MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
5MHz	[FFS]	[FFS]	[FFS]	QPSK	8	8
5MHz	[FFS]	[FFS]	[FFS]	16QAM	8	8
10MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
10MHz	[FFS]	[FFS]	[FFS]	QPSK	12	12
10MHz	[FFS]	[FFS]	[FFS]	16QAM	12	12
15MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
15MHz	[FFS]	[FFS]	[FFS]	QPSK	16	16
15MHz	[FFS]	[FFS]	[FFS]	16QAM	16	16
20MHz	[FFS]	[FFS]	[FFS]	QPSK	Full	Full
20MHz	[FFS]	[FFS]	[FFS]	QPSK	18	18
20MHz	[FFS]	[FFS]	[FFS]	16QAM	18	18
Note 1. Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2: For QPSK with partial RB allocation, the UE transmitted power shall not be adjusted by MPR, i.e. the UE shall transmit with MPR = 0 dB. For QPSK with full RB allocation and 16QAM with partial RB allocation, the UE transmitted power might be adjusted by allowed MPR ≤ 1 dB. Note 3. For low range frequency, the starting resource block of partial RB allocation shall be RB# (max – RB allocation) of the channel bandwidth. Note 4. For middle range frequency, the starting resource block of partial RB allocation shall be RB# 0 and RB# (max – RB allocation) of the channel bandwidth. Note 5. For high range frequency, the starting resource block of partial RB allocation shall be RB# 0 of the channel bandwidth.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.6.2.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.6.2.2.4.3.

6.6.2.2.4.2 Test procedure

1. Send continuously power control "up"commands to the UE until the UE transmits at its maximum output power state according to each test configuration in Table 6.6.2.2.4.1-1.

2. Measure the power of the transmitted signal with a measurement filter of bandwidths according to table 6.6.2.2.5.1-1, 6.6.2.2.5.2-1, 6.6.2.2.5.3-1. The center frequency of the filter shall be stepped in contiguous steps according to table 6.6.2.2.5.1-1, 6.6.2.2.5.2-1, 6.6.2.2.5.3-1. The measured power shall be recorded for each step.

6.6.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions for each network signalled value.

6.6.2.2.4.3.1 Message contents exceptions (network signalled value "NS_03")

1. Information element additionalSpectrumEmission is set to NS_03. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.6.2.2.4.3.1-1: *SystemInformationBlockType2* :Additional spurious emissions requirement

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	3 (NS_03)		

6.6.2.2.4.3.2 Message contents exceptions (network signalled value "NS_04")

1. Information element additionalSpectrumEmission is set to NS_04. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.6.2.2.4.3.2-1: *SystemInformationBlockType2* :Additional spurious emissions requirement

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	4 (NS_04)		

6.6.2.2.4.3.3 Message contents exceptions (network signalled value "NS_06")

1. Information element additionalSpectrumEmission is set to NS_06. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.6.2.2.4.3.3-1: *SystemInformationBlockType2* :Additional spurious emissions requirement

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	6 (NS_06)		

6.6.2.2.5 Test requirements

6.6.2.2.5.1 Test requirements (network signalled value "NS_03")

When "NS_03" is indicated in the cell, the power of any UE emission shall fulfil requirements in Table 6.6.2.2.5.1-1.

Table 6.6.2.2.5.1-1: Additional requirements (network signalled value "NS_03")

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf$_{OOB}$ (MHz)	**1.4 MHz**	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**Measurement bandwidth**
0-1	-8.5	-11.5	-13.5	-16.5	-18.5	-19.5	30 kHz
1-2.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	1 MHz
2.5-5	-23.5	-11.5	-11.5	-11.5	-11.5	-11.5	1 MHz
5-6		-23.5	-11.5	-11.5	-11.5	-11.5	1 MHz
6-10			-23.5	-11.5	-11.5	-11.5	1 MHz
10-15				-23.5	-11.5	-11.5	1 MHz
15-20					-23.5	-11.5	1 MHz
20-25						-23.5	1 MHz
NOTE 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz. NOTE 2: The first and last measurement position with a 1 MHz filter for 1-2.5 MHz offset range is at ΔfOOB equals to 1.5 MHz and 2.0 MHz. Similarly for other ΔfOOB ranges NOTE 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel NOTE 4: Above SEM requirement applies to bands 2, 4, 10, 35, 36 corresponding to network signalling value NS_03 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.							

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.

6.6.2.2.5.2 Test requirements (network signalled value "NS_04")

When "NS_04" is indicated in the cell, the power of any UE emission shall fulfil requirements in Table 6.6.2.2.5.2-1.

Table 6.6.2.2.5.2-1: Additional requirements (network signalled value "NS_04")

	Spectrum emission limit (dBm)/ Channel bandwidth						
Δf$_{OOB}$ (MHz)	**1.4 MHz**	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**Measurement bandwidth**
0-1	-8.5	-11.5	-13.5	-16.5	-18.5	-19.5	30 kHz
1-2.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	1 MHz
2.5-5	-23.5	-11.5	-11.5	-11.5	-11.5	-11.5	1 MHz
5-6		-23.5	-23.5	-23.5	-23.5	-23.5	1 MHz
6-10			-23.5	-23.5	-23.5	-23.5	1 MHz
10-15				-23.5	-23.5	-23.5	1 MHz
15-20					-23.5	-23.5	1 MHz
20-25						-23.5	1 MHz
NOTE 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.985 MHz. NOTE 2: The first and last measurement position with a 1 MHz filter for 1-2.5 MHz offset range is at ΔfOOB equals to 1.5 MHz and 2.0 MHz. Similarly for other ΔfOOB ranges NOTE 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel NOTE 4: Above SEM requirement applies to bands FFS corresponding to network signalling value NS_04 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.							

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.

6.6.2.2.5.3 Test requirements (network signalled value "NS_06" or “NS_07”)

When "NS_06" or “NS_07” is indicated in the cell, the power of any UE emission shall fulfil requirements in Table 6.6.2.2.5.3-1.

Table 6.6.2.2.5.3-1: Additional requirements (network signalled value "NS_06" or “NS_07”)

	Spectrum emission limit (dBm)/ Channel bandwidth				
Δf_{OOB} (MHz)	**1.4 MHz**	**3.0 MHz**	**5 MHz**	**10 MHz**	**Measurement bandwidth**
0-0.1	-11.5	-11.5	-13.5	-16.5	30 kHz
0.1-1	-11.5	-11.5	-11.5	-11.5	100 kHz
1-2.5	-11.5	-11.5	-11.5	-11.5	1 MHz
2.5-5	-23.5	-11.5	-11.5	-11.5	1 MHz
5-6		-23.5	-11.5	-11.5	1 MHz
6-10			-23.5	-11.5	1 MHz
10-15				-23.5	1 MHz
NOTE 1: The first and last measurement position with a 30 kHz filter is at ΔfOOB equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at ΔfOOB equals to 0.15 MHz and 0.95 MHz. NOTE 2: The first and last measurement position with a 1 MHz filter for 1-2.5 MHz offset range is at ΔfOOB equals to 1.5 MHz and 2.0 MHz. Similarly for other ΔfOOB ranges NOTE 3: The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel NOTE 4: Above SEM requirement applies to bands 12, 13, 14, 17 corresponding to network signalling value NS_06 and it also applies to band 13 corresponding to network signalling value NS_07 as defined in TS 36.101 [2] subclause 6.2.4 Table 6.2.4-1.					

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 power Ratio

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

FDD aspects missing or not yet determined:

- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*

Test Case in this clause has been verified to apply for both TDD and FDD.

6.6.2.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to adjacent channels in terms of Adjacent Channel Leakage power Ratio (ACLR).

6.6.2.3.2 Test applicability

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

6.6.2.3.3 Minimum conformance requirements

ACLR requirements are specified for two scenarios for an adjacent E -UTRA$_{ACLR}$ and UTRA$_{ACLR1/2}$ as shown in Figure 6.6.2.3.3-1.

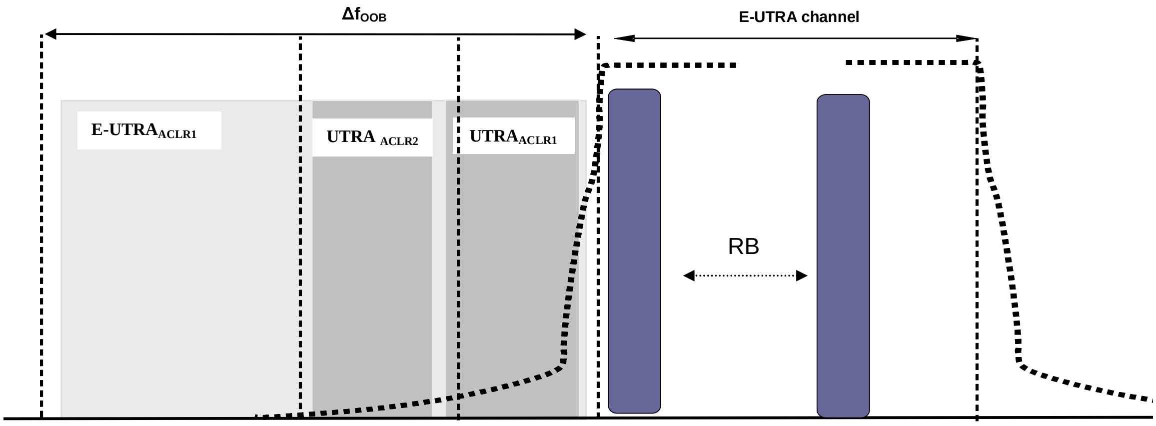

Figure 6.6.2.3.3-1: Adjacent Channel Leakage Power Ratio requirements

6.6.2.3.3.1 Minimum conformance requirements for E-UTRA

E-UTRA ACLR (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 bandwidth specified in Table 6.6.2.3.3.1-1.

If the measured adjacent channel power is greater than –50dBm then the E-UTRA$_{ACLR}$ shall be higher than the valued specified in Table 6.6.2.3.3.1-1.

Table 6.6.2.3.3.1-1: General requirements for E-UTRA$_{ACLR}$

	Channel bandwidth / E-UTRA$_{ACLR1}$ / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
E-UTRA$_{ACLR1}$	30 dB	30 dB	30 dB	30 dB	30 dB	30 dB
E-UTRA channel Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.3.1.

6.6.2.3.3.2 Minimum conformance requirements for UTRA

UTRA ACLR (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 UTRA channel frequency.

UTRA ACLR is specified for both the first UTRA adjacent channel (UTRA$_{ACLR1}$) and the 2nd UTRA adjacent channel (UTRA$_{ACLR2}$) .The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned E-UTRA channel power is measured with a rectangular filter with measurement bandwidth specified in Table 6.6.2.3.3.2-1.

If the measured UTRA channel power is greater than –50dBm then the UTRA$_{ACLR1}$ and UTRA$_{ACLR2}$ shall be higher than the valued specified in Table 6.6.2.3.3.2-1.

Table 6.6.2.3.3.2-1: General requirements for UTRA$_{ACLR1/2}$

	Channel bandwidth / UTRA$_{ACLR1/2}$ / measurement bandwidth					
	1.4	3.0	5	10	15	20

	MHz	MHz	MHz	MHz	MHz	MHz
$UTRA_{ACLR1}$	33 dB	33 dB	33 dB	33 dB	33 dB	33 dB
Adjacent channel centre frequency offset (in MHz)	$0.7+BW_{UTRA}/2$	$1.5+BW_{UTRA}/2$	$2.5+BW_{UTRA}/2$	$5+BW_{UTRA}/2$	$7.5+BW_{UTRA}/2$	$10+BW_{UTRA}/2$
$UTRA_{ACLR2}$	-	-	36 dB	36 dB	36 dB	36 dB
Adjacent channel centre frequency offset (in MHz)	-	-	$2.5+3*BW_{UTRA}/2$	$5+3*BW_{UTRA}/2$	$7.5+3*BW_{UTRA}/2$	$10+3*BW_{UTRA}/2$
E-UTRA channel Measurement bandwidth	-	-	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
UTRA 5MHz channel Measurement bandwidth[1]	-	-	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz
UTRA 1.6MHz channel measurement bandwidth[2]	-	-	1.28 MHz	1.28 MHz	1.28 MHz	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.						

The normative reference for this requirement is TS 36.101 subclause 6.6.2.3.2.

6.6.2.3.4 Test description

6.6.2.3.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.6.2.3.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.6.2.3.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)			NC, TL/VL, TL/VH, TH/VL, TH/VH			
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)			Low range, Mid range, High range			
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)			Lowest, 5MHz, 10MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	2	[FFS]	QPSK	Full	Full
1.4MHz	QPSK	2	[FFS]	QPSK	5	5
1.4MHz	QPSK	2	[FFS]	16QAM	5	5
3MHz	QPSK	4	[FFS]	QPSK	Full	Full
3MHz	QPSK	4	[FFS]	QPSK	4	4
3MHz	QPSK	4	[FFS]	16QAM	4	4
5MHz	QPSK	8	[FFS]	QPSK	Full	Full
5MHz	QPSK	8	[FFS]	QPSK	8	8
5MHz	QPSK	8	[FFS]	16QAM	8	8
10MHz	QPSK	16	[FFS]	QPSK	Full	Full
10MHz	QPSK	16	[FFS]	QPSK	12	12
10MHz	QPSK	16	[FFS]	16QAM	12	12
10MHz	QPSK	16	[FFS]	16QAM	Full	Full
15MHz	QPSK	25	[FFS]	QPSK	Full	Full
15MHz	QPSK	25	[FFS]	QPSK	16	16
15MHz	QPSK	25	[FFS]	16QAM	16	16
20MHz	QPSK	30	[FFS]	QPSK	Full	Full
20MHz	QPSK	30	[FFS]	QPSK	18	18
20MHz	QPSK	30	[FFS]	16QAM	18	18
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2: The allowed MPR for maximum output power UE might apply is described in clause 6.2.3.3. Note 3: For low range frequency, the starting resource block of partial RB allocation shall be RB# (max – RB allocation) of the channel bandwidth. Note 4: For middle range frequency, the starting resource block of partial RB allocation shall be RB# 0 and RB# (max – RB allocation) of the channel bandwidth. Note 5: For high range frequency, the starting resource block of partial RB allocation shall be RB# 0 of the channel bandwidth.						

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.6.2.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.6.2.3.4.3.

6.6.2.3.4.2 Test procedure

1. Send continuously uplink power control "up" commands to the UE until the UE transmits at maximum output power state according to the test configuration from Table 6.6.2.3.4.1-1.
2. Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in Tables 6.2.2.5-1 and 6.2.3.5-1. The period of the measurement shall be at least one sub-frame (1ms).

3. Measure the rectangular filtered mean power for E-UTRA.

4. Measure the rectangular filtered mean power of the first E-UTRA adjacent channel.

5. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel.

6. Calculate the ratio of the power between the values measured in step 2 over step 3 for E-$UTRA_{ACLR}$.

7. Calculated the ratio of the power between the values measured in step 2 over step 4 for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$.

6.6.2.3.4.3 Message contents

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

6.6.2.3.5 Test requirement

6.6.2.3.5.1 Test requirements E-UTRA

If the measured adjacent channel power is greater than –50 dBm then the measured E-$UTRA_{ACLR}$, derived in step 5), shall be higher than the limits in table 6.6.2.3.5.1-1.

Table 6.6.2.3.5.1-1: E-UTRA UE ACLR

	Channel bandwidth / E-$UTRA_{ACLR1}$ / measurement bandwidth					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
E-$UTRA_{ACLR1}$	29.2 dB	29.2 dB	29.2 dB	29.2 dB	29.2 dB	29.2 dB
E-UTRA channel Measurement bandwidth	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
UE channel	+1.4 MHz or -1.4 MHz	+3 MHz or -3 MHz	+5MHz or -5MHz	+10MHz or -10MHz	+15MHz or -15MHz	+20MHz or -20MHz

6.6.2.3.5.2 Test requirements UTRA

If the measured UTRA channel power is greater than –50dBm then the measured $UTRA_{ACLR1}$, $UTRA_{ACLR2}$, derived in step 6), shall be higher than the limits in table 6.6.2.3.5.2-1.

Table 6.6.2.3.5.2-1: UTRA UE ACLR

	Channel bandwidth / $UTRA_{ACLR1/2}$ / measurement bandwidth					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**

$UTRA_{ACLR1}$	32.2 dB	32.2 dB	32.2 dB	32.2 dB	32.2 dB	32.2 dB
Adjacent channel centre frequency offset (in MHz)	0.7+BW_{UTRA}/2	1.5+BW_{UTRA}/2	2.5+BW_{UTRA}/2	5+BW_{UTRA}/2	7.5+BW_{UTRA}/2	10+BW_{UTRA}/2
$UTRA_{ACLR2}$	-	-	35.2 dB	35.2 dB	35.2 dB	35.2 dB
Adjacent channel centre frequency offset (in MHz)	-	-	2.5+3*BW_{UTRA}/2	5+3*BW_{UTRA}/2	7.5+3*BW_{UTRA}/2	10+3*BW_{UTRA}/2
E-UTRA channel Measurement bandwidth	-	-	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
UTRA 5MHz channel Measurement bandwidth[1]	-	-	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz
UTRA 1.6MHz channel measurement bandwidth[2]	-	-	1.28 MHz	1.28 MHz	1.28 MHz	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. NOTE 3: BW_{UTRA} for UTRA FDD is 5MHz and for UTRA TDD is 1.6MHz.						

6.6.2.4 Additional ACLR requirements

Void

6.6.3 Spurious emissions

Editor's note: The test cases for spurious emissions are *incomplete. The following aspects are either missing or not yet determined:*

FDD aspects missing or not yet determined:

- *The Core requirements for Δf_{OOB} for channel bandwidth 1.4 MHz and 3.0MHz.*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *Test description section needs to be verified or modified (if necessary) for TDD applicability*
- *Test requirement the text regarding the measured average power [in one slot] needs to be verified*

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. The spurious emission limits are specified in terms of general requirements inline with SM.329 [3] and E-UTRA operating band requirement to address UE co-existence.

6.6.3.1 Transmitter Spurious emissions

6.6.3.1.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions.

6.6.3.1.2 Test applicability

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

6.6.3.1.3 Minimum conformance requirements

The spurious emission limits apply for the frequency ranges that are more than Δf_{OOB} (MHz) from the edge of the channel bandwidth.

Table 6.6.3.1.3-1: Δf_{OOB} boundary between E-UTRA channel and spurious emission domain

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

The spurious emission limits in Table 6.6.3.1.3-2 apply for all transmitter band configurations (RB) and channel bandwidths

Table 6.6.3.1.3-2: Spurious emissions limits

Frequency Range	Maximum Level	Measurement Bandwidth
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

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.1.

6.6.3.1.4 Test description

6.6.3.1.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in Table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.1.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.6.3.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)			NC			
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)			Low range, Mid range, High range			
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)			Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	[FFS]	QPSK	Full	[FFS]
1.4MHz	QPSK	6	[FFS]	QPSK	1	[FFS]
3MHz	QPSK	4	[FFS]	QPSK	Full	[FFS]
3MHz	QPSK	4	[FFS]	QPSK	1	[FFS]
5MHz	QPSK	8	[FFS]	QPSK	Full	[FFS]
5MHz	QPSK	8	[FFS]	QPSK	1	[FFS]
10MHz	QPSK	16	[FFS]	QPSK	Full	[FFS]
10MHz	QPSK	16	[FFS]	QPSK	1	[FFS]
15MHz	QPSK	25	[FFS]	QPSK	Full	[FFS]
15MHz	QPSK	25	[FFS]	QPSK	1	[FFS]
20MHz	QPSK	30	[FFS]	QPSK	Full	[FFS]
20MHz	QPSK	30	[FFS]	QPSK	1	[FFS]
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. The 1 RB allocation shall be tested at both RB #0 and RB #max.						

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.6.3.1.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.6.3.1.4.3.

6.6.3.1.4.2 Test procedure

1. Send continuously uplink power control "up" commands to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 6.6.3.1.4.1-1.

2. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.

6.6.3.1.4.3 Message contents

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

6.6.3.1.5 Test requirement

The measured average power of spurious emission, derived in step 2, shall not exceed the described value in tables 6.6.3.1.5-1.

The spurious emission limits apply for the frequency ranges that are more than Δf_{OOB} (MHz) from the edge of the channel bandwidth shown in Table 6.6.3.1.3-1.

Table 6.6.3.1.5-1: General spurious emissions test requirements

Frequency Range	Maximum Level	Measurement Bandwidth
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

6.6.3.2 Spurious emission band UE co-existence

6.6.3.2.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to co-existing systems for the specified bands which has specific requirements in terms of transmitter spurious emissions.

6.6.3.2.2 Test applicability

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

6.6.3.2.3 Minimum conformance requirements

This clause specifies the requirements for the specified E-UTRA band as indicated in Table 6.6.3.2.3-1.

Table 6.6.3.2.3-1: Spurious emission band UE co-existence limits

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)			Level (dBm)	Bandwidth (MHz)	Comment
1	E-UTRA Band 1, 3, 7, 8, 9, 11, 34, 38, 40	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note [6, 7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note [6, 8]
	E-UTRA band 33	1900	-	1920	-50	1	Note [3]
	E-UTRA band 39	1880	-	1920	-50	1	Note [3]
2	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
3	E-UTRA Band 1, 3, 7, 8, 9, 11, 33, 34, 38	FDL_low	-	FDL_high	-50	1	
4	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
5	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
6	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	875	-37	1	
	Frequency range	875	-	895	-50	1	
		1884.5	-	1919.6			Note [7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note [8]
7	E-UTRA Band 1, 3, 7, 8, 33, 34	FDL_low	-	FDL_high	-50	1	
	E-UTRA Band 38	2570	-	2620	-50	1	Note [3]
8	E-UTRA Band 1, 8, 7, 33, 34, 38, 39, 40	FDL_low	-	FDL_high	-50	1	
	E-UTRA band 3	1805	-	1830	-50	1	Note [4]
	E-UTRA band 3	1805	-	1880	-36	0.1	Note [2,4]
	E-UTRA band 3	1830	-	1880	-50	1	Note [4]
	E-UTRA band 7	2640	-	2690	-50	1	Note [4]
	E-UTRA band 7	2640	-	2690	-36	0.1	Note [2,4]
9	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note [7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note [8]
10	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
11	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note [7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note [8]
12	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
13	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
14	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
17	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
18	E-UTRA Band 1, 9, 11, 34	FDL_low		FDL_high	-50	1	
	Frequency range	860		895	-40	1	
		1884.5		1919.6			Note [7]
	Frequency range	1884.5		1915.7	-41	0.3	Note [8]
19	E-UTRA Band 1, 9, 11, 34	FDL_low		FDL_high	-50	1	
	Frequency range	860		895	-40	1	Note [9]
		1884.5		1919.6			Note [7]
	Frequency range	1884.5		1915.7	-41	0.3	Note [8]
33	E-UTRA Band 1, 3, 8, 34, 38, 39, 40	FDL_low	-	FDL_high	-50	1	Note [5]
34	E-UTRA Band 1, 3, 7, 8, 9, 11, 33, 38,39, 40	FDL_low	-	FDL_high	-50	1	Note [5]
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note [7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note [8]
35							
36							
37			-				

38	E-UTRA Band 1,3, 33, 34	FDL_low	-	FDL_high	-50	1	
39	E-UTRA Band 34, 40	FDL_low	-	FDL_high	-50	1	
40	E-UTRA Band 1, 3, 33, 34, 39	FDL_low	-	FDL_high	-50	1	
NOTE 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.2-1 NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd or 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RE within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd or 3rd harmonic, i.e. the frequency equal to two or three times the frequency of that RE, is within the measurement bandwidth. NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band NOTE 4: Requirements are specified in terms of E-UTRA sub-bands NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band NOTE 6: Applicable when NS_05 in section 6.6.3.3.3.1 is signalled by the network. NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz. NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz. NOTE 9: Applicable when NS_08 in section 6.6.3.3.3.3 is signalled by the network							

NOTE: Bands 1,6,9,11,34 in the tables shall be reviewed after June 2012 because of PHS band operation change

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.3.2.

6.6.3.2.4 Test description

6.6.3.2.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in Table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in Table 6.6.3.2.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.6.3.2.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment (as specified in TS 36.508 [7] subclause 4.1)				NC		
Test Frequencies (as specified in TS36.508 [7] subclause 4.3.1)				Low range, Mid range, High range		
Test Channel Bandwidths (as specified in TS 36.508 [7] subclause 4.3.1)				Lowest, 5MHz, Highest		
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	[FFS]	QPSK	Full	[FFS]
1.4MHz	QPSK	6	[FFS]	QPSK	1	[FFS]
3MHz	QPSK	4	[FFS]	QPSK	Full	[FFS]
3MHz	QPSK	4	[FFS]	QPSK	1	[FFS]
5MHz	QPSK	8	[FFS]	QPSK	Full	[FFS]
5MHz	QPSK	8	[FFS]	QPSK	1	[FFS]
10MHz	QPSK	16	[FFS]	QPSK	Full	[FFS]
10MHz	QPSK	16	[FFS]	QPSK	1	[FFS]
15MHz	QPSK	25	[FFS]	QPSK	Full	[FFS]
15MHz	QPSK	25	[FFS]	QPSK	1	[FFS]
20MHz	QPSK	30	[FFS]	QPSK	Full	[FFS]
20MHz	QPSK	30	[FFS]	QPSK	1	[FFS]
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. The 1 RB allocation shall be tested at both RB #0 and RB #max.						

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.6.3.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.6.3.2.4.3.

6.6.3.2.4.2 Test procedure

1. Send continuously uplink power control “up” commands to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 6.6.3.2.4.1-1.
2. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.

6.6.3.2.4.3 Message contents

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

6.6.3.2.5 Test requirement

The measured average power of spurious emission [in one active slot], derived in step 2, shall not exceed the described value in tables 6.6.3.2.5-1.

Table 6.6.3.2.5-1: Spurious emission band UE co-existence limits

E-UTRA Band	Spurious emission						
	Protected band	**Frequency range (MHz)**			**Level (dBm)**	**Bandwidth (MHz)**	**Comment**
1	E-UTRA Band 1, 3, 7, 8, 9, 11, 34, 38, 40	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note [6, 7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note [6, 8]
	E-UTRA band 33	1900	-	1920	-50	1	Note [3]
	E-UTRA band 39	1880	-	1920	-50	1	Note [3]
2	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
3	E-UTRA Band 1, 3, 7, 8, 9, 11, 33, 34, 38	FDL_low	-	FDL_high	-50	1	
4	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
5	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
6	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	875	-37	1	
	Frequency range	875	-	895	-50	1	
		1884.5	-	1919.6			Note[7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note[8]
7	E-UTRA Band 1, 3, 7, 8, 33, 34	FDL_low	-	FDL_high	-50	1	
	E-UTRA Band 38	2570	-	2620	-50	1	Note [3]
8	E-UTRA Band 1, 8, 7, 33, 34, 38, 39, 40	FDL_low	-	FDL_high	-50	1	
	E-UTRA band 3	1805	-	1830	-50	1	Note [4]
	E-UTRA band 3	1805	-	1880	-36	0.1	Note [2,4]
	E-UTRA band 3	1830	-	1880	-50	1	Note [4]
	E-UTRA band 7	2640	-	2690	-50	1	Note [4]
	E-UTRA band 7	2640	-	2690	-36	0.1	Note [2,4]
9	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note[7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note[8]
10	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
11	E-UTRA Band 1, 9, 11, 34	FDL_low	-	FDL_high	-50	1	
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note[7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note[8]
12	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
13	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
14	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
17	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17	FDL_low	-	FDL_high	-50	1	
18	E-UTRA Band 1, 9, 11, 34	FDL_low		FDL_high	-50	1	
	Frequency range	860		895	-40	1	
		1884.5		1919.6			Note[7]
	Frequency range	1884.5		1915.7	-41	0.3	Note[8]
19	E-UTRA Band 1, 9, 11, 34	FDL_low		FDL_high	-50	1	
	Frequency range	860		895	-40	1	Note[9]
		1884.5		1919.6			Note[7]
	Frequency range	1884.5		1915.7	-41	0.3	Note[8]
33	E-UTRA Band 1, 3, 8, 34, 38, 39, 40	FDL_low	-	FDL_high	-50	1	Note [5]
34	E-UTRA Band 1, 3, 7, 8, 9, 11, 33, 38,39, 40	FDL_low	-	FDL_high	-50	1	Note [5]
	Frequency range	860	-	895	-50	1	
		1884.5	-	1919.6			Note[7]
	Frequency range	1884.5	-	1915.7	-41	0.3	Note[8]
35							
36							
37			-				

38	E-UTRA Band 1,3, 33, 34	FDL_low	-	FDL_high	-50	1	
39	E-UTRA Band 34, 40	FDL_low	-	FDL_high	-50	1	
40	E-UTRA Band 1, 3, 33, 34, 39	FDL_low	-	FDL_high	-50	1	
NOTE 1: FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table 5.2-1 NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in Table 6.6.3.1.3-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd or 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RE within the transmission bandwidth (see Figure 5.4.2-1) for which the 2nd or 3rd harmonic, i.e. the frequency equal to two or three times the frequency of that RE, is within the measurement bandwidth. NOTE 3: To meet these requirements some restriction will be needed for either the operating band or protected band NOTE 4: Requirements are specified in terms of E-UTRA sub-bands NOTE 5: For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band NOTE 6: Applicable when NS_05 in section 6.6.3.3.3.1 is signalled by the network. NOTE 7: Applicable when co-existence with PHS system operating in 1884.5 -1919.6MHz. NOTE 8: Applicable when co-existence with PHS system operating in 1884.5 -1915.7MHz. NOTE 9: Applicable when NS_08 in section 6.6.3.3.3.3 is signalled by the network							

NOTE: Bands 1,6,9,11,34 in the tables shall be reviewed after June 2012 because of PHS band operation change

6.6.3.3 Additional spurious emissions

6.6.3.3.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to other channels or other systems in terms of transmitter spurious emissions under the deployment scenarios where additional requirements are specified.

6.6.3.3.2 Test applicability

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

6.6.3.3.3 Minimum conformance requirements

6.6.3.3.3.1 Minimum conformance requirements (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 6.6.3.3.3.1-1. This requirement also applies for the frequency ranges that are less than Δf_{OOB} (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

Table 6.6.3.3.3.1-1: Additional requirements (PHS) limits

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)						Measurement bandwidth
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
1884.5 ≤ f ≤1919.6	-41	-41	-41	-41	-41	-41	300 KHz
1884.5 ≤ f ≤1915.7[*2]	-41	-41	-41	-41	-41	-41	300 KHz
NOTE 1: Applicable when the edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1919.6MHz)+ 4 MHz + the Channel BW assigned. Operations below this point are for further study. NOTE 2: Applicable when the 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. Operations below this point are for further study.							

NOTE: Notes in the tables shall be reviewed after June 2012 because of PHS band operation change

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.1.

6.6.3.3.3.2 Minimum conformance requirements (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 6.6.3.3.3.2-1.

Table 6.6.3.3.3.2-1: Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
	10 MHz	
763 ≤ f ≤ 775	[-60]	6.25 kHz

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.2.

6.6.3.3.3.3 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 Δf_{OOB} (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

Table 6.6.3.3.3-1 Additional requirement

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)			Measurement bandwidth
	5MHz	10MHz	15MHz	
860 ≤ f ≤ 895	-40	-40	-40	1 MHz

6.6.3.3.4 Test description

6.6.3.3.4.1 Initial conditions

Table 6.6.3.3.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1	Normal					
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1	Low range, Mid range, High range For network signalled "NS_05" , For 5MHz channel bandwidth: the low range test frequencies to be tested are UL 1927.2MHz (N_UL = 18072), DL 2117.2MHz (N_DL = 72) and UL 1931.1MHz (N_UL = 18111) DL 2121.1 MHz (N_DL = 111) For 20MHz channel bandwidth: low range test frequency is not used					
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1	Lowest, 5MHz, Highest					
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	[FFS]	6	[FFS]	QPSK	[FFS]	[FFS]
3MHz	[FFS]	4	[FSS]	QPSK	[FFS]	[FSS]
5MHz	[FFS]	8	[FFS]	QPSK	[FFS]	[FFS]
10MHz	[FFS]	16	[FFS]	QPSK	[FFS]	[FFS]
15MHz	[FFS]	25	[FFS]	QPSK	[FFS]	[FFS]
20MHz	[FFS]	30	[FFS]	QPSK	[FFS]	[FFS]
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2: Low range frequencies for 5MHz channel bandwidth in case of network signalled "NS_05" shall be reviewed after June 2012 because of PHS band operation change.						

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.6.3.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 6.6.3.3.4.3.

6.6.3.3.4.2 Test procedure

1. Send continuously uplink power control "up" commands to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 6.6.3.3.4.1-1.
2. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.

6.6.3.3.4.3 Message contents

6.6.3.3.4.3.1 Message contents (network signalled value "NS_05")

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS_05. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.6.3.3.4.3.1-1: *SystemInformationBlockType2* :Additional spurious emissions requirement

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	5 (NS_05)		

6.6.3.3.4.3.2 Message contents (network signalled value "NS_07")

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS_07. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.6.3.3.4.3.2-1: *SystemInformationBlockType2* :Additional spurious emissions requirement

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	7 (NS_07)		

6.6.3.3.4.3.3 Message contents (network signalled value "NS_08")

Message contents are according to TS 36.508 [7] subclause 4.6, with the following exceptions:

1. Information element additionalSpectrumEmission is set to NS_08. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional spurious emission requirement for a specific deployment scenario.

Table 6.6.3.3.4.3.3-1: *SystemInformationBlockType2* :Additional spurious emissions requirement

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1			
Information Element	**Value/remark**	**Comment**	**Condition**
additionalSpectrumEmission	8 (NS_08)		

6.6.3.3.5 Test requirement

6.6.3.3.5.1 Test requirement (network signalled value "NS_05")

The measured average power of spurious emission, derived in step 2, shall not exceed the described value in tables 6.6.3.3.5.1-1. This requirement also applies for the frequency ranges that are less than Δf_{OOB} (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

Table 6.6.3.3.5.1-1: Additional requirements (PHS) test requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)						Measurement bandwidth
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
1884.5 ≤ f ≤1919.6	-41	-41	-41	-41	-41	-41	300 KHz
1884.5 ≤ f ≤1915.7[*2]	-41	-41	-41	-41	-41	-41	300 KHz
NOTE 1: Applicable when the edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1919.6 MHz) + 4 MHz + the Channel BW assigned. Operations below this point are for further study. NOTE 2: Applicable when the 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. Operations below this point are for further study.							

NOTE: Notes in the tables shall be reviewed after June 2012 because of PHS band operation change

6.6.3.3.5.2 Test requirement (network signalled value “NS_07")

The measured average power of spurious emission, derived in step 2, shall not exceed the described value in tables 6.6.3.3.5.2-1.

Table 6.6.3.3.5.2-1: Additional requirements (network signalled value “NS_07”)

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
	10 MHz	
763 ≤ f ≤ 775	[-60]	6.25 kHz

6.6.3.3.5.3 Test requirement (network signalled value “NS_08")

The measured average power of spurious emission, derived in step 2, shall not exceed the described value in tables 6.6.3.3.5.3-1. This requirement also applies for the frequency ranges that are less than Δf_{OOB} (MHz) in Table 6.6.3.1.3-1 from the edge of the channel bandwidth.

Table 6.6.3.3.5.3-1: Additional requirements (network signalled value “NS_08”)

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)			Measurement bandwidth
	5MHz	10MHz	15MHz	
860 ≤ f ≤ 895	-40	-40	-40	1 MHz

6.7 Transmit intermodulation

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

FDD aspects missing or not yet determined:

- *Reference Measurement Channel is undefined*
- *The Test system uncertainties and test tolerance applicable to this test are not confirmed*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *Test description section needs to be verified or modified (if necessary) for TDD applicability*
- *The test case description has been verified to apply for both FDD and TDD*

6.7.1 Test purpose

To verify that the UE transmit intermodulation does not exceed the described value in the test requirement.

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.

6.7.2 Test applicability

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

6.7.3 Minimum conformance requirements

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 6.7.3-1.

The requirement of transmitting intermodulation is prescribed in Table 6.7.3-1.

Table 6.7.3-1: Transmit Intermodulation

BWChannel (UL)	5MHz		10MHz		15MHz		20MHz	
Interference Signal Frequency Offset	5MHz	10MHz	10MHz	20MHz	15MHz	30MHz	20MHz	40MHz
Interference CW Signal Level	-40dBc							
Intermodulation Product	-29dBc	-35dBc	-29dBc	-35dBc	-29dBc	-35dBc	-29dBc	-35dBc
Measurement bandwidth	4.5MHz	4.5MHz	9.0MHz	9.0MHz	13.5MHz	13.5MHz	18MHz	18MHz

The normative reference for this requirement is TS 36.101 [2] clause 6.7.1.

6.7.4 Test description

6.7.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA operating bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 6.7.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 6.7.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1		Normal				
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1		Mid range				
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1		5MHz and Highest				
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
5MHz	QPSK	8	8	QPSK	8	8
10MHz	QPSK	16	16	QPSK	12	12
15MHz	QPSK	25	25	QPSK	16	16
20MHz	QPSK	30	30	QPSK	18	18
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, the applicable channel bandwidths are specified in Table 5.4.2.1-1.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.2.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C.0, C.1, and C.3.0, and uplink signals according to Annex H.1 and H.3.0.
4. The UL and DL Reference Measurement channels are set according to Table 6.7.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS.Message contents are defined in clause 6.7.4.3.

6.7.4.3 Test procedure

1. Send continuously uplink power control “up” commands to the UE until the UE transmits at its maximum output power state according to the test configuration from Table [FFS].
2. Measure the rectangular filtered mean power of the UE.
3. Set the interference signal frequency below the UL carrier frequency using the first offset in table 6.7.5-1.
4. Set the interference CW signal level according to table 6.7.5-1.
5. Search the intermodulation product signals below and above the UL carrier frequency, then measure the RRC filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 2.
6. Set the interference signal frequency above the UL carrier frequency using the first offset in table 6.7.5-1.
7. Search the intermodulation product signals below and above the UL carrier frequency, then measure the RRC filtered mean power of transmitting intermodulation for both signals, and calculate the ratios with the power measured in step 2.
8. Repeat the measurement using the second offset in table 6.7.5-1.

6.7.4.3 Message contents

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

6.7.5 Test requirement

The ratio derived in step 5 and 7, shall not exceed the described value in table 6.7.5-1

Table 6.7.5-1: Transmit Intermodulation

BWChannel (UL)	5MHz		10MHz		15MHz		20MHz	
Interference Signal Frequency Offset	5MHz	10MHz	10MHz	20MHz	15MHz	30MHz	20MHz	40MHz
Interference CW Signal Level	[-40dBc]							
Intermodulation Product	[-29dBc]	[-35dBc]	[-29dBc]	[-35dBc]	[-29dBc]	[-35dBc]	[-29dBc]	[-35dBc]
Measurement bandwidth	4.5MHz	4.5MHz	9.0MHz	9.0MHz	13.5MHz	13.5MHz	18MHz	18MHz

7 Receiver Characteristics

7.1 General

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

- Any required test functions used for Rx tests are undefined
- It is not yet known whether there is any requirement to transmit DCCH and DTCH data continuously
- It is not yet known whether there is any requirement to transmit specific MAC headers

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).

Unless otherwise stated, the test signal levels are defined at each antenna port,and specified in the respective sections below.Any specific test conditions are defined in the paragraph for each test. Unless stated otherwise, power control of the Downlink is OFF.

In general, the UE is set into the correct state in the "Initial conditions" part of the test, using normal SS signalling procedures over the air interface under easy radio conditions to ensure reliable message exchange. In the "Test procedure" part of the test, specific radio conditions are applied according to the test requirement and the desired measurement is made or the desired response is tested.

The ACS, blocking, spurious emissions and intermodulation requirements in sections 7.5, 7.6, 7.7 and 7.8 are defined for full band width signals i.e. for signals where all resource blocks are allocated for a specific user.

7.2 Diversity characteristics

The requirements in Section 7 assume that the receiver is equipped with two Rx port as a baseline. Requirements for 4 ports are FFS. With the exception of clause 7.9, All requirements shall be verified by using both (all) antenna ports simultaneously.

7.3 Reference sensitivity level

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

FDD aspects missing or not yet determined:

- The Message contents are undefined
- The Maximum Sensitivity Degradation figures for large transmission configurations are not finalised in the core specification.
- Test case is not complete for FDD

TDD aspects missing or not yet determined:

- Test case is not complete for TDD
- Test cases in this clause have been verified to apply for both TDD and FDD.

7.3.1 Test purpose

To verify the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of low signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the effective coverage area of an e-NodeB.

7.3.2 Test applicability

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

7.3.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel as specified in Annex A.3.2 with parameters specified in Table 7.3.3-1, Table7.3.3-2 and Table 7.3.3-3.

Table 7.3.3-1: Reference sensitivity QPSK $P_{REFSENS}$

	Channel bandwidth						
E-UTRA Band	**1.4 MHz (dBm)**	**3 MHz (dBm)**	**5 MHz (dBm)**	**10 MHz (dBm)**	**15 MHz (dBm)**	**20 MHz (dBm)**	**Duplex Mode**
1	-	-	-100	-97	-95.2	-94	FDD
2	-103.2	-100.2	-98	-95	-93.2	-92	FDD
3	-102.2	-99.2	-97	-94	-92.2	-91	FDD
4	-105.2	-102.2	-100	-97	-95.2	-94	FDD
5	-103.2	-100.2	-98	-95			FDD
6	-	-	-100	-97			FDD
7	-	-	-98	-95	-93.2	-92	FDD
8	-102.2	-99.2	-97	-94			FDD
9	-	-	-99	-96	-94.2	-93	FDD
10	-	-	-100	-97	-95.2	-94	FDD
11	-	-	-98	-95	-93.2	-92	FDD
12	-102.2	-99.2	-97	-94			FDD
13	-102.2	-99.2	-97	-94			FDD
14							FDD
...							
17	-102.2	-99.2	-97	-94			FDD
18	-	-	-100	-97	-95.2	-	FDD
19	-	-	-100	-97	-95.2	-	FDD
...							
33	-	-	-100	-97	-95.2	-94	TDD
34	-	-	-100	-97	-95.2	-94	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
NOTE 1: The transmitter shall be set to maximum output power level (Table 7.3.3-2) NOTE 2: The reference measurement channel is specified in A.3.2 NOTE 3: The signal power is specified per port NOTE 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level of Band 3 + 0.5 dB is applicable for band 9							

NOTE 1: The relation to the received PSD is $\left\langle \mathrm{REF}\,\hat{I}_{or} \right\rangle = P_{REFSENS}\left(N_{sc}^{RB} N_{RB} \Delta f\right)^{-1}$ with N_{RB} is the maximum transmission configuration according to Table 5.4.2-1.

Table 7.3.3-2 specifies the minimum number of allocated uplink resource blocks for which the reference receive sensitivity requirement must be met.

Table 7.3.3-2: Maximum uplink configuration for reference sensitivity

E-UTRA Band / Channel bandwidth / N_{RB} / Duplex mode							
E-UTRA Band	**1.4 MHz**	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**Duplex Mode**
1	-	-	25	50	75	100	FDD
2	6	15	25	50	50[1]	50[1]	FDD
3	6	15	25	50	50[1]	50[1]	FDD
4	6	15	25	50	75	100	FDD
5	6	15	25	25[1]	-	-	FDD
6	-	-	25	25[1]	-	-	FDD
7	-	-	25	50	75[1]	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]	25[1]	25[1]	FDD
12	6	15	20[1]	20[1]			FDD
13	6	15	20[1]	20[1]			FDD
14							FDD
...							
17	6	15	20[1]	20[1]			FDD
18	-	-	25	25[1]	25[1]	-	FDD
19	-	-	25	25[1]	25[1]	-	FDD
...							
33	-	-	25	50	75	100	TDD
34	-	-	25	50	75	-	TDD
35	6	15	25	50	75	100	TDD
36	6	15	25	50	75	100	TDD
37	-	-	25	50	75	100	TDD
38	-	-	25	50	75	100	TDD
39			25	50	75	100	TDD
40			25	50	75	100	TDD
NOTE: Maximum number of UL resources blocks allocated is less than the total resources blocks supported by the channel bandwidth							

The normative reference for this requirement is TS 36.101 [2] clause 7.3.1.

7.3.4 Test description

7.3.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.3.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.3.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			**NC, TL/VL, TL/VH, TH/VL, TH/VH**			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			**Low range, Mid range, High range**			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			**Lowest, 5MHz, Highest**			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	6	6
3MHz	QPSK	15	15	QPSK	15	15
5MHz	QPSK	25	25	QPSK	25	25
5MHz	QPSK	25	N/A	QPSK	20	N/A
10MHz	QPSK	50	50	QPSK	50	50
10MHz	QPSK	50	N/A	QPSK	25	N/A
10MHz	QPSK	50	N/A	QPSK	20	N/A
15MHz	QPSK	75	75	QPSK	75	75
15MHz	QPSK	75	N/A	QPSK	50	N/A
15MHz	QPSK	75	N/A	QPSK	25	N/A
20MHz	QPSK	100	100	QPSK	100	100
20MHz	QPSK	100	N/A	QPSK	75	N/A
20MHz	QPSK	100	N/A	QPSK	50	N/A
20MHz	QPSK	100	N/A	QPSK	25	N/A
Note 1:Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.3.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.3.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A according to TS 36.508 [7] clause 4.5.3A. Message contents are defined in clause 7.3.4.3.

7.3.4.2 Test procedure

1. SS transmits PDSCH every TTI via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to Table 6.5.2.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
2. SS sends uplink scheduling information every TTI via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to Table 6.5.2.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
3. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at its maximum output power state according to the test configuration from Table 7.3.4.1-1.
4. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3.5-1.
5. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

7.3.4.3 Message contents

Message contents are according to [clause FFS in reference FFS].

7.3.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.3.5-1, Table 7.3.5-2, and Table 7.3.5-3.

Table 7.3.5-1: Reference sensitivity QPSK $P_{REFSENS}$

	Channel bandwidth						
E-UTRA Band	1.4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	Duplex Mode
1	-	-	-99.3	-96.3	-94.5	-93.3	FDD
2	-102.5	-99.5	-97.3	-94.3	-92.5	-91.3	FDD
3	-101.5	-98.5	-96.3	-93.3	-91.5	-90.3	FDD
4	-104.5	-101.5	-99.3	-96.3	-94.5	-93.3	FDD
5	-102.5	-99.5	-97.3	-94.3			FDD
6	-	-	-99.3	-96.3			FDD
7	-	-	-97.3	-94.3	-92.5	-91.3	FDD
8	-101.5	-98.5	-96.3	-93.3			FDD
9	-	-	-98.3	-95.3	-93.5	-92.3	FDD
10	-	-	-99.3	-96.3	-94.5	-93.3	FDD
11	-	-	-97.3	-94.3	-92.5	-91.3	FDD
12	-101.5	-98.5	-96.3	-93.3			FDD
13	-101.5	-98.5	-96.3	-93.3			FDD
14							FDD
...							
17	-101.5	-98.5	-96.3	-93.3			FDD
18	-	-	-99,3	-96.3	-94.5	-	FDD
19	-	-	-99,3	-96.3	-94.5	-	FDD
...							
33	-	-	-99,3	-96.3	-94.5	-93.3	TDD
34	-	-	-99.3	-96.3	-94.5	-93.3	TDD
35	-105.5	-101.5	-99.3	-96.3	-94.5	-93.3	TDD
36	-105.5	-101.5	-99.3	-96.3	-94.5	-93.3	TDD
37	-	-	-99.3	-96.3	-94.5	-93.3	TDD
38	-	-	-99.3	-96.3	-94.5	-93.3	TDD
39	-	-	-99.3	-96.3	-94.5	-93.3	TDD
40	-	-	-99.3	-96.3	-94.5	-93.3	TDD
NOTE 1: The transmitter shall be set to maximum output power level (Table 7.3.5-2) NOTE 2: The reference measurement channel is specified in A.3.2 NOTE 3: The signal power is specified per port NOTE 4: For the UE which supports both Band 3 and Band 9 the reference sensitivity level of Band 3 + 0.5 dB is applicable for band 9							

NOTE: The relation to the received PSD is $\left\langle \mathrm{REF}\,\hat{I}_{or} \right\rangle = P_{REFSENS}\left(N_{sc}^{RB} N_{RB} \Delta f\right)^{-1}$ with N_{RB} is the maximum transmission configuration according to Table 5.4.2-1.

Table 7.3.5-2 specifies the minimum number of allocated uplink resource blocks for which the reference receive sensitivity requirement must be met.

Table 7.3.5-2: Maximum uplink configuration for reference sensitivity

E-UTRA Band / Channel bandwidth / N_{RB} / Duplex mode							
E-UTRA Band	**1.4 MHz**	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**	**Duplex Mode**
1	-	-	25	50	75	100	FDD
2	6	15	25	50	50[1]	50[1]	FDD
3	6	15	25	50	50[1]	50[1]	FDD
4	6	15	25	50	75	100	FDD
5	6	15	25	25[1]	-	-	FDD
6	-	-	25	25[1]	-	-	FDD
7	-	-	25	50	75[1]	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]	25[1]	25[1]	FDD
12	6	15	20[1]	20[1]			FDD
13	6	15	20[1]	20[1]			FDD
14							FDD
...							
17	6	15	20[1]	20[1]			FDD
18	-	-	25	25[1]	25[1]	-	FDD
19	-	-	25	25[1]	25[1]	-	FDD
...							
33	-	-	25	50	75	100	TDD
34	-	-	25	50	75	-	TDD
35	6	15	25	50	75	100	TDD
36	6	15	25	50	75	100	TDD
37	-	-	25	50	75	100	TDD
38	-	-	25	50	75	100	TDD
39			25	50	75	100	TDD
40			25	50	75	100	TDD
NOTE: Maximum number of UL resources blocks allocated is less than the total resources blocks supported by the channel bandwidth							

7.4 Maximum input level

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

FDD aspects missing or not yet determined:

- The acceptable window for the UE Tx power is not confirmed
- The power control method and message IEs for setting the UE output power to a constant level are undefined
- The Message contents are undefined
- Test case is not complete for FDD

TDD aspects missing or not yet determined:

- Test case is not complete for TDD
- Test case in this clause has been verified to apply for both TDD and FDD.

7.4.1 Test purpose

Maximum input level tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, under conditions of high signal level, ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area near to an e-NodeB.

7.4.2 Test applicability

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

7.4.3 Minimum conformance requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4.3-1.

Table 7.4.3-1: Maximum input level

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	-25					
NOTE: The transmitter shall be set to 4dB below the supported maximum output power. Reference measurement channel is Annex A.3.2 64QAM R=3/4 variant.							

The normative reference for this requirement is TS 36.101 [2] clause 7.4.1.

7.4.4 Test description

7.4.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.4.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively.Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.4.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			NC			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Mid range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	64-QAM	Full	Full	QPSK	[5]	[5]
3MHz	64-QAM	Full	Full	QPSK	[4]	[4]
5MHz	64-QAM	Full	Full	QPSK	[8]	[8]
10MHz	64-QAM	Full	Full	QPSK	[12]	[12]
15MHz	64-QAM	Full	Full	QPSK	[16]	[16]
20MHz	64-QAM	Full	Full	QPSK	[18]	[18]
Note 1:Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 7.3.3-2.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Figure A.3.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. 4The UL and DL Reference Measurement channels are set according to Table 7.4.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS . Message contents are defined in clause 7.4.4.3.

7.4.4.2 Test procedure

1. Send Uplink power control commands to the UE, to ensure that the UE output power is within [+0dB, -5dB] of the target level in Table 7.4.5-1 for at least the duration of the Throughput measurement.

2. Set the Downlink signal level to the value defined in Table 7.4.5-1.

3. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

7.4.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

Table 7.4.4.3-1: UplinkPowerControlDedicated

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE {			
p0-UePUSCH	0		
deltaMCS-Enabled	en0		
accumulationEnabled	TRUE		
p0-uePUCCH	0		
pSRS-Offset	3 (-6 dB)		
filterCoefficient	fc8	larger filter length is used to reduce the RSRP measurement variation	
}			

7.4.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.4.5-1.

Table 7.4.5-1: Maximum input level

Rx Parameter	**Units**	**Channel bandwidth**					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Wanted signal mean power	dBm	-25.7					
NOTE: The transmitter shall be set to 4dB below the supported maximum output power. Reference measurement channel is Annex A.3.2 64QAM R=3/4variant.							

7.5 Adjacent Channel Selectivity (ACS)

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

FDD aspects missing or not yet determined:

- The acceptable window for the UE Tx power is not confirmed
- The power control method and message IEs for setting the UE output power to a constant level are undefined
- The Interferer offset frequency is in [ ] in the core specification
- The Message contents are undefined
- Test case is not complete for FDD

TDD aspects missing or not yet determined:

- Test case is not complete for TDD
- Test case in this clause has been verified to apply for both TDD and FDD.

7.5.1 Test purpose

Adjacent channel selectivity tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of an adjacent channel signal at a given frequency offset from the centre frequency of the assigned channel, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when other e-NodeB transmitters exist in the adjacent channel.

7.5.2 Test applicability

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

7.5.3 Minimum conformance requirements

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).

The UE shall fulfil the minimum requirement specified in Table 7.5.3-1 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 7.5.3-2 and Table 7.5.3-3 where the throughput R_{av} shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2.

Table 7.5.3-1: Adjacent channel selectivity

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

Table 7.5.3-2: Test parameters for Adjacent channel selectivity, Case 1

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Wanted signal mean power	dBm	REFSENS + 14 dB					
$P_{Interferer}$	dBm	REFSENS +45.5dB	REFSENS +45.5dB	REFSENS +45.5dB*	REFSENS +45.5dB	REFSENS +42.5dB	REFSENS +39.5dB
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Interferer}$ (offset)	MHz	1.4+0.0025	3+0.0075	5+0.0025	7.5+0.0075	10+0.0125	12.5+0.0025
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1.							

Table 7.5.3-3: Test parameters for Adjacent channel selectivity, Case 2

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Wanted signal mean power	dBm	-56.5	-56.5	-56.5	-56.5	-53.5	-50.5
$P_{Interferer}$	dBm	-25					
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Interferer}$ (offset)	MHz	1.4+0.0025	3+0.0075	5+0.0025	7.5+0.0075	10+0.0125	12.5+0.0025
NOTE 1: The transmitter shall be set to 24dB below the supported maximum output power. NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1.							

The normative reference for this requirement is TS 36.101 [2] clause 7.5.1.

7.5.4 Test description

7.5.4.1 Initial conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.5.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.5.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1		NC				
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1		Mid range				
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1		Lowest, 5MHz, Highest				
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	Full	Full	QPSK	[5]	[5]
3MHz	QPSK	Full	Full	QPSK	[4]	[4]
5MHz	QPSK	Full	Full	QPSK	[8]	[8]
10MHz	QPSK	Full	Full	QPSK	[12]	[12]
15MHz	QPSK	Full	Full	QPSK	[16]	[16]
20MHz	QPSK	Full	Full	QPSK	[18]	[18]
Note 1:Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 7.3.3-2.						

1. Connect the SS and interfering source to the UE antenna connectors as shown in TS 36.508 [7] Figure A.4.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.5.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 7.5.4.3.

7.5.4.2 Test procedure

1. Send Uplink power control commands to the UE, to ensure that the UE output power is within [+0dB, -5dB] of the target level in Table 7.5.5-2 (Case 1) for at least the duration of the Throughput measurement.
2. Set the Downlink signal level to the value as defined in Table 7.5.5-2 (Case 1).
3. Set the Interferer signal level to the value as defined in Table 7.5.5-2 (Case 1), using a modulated interferer bandwidth as defined in Annex D of the present document.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

5. Send Uplink power control commands to the UE, to ensure that the UE output power is within [+0dB, -5dB] of the target level in Table 7.5.5-3 (Case 2) for at least the duration of the Throughput measurement.

6. Set the Downlink signal level to the value as defined in Table 7.5.5-3 (Case 2).

7. Set the Interferer signal level to the value as defined in Table 7.5.5-3 (Case 2), using a modulated interferer bandwidth as defined in Annex D of the present document.

8. Measure the average throughput for a duration sufficient to achieve statistical significance according to [FFS in clause FFS of this document].

9. Repeat for applicable channel bandwidths and operating band combinations in both Case 1 and Case 2.

7.5.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception

Table 7.5.4.3-1: UplinkPowerControlDedicated

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE {			
p0-UePUSCH	0		
deltaMCS-Enabled	en0		
accumulationEnabled	TRUE		
p0-uePUCCH	0		
pSRS-Offset	3 (-6 dB)		
filterCoefficient	fc8	larger filter length is used to reduce the RSRP measurement variation	
}			

.

7.5.5 Test requirement

The throughput R_{av} shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 under the conditions specified in table 7.5.5-2, and also under the conditions specified in table 7.5.5-3.

Table 7.5.5-1: Adjacent channel selectivity

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

Table 7.5.5-2: Test parameters for Adjacent channel selectivity, Case 1

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Wanted signal mean power	dBm	REFSENS + 14 dB					
$P_{Interferer}$	dBm	REFSENS +45.5dB	REFSENS +45.5dB	REFSENS +45.5dB*	REFSENS +45.5dB	REFSENS +42.5dB	REFSENS +39.5dB
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Interferer}$ (offset)	MHz	1.4+0.0025	3+0.0075	5+0.0025	7.5+0.0075	10+0.0125	12.5+0.0025
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1.							

Table 7.5.5-3: Test parameters for Adjacent channel selectivity, Case 2

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Wanted signal mean power	dBm	-56.5	-56.5	-56.5	-56.5	-53.5	-50.5
$P_{Interferer}$	dBm	-25					
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Interferer}$ (offset)	MHz	1.4+0.0025	3+0.0075	5+0.0025	7.5+0.0075	10+0.0125	12.5+0.0025
NOTE 1: The transmitter shall be set to 24dB below the supported maximum output power. NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1.							

7.6 Blocking characteristics

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

FDD aspects missing or not yet determined:

- For narrow-band blocking, the frequency offset for 7.5kHz hasn't been defined..
- Output power level tolerance is not confirmed
- The Message contents are undefined
- Test case is not complete for FDD

TDD aspects missing or not yet determined:

- Test case is not complete for TDD
- The test cases in this clause have been verified to apply for both FDD and TDD

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

7.6.1.1 Test Purpose

In-band blocking is defined for an unwanted interfering signal falling into the range from 15MHz below to 15MHz above the UE receive band, at which the relative throughput shall meet or exceed the requirement for the specified measurement channels.

The lack of in-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6.1.2 Test Applicability

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

7.6.1.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1.3-1 and 7.6.1.3-2.

Table 7.6.1.3-1: In band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Ioffset, case 1}$	MHz	2.1[+0.0125]	4.5[+0.0075]	7.5[+0.0125]	7.5[+0.0025]	7.5[+0.0075]	7.5[+0.0125]
$F_{Ioffset, case 2}$	MHz	3.5[+0.0075]	7.5[+0.0075]	12.5[+0.0075]	12.5[+0.0125]	12.5[+0.0025]	12.5[+0.0075]
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with a set-up according to Annex C.3.1.							

Table 7.6.1.3-2: In-band blocking

E-UTRA band	Parameter	Units	Case 1	Case 2	Case
	$P_{Interferer}$	dBm	-56	-44	[-30
	$F_{Interferer}$ (Offset)	MHz	=-BW/2 - $F_{Ioffset, case 1}$ & =+BW/2 + $F_{Ioffset, case 1}$	≤ -BW/2- $F_{Ioffset, case 2}$ & ≥ +BW/2 + $F_{Ioffset, case 2}$	-BW/2 – 9 & -BW/2 – 1
1, 2, 3, 4, 5, 6. 7, 8, 9, 10, 11, 12, 13, 18, 19 33,34,35,36,37, 38,39,40	$F_{Interferer}$	MHz	(NOTE 2)	F_{DL_low} -15 to F_{DL_high} +15	
17	$F_{Interferer}$	MHz	(NOTE 2)	F_{DL_low} -9.0 to F_{DL_high} +15	F_{DL_low} -1 F_{DL_low} -9.0
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 -FIoffset, case 1 and b. the carrier frequency + BW/2 + FIoffset, case 1. NOTE 3: $F_{interferer}$ range values for unwanted modulated interfering signal are interferer center frequencies. NOTE 4: Case 3 only applies to assigned UE channel bandwidth of 5 MHz.					

The normative reference for this requirement is TS 36.101 [2] clause 7.6.1.

7.6.1.4 Test Description

7.6.1.4.1 Initial Conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.1.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1		NC				
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1		Mid range				
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1		Lowest, 5MHz, Highest				
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	6	6
3MHz	QPSK	15	15	QPSK	15	15
5MHz	QPSK	25	25	QPSK	25	25
5MHz	QPSK	25	N/A	QPSK	20	N/A
10MHz	QPSK	50	50	QPSK	50	50
10MHz	QPSK	50	N/A	QPSK	25	N/A
10MHz	QPSK	50	N/A	QPSK	20	N/A
15MHz	QPSK	75	75	QPSK	75	75
15MHz	QPSK	75	N/A	QPSK	50	N/A
15MHz	QPSK	75	N/A	QPSK	25	N/A
20MHz	QPSK	100	100	QPSK	100	100
20MHz	QPSK	100	N/A	QPSK	75	N/A
20MHz	QPSK	100	N/A	QPSK	50	N/A
20MHz	QPSK	100	N/A	QPSK	25	N/A
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.4.

2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.

4. The UL and DL Reference Measurement channels are set according to in Table 7.6.1.4.1-1.

5. Propagation conditions are set according to Annex B.0.

6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 7.6.1.4.3.

7.6.1.4.2 Test Procedure

1. Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to Tables 7.6.1.5-1 and 7.6.1.5-2.

2. Set the output power level of the UE according to the table 7.6.1.5-1 or send uplink power control commands to the UE, to ensure that the UE output power is within [+0dB, -5dB] of the target level in table 7.6.1.5-1 for at least the duration of the throughput measurement.

3. Set the downlink signal level according to the table 7.6.1.5-1.

4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

5. Repeat steps from 1 to 4, using an interfering signal above the wanted signal in Case 1 at step 1.

6. Repeat steps from 1 to 5, using interfering signals in Case 2 at step 1and 5. The ranges of case 2 are covered in steps equal to the interferer bandwidth.The test frequencies are chosen in analogy to table 7.6.1.4.2-1.

7. Repeat steps from 1 to 4, using successively all interfering signals in Case 3 at step 1.

Table 7.6.1.4.2-1: Example for interferer frequencies

	Lower frequency	Upper frequency
Band 1 DL	2110 MHz	2170 MHz
Band 1 Midrange	2140 MHz	
Receive band wanted signal (BW 5MHz)	2137.5 MHz	2142.5 MHz
Interferer case 1	2129.9875 MHz	2150.0125 MHz
Interferer case 2 (inner frequency)	2124.9925 MHz	2155.0075 MHz
Interferer case 2 (outer frequency)	2099.9925 MHz	2180.0075 MHz
Outer limit for inband blocking	2095MHz	2185MHz
Number of test frequencies case 2	6	6
Number of test frequencies for Band 17(asymmetric!), BW 5MHz, case 2	0	2

7.6.1.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception

Table 7.6.1.4.3-1: UplinkPowerControlDedicated

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE {			
p0-UePUSCH	0		
deltaMCS-Enabled	en0		
accumulationEnabled	TRUE		
p0-uePUCCH	0		
pSRS-Offset	3 (-6 dB)		
filterCoefficient	fc8	larger filter length is used to reduce the RSRP measurement variation	
}			

.

7.6.1.5 Test Requirement

The measurement derived in step 4) shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.1.5-1 and 7.6.1.5-2.

Table 7.6.1.5-1: In band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Ioffset, case 1}$	MHz	2.1[+0.0125]	4.5[+0.0075]	7.5[+0.0125]	7.5[+0.0025]	7.5[+0.0075]	7.5[+0.0125]
$F_{Ioffset, case 2}$	MHz	3.5[+0.0075]	7.5[+0.0075]	12.5[+0.0075]	12.5[+0.0125]	12.5[+0.0025]	12.5[+0.0075]
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The interferer consists of the Reference measurement channel specified in Annex A.3.2 with a set-up according to Annex C.3.1.							

Table 7.6.1.5-2: In-band blocking

E-UTRA band	Parameter	Units	Case 1	Case 2	Case 3
	$P_{Interferer}$	dBm	-56	-44	[-30]
	$F_{Interferer}$ (Offset)	MHz	=-BW/2 - $F_{Ioffset, case 1}$ & =+BW/2 + $F_{Ioffset, case 1}$	≤ -BW/2- $F_{Ioffset, case 2}$ & ≥ +BW/2 + $F_{Ioffset, case 2}$	-BW/2 – 9 MHz & -BW/2 – 15 MHz
1, 2, 3, 4, 5, 6. 7, 8, 9, 10, 11, 12, 13, 18, 19 33,34,35,36,37, 38,39,40	$F_{Interferer}$	MHz	(NOTE 2)	F_{DL_low} -15 to F_{DL_high} +15	
17	$F_{Interferer}$	MHz	(NOTE 2)	F_{DL_low} -9.0 to F_{DL_high} +15	F_{DL_low} -15 and F_{DL_low} -9.0 (NOTE 3)
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 -FIoffset, case 1 and b. the carrier frequency + BW/2 + FIoffset, case 1. NOTE 3: $F_{interferer}$ range values for unwanted modulated interfering signal are interferer center frequencies. NOTE 4: Case 3 only applies to assigned UE channel bandwidth of 5 MHz.					

7.6.2 Out-of-band blocking

7.6.2.1 Test Purpose

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, at which a given average throughput shall meet or exceed the requirement for the specified measurement channels.

For the first 15 MHz below or above the UE receive band the appropriate in-band blocking or adjacent channel selectivity in sub-clause 7.5.1 and sub-clause 7.6.1 shall be applied.

The lack of out-of-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6.2.2 Test Applicability

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

7.6.2.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.2.3-1 and 7.6.2.3-2.

For Table 7.6.2.3-2 in frequency range 1, 2 and 3, up to $\max(24,\ 6\cdot\lceil N_{RB}/6\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configuration (see Figure 5.4.2-1). For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

For Table 7.6.2.3-2 in frequency range 4, up to $\max(8,\ \lceil (N_{RB}+2\cdot L_{CRBs})/8\rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configurations (see Figure 5.4.2-1) and L_{CRBs} is the number of resource blocks allocated in the uplink. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

Table 7.6.2.3-1: Out-of-band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The reference measurement channel is specified in Annex A.3.2							

Table 7.6.2.3-2: Out of band blocking

E-UTRA band	Parameter	Units	Frequency			
			range 1	range 2	range 3	range 4
	$P_{Interferer}$	dBm	-44	-30	-15	-15
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 17, 18, 19 33,34,35,36,37 ,38,39,40	$F_{Interferer}$ (CW)	MHz	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	-
			F_{DL_high} +15 to F_{DL_high} + 60	F_{DL_high} +60 to F_{DL_high} +85	F_{DL_high} +85 to +12750 MHz	-
2, 5, 12, 17	$F_{Interferer}$	MHz	-	-	-	F_{UL_low} - F_{UL_high}

The normative reference for this requirement is TS 36.101 [2] clause 7.6.2.

7.6.2.4 Test Description

7.6.2.4.1 Initial Conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.2.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6.2.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			NC			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Low range for $F_{Interferer}$ below F_{DL_low} High range for $F_{Interferer}$ above F_{DL_high}			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	6	6
3MHz	QPSK	15	15	QPSK	15	15
5MHz	QPSK	25	25	QPSK	25	25
5MHz	QPSK	25	N/A	QPSK	20	N/A
10MHz	QPSK	50	50	QPSK	50	50
10MHz	QPSK	50	N/A	QPSK	25	N/A
10MHz	QPSK	50	N/A	QPSK	20	N/A
15MHz	QPSK	75	75	QPSK	75	75
15MHz	QPSK	75	N/A	QPSK	50	N/A
15MHz	QPSK	75	N/A	QPSK	25	N/A
20MHz	QPSK	100	100	QPSK	100	100
20MHz	QPSK	100	N/A	QPSK	75	N/A
20MHz	QPSK	100	N/A	QPSK	50	N/A
20MHz	QPSK	100	N/A	QPSK	25	N/A
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A.5.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.6.2.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 7.6.2.4.3.

7.6.2.4.2 Test Procedure

1. Set the parameters of the CW signal generator for an interfering signal according to Table 7.6.1.5-2. The frequency step size is 1MHz.
2. Set the output power level of the UE according to the table 7.6.2.5-1 or send uplink power control commands to the UE, to ensure that the UE output power is within [+0dB, -5dB] of the target level in table 7.6.2.5-1 for at least the duration of the throughput measurement.
3. Set the downlink signal level according to the table 7.6.2.5-1.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.
5. Record the frequencies for which the throughput doesn't meet the requirements.

7.6.2.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

Table 7.6.2.4.3-1: UplinkPowerControlDedicated

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE {			
p0-UePUSCH	0		
deltaMCS-Enabled	en0		
accumulationEnabled	TRUE		
p0-uePUCCH	0		
pSRS-Offset	3 (-6 dB)		
filterCoefficient	fc8	larger filter length is used to reduce the RSRP measurement variation	
}			

7.6.2.5 Test Requirement

Except for the spurious response frequencies recorded at step 5), the measurement derived in step 4) shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.6.2.5-1 and 7.6.2.5-2.

For frequency range 1, 2, and 3, the number of spurious response frequencies recorded in step 5) shall not exceed $\max(24,\ 6 \cdot \lceil N_{RB} / 6 \rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

For frequency range 4, the number of spurious response frequencies recorded in step 5) shall not exceed $\max(8,\ \lceil (N_{RB} + 2 \cdot L_{CRBs}) / 8 \rceil)$ in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

Table 7.6.2.5-1: Out-of-band blocking parameters

Rx Parameter	**Units**	**Channel bandwidth**					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The reference measurement channel is specified in Annex A.3.2							

Table 7.6.2.5-2: Out of band blocking

E-UTRA band	**Parameter**	**Units**	**Frequency**			
			range 1	**range 2**	**range 3**	**range 4**
	$P_{Interferer}$	dBm	-44	-30	-15	-15
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 17, 18, 19 33,34,35,36,37,38,39,40	$F_{Interferer}$ (CW)	MHz	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	-
			F_{DL_high} +15 to F_{DL_high} + 60	F_{DL_high} +60 to F_{DL_high} +85	F_{DL_high} +85 to +12750 MHz	-
2, 5, 12, 17	$F_{Interferer}$	MHz	-	-	-	F_{UL_low} - F_{UL_high}
NOTE: Range 3 shall be tested only with the highest channel bandwidth.						

7.6.3 Narrow band blocking

7.6.3.1 Test Purpose

Verifies a receiver's ability to receive an 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.

The lack of narrow-band blocking ability will decrease the coverage area when other e-NodeB transmitters exist (except in the adjacent channels and spurious response).

7.6.3.2 Test Applicability

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

7.6.3.3 Minimum Conformance Requirements

The relative throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3.3-1.

Table 7.6.3.3-1: Narrow-band blocking

Parameter	Unit	Channel Bandwidth					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
P_w	dBm	$P_{REFSENS}$ + channel-bandwidth specific value below					
		22	18	16	13	14	16
P_{uw} (CW)	dBm	-55	-55	-55	-55	-55	-55
F_{uw} (offset for Δf = 15 kHz)	MHz	0.9075	1.7025	2.7075	5.2125	7.7025	10.2075
F_{uw} (offset for Δf = 7.5 kHz)	MHz						
NOTE 1: The transmitter shall be set a 4 dB below the supported maximum power. NOTE 2: The reference measurement channel is specified in Annex A.3.2.							

The normative reference for this requirement is TS 36.101 [2] clause 7.6.3.

7.6.3.4 Test Description

7.6.3.4.1 Initial Conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.6.3.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.6.3.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1	NC					
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1	Mid range					
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1	Lowest, 5MHz, Highest					
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	6	6
3MHz	QPSK	15	15	QPSK	15	15
5MHz	QPSK	25	25	QPSK	25	25
5MHz	QPSK	25	N/A	QPSK	20	N/A
10MHz	QPSK	50	50	QPSK	50	50
10MHz	QPSK	50	N/A	QPSK	25	N/A
10MHz	QPSK	50	N/A	QPSK	20	N/A
15MHz	QPSK	75	75	QPSK	75	75
15MHz	QPSK	75	N/A	QPSK	50	N/A
15MHz	QPSK	75	N/A	QPSK	25	N/A
20MHz	QPSK	100	100	QPSK	100	100
20MHz	QPSK	100	N/A	QPSK	75	N/A
20MHz	QPSK	100	N/A	QPSK	50	N/A
20MHz	QPSK	100	N/A	QPSK	25	N/A
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth.						

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.5.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1
4. The UL and DL Reference Measurement channels are set according to Table 7.6.3.4.1-1..
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 7.6.3.4.3.

7.6.3.4.2 Test Procedure

1. Set the parameters of the CW signal generator for an interfering signal according to Table 7.6.3.5-1.
2. Set the output power level of the UE according to the table 7.6.3.5-1 or send uplink power control commands to the UE, to ensure that the UE output power is within [+0dB, -5dB] of the target level in table 7.6.3.5-1 for at least the duration of the throughput measurement.
3. Set the downlink signal level according to the table 7.6.3.5-1.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

7.6.3.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

Table 7.6.3.4.3-1: UplinkPowerControlDedicated

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE {			
p0-UePUSCH	0		
deltaMCS-Enabled	en0		
accumulationEnabled	TRUE		
p0-uePUCCH	0		
pSRS-Offset	3 (-6 dB)		
filterCoefficient	fc8	larger filter length is used to reduce the RSRP measurement variation	
}			

7.6.3.5 Test Requirement

The measurement derived in step 4) shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.6.3.5-1.

Table 7.6.3.5-1: Narrow-band blocking

Parameter	**Unit**	**Channel Bandwidth**					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
P_w	dBm	$P_{REFSENS}$ + channel-bandwidth specific value below					
		22	18	16	13	14	16
P_{uw} (CW)	dBm	-55	-55	-55	-55	-55	-55
F_{uw} (offset for Δf = 15 kHz)	MHz	0.9075	1.7025	2.7075	5.2125	7.7025	10.2075
F_{uw} (offset for Δf = 7.5 kHz)	MHz						
NOTE 1: The transmitter shall be set a 4 dB below the supported maximum power. NOTE 2: The reference measurement channel is specified in Annex A.3.2.							

7.7 Spurious response

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

FDD aspects missing or not yet determined:

- Output power level tolerance is not confirmed
- The Message contents are undefined
- Test case is not complete for FDD

TDD aspects missing or not yet determined:

- Test case is not complete for TDD
- The test cases in this clause have been verified to apply for both FDD and TDD

7.7.1 Test Purpose

Spurious response verifies 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 sub-clause 7.6.2 is not met.

The lack of the spurious response ability decreases the coverage area when other unwanted interfering signal exists at any other frequency.

7.7.2 Test Applicability

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

7.7.3 Minimum Conformance Requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7.3-1 and 7.7.3-2.

Table 7.7.3-1: Spurious response parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
NOTE 1:The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The reference measurement channel is specified in Annex A.3.2							

Table 7.7.3-2: Spurious Response

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44
$F_{Interferer}$	MHz	Spurious response frequencies

The normative reference for this requirement is TS 36.101 [2] clause 7.7.

7.7.4 Test Description

7.7.4.1 Initial Conditions

The initial conditions shall be the same as in clause 7.6.2.4.1 in order to test spurious responses obtained in clause 7.6.2 under the same conditions.

7.7.4.2 Test Procedure

1. Set the parameters of the CW signal generator for an interfering signal according to Table 7.7.5-2. The spurious frequencies are taken from step 5) records in clause 7.6.2.4.2.

2. Set the output power level of the UE according to the table 7.7.5-1 or send uplink power control commands to the UE, to ensure that the UE output power is within [+0dB, -5dB] of the target level in table 7.7.5-1 for at least the duration of the throughput measurement.

3. Set the downlink signal level according to the table 7.7.5-1.

4. For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

7.7.4.3 Message Contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

Table 7.7.4.3-1: UplinkPowerControlDedicated

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE {			
p0-UePUSCH	0		
deltaMCS-Enabled	en0		
accumulationEnabled	TRUE		
p0-uePUCCH	0		
pSRS-Offset	3 (-6 dB)		
filterCoefficient	fc8	larger filter length is used to reduce the RSRP measurement variation	
}			

7.7.5 Test Requirement

The measurement derived in step 4) shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Tables 7.7.5-1 and 7.7.5-2.

Table 7.7.5-1: Spurious response parameters

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The reference measurement channel is specified in Annex A.3.2							

Table 7.7.5-2: Spurious Response

Parameter	Unit	Level
$P_{Interferer}$ (CW)	dBm	-44
$F_{Interferer}$	MHz	Spurious response frequencies

7.8 Intermodulation characteristics

7.8.1 Wide band Intermodulation

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

FDD aspects missing or not yet determined:

- *Some of the channel bandwidth specific dB values are not yet finalised*
- *The acceptable window for the UE Tx power is not confirmed*
- *The power control method and message IEs for setting the UE output power to a constant level are undefined*

- *In the Core requirements it is unclear whether the formal reference to the interfering signal as defined in 36.101 Annex D applies to channel bandwidths of less than 5MHz. In this test specification the modulated interferer definition .has been assumed to be that in the Core spec Annex D for all channel bandwidths.*
- *The Message contents are undefined*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *Test description section needs to be verified or modified (if necessary) for TDD applicability*

7.8.1.1 Test purpose

Intermodulation response tests the UE's ability to receive data with a given average throughput for a specified reference measurement channel, in the presence of two or more interfering signals which have a specific frequency relationship to the wanted signal, under conditions of ideal propagation and no added noise.

A UE unable to meet the throughput requirement under these conditions will decrease the coverage area when two or more interfering signals exist which have a specific frequency relationship to the wanted signal.

7.8.1.2 Test applicability

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

7.8.1.3 Minimum conformance requirements

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.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1.3-1 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8.1.3-1: Wide band intermodulation

Rx Parameter	Units	Channel bandwidth					
		1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		[12]	[8]	6	6	7	9
$P_{Interferer\ 1}$ (CW)	dBm	-46					
$P_{Interferer\ 2}$ (Modulated)	dBm	-46					
$BW_{Interferer\ 2}$		1.4	3	5			
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 –2.1 / +BW/2+ 2.1	-BW/2 –4.5 / +BW/2 + 4.5	-BW/2 – 7.5 / +BW/2 + 7.5			
$F_{Interferer\ 2}$ (Offset)	MHz	$2*F_{Interferer\ 1}$					
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power. NOTE 2: The reference measurement channel is specified in Annex A.3.2 NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz							

The normative reference for this requirement is TS 36.101 [2] clause 7.8.1 and TS 36.101 [2] Annexes A and D.

[FFS: Although it is not explicitly stated in TS 36.101 [2] whether the modulated interferer defined in 36.101 Annex D applies to wanted channel bandwidths of less than 5MHz, this test specification has assumed that the modulated interferer definition applies to all channel bandwidths. The content of TS 36.101 [2] Annex D.2 has been copied into Annex FFS of the present document]

7.8.1.4 Test description

7.8.1.4.1 Initial condition

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.8.4.1-1. The details of the uplink and downlink reference measurement channels (RMCs) are specified in Annexes A.2 and A.3 respectively. Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Table 7.8.1.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			NC			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Mid range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			Lowest, 5MHz, Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	6	6	QPSK	6	6
3MHz	QPSK	15	15	QPSK	15	15
5MHz	QPSK	25	25	QPSK	25	25
5MHz	QPSK	25	N/A	QPSK	20	N/A
10MHz	QPSK	50	50	QPSK	50	50
10MHz	QPSK	50	N/A	QPSK	25	N/A
10MHz	QPSK	50	N/A	QPSK	20	N/A
15MHz	QPSK	75	75	QPSK	75	75
15MHz	QPSK	75	N/A	QPSK	50	N/A
15MHz	QPSK	75	N/A	QPSK	25	N/A
20MHz	QPSK	100	100	QPSK	100	100
20MHz	QPSK	100	N/A	QPSK	75	N/A
20MHz	QPSK	100	N/A	QPSK	50	N/A
20MHz	QPSK	100	N/A	QPSK	25	N/A
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band, which applicable channel bandwidths are specified in Table 5.4.2.1-1. Note 2. Depending on E-UTRA band, only the appropriate Uplink RB allocation value according to table 7.3.3-2 is tested per Test Channel Bandwidth.						

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508 [7] Figure A.6.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1, and uplink signals according to Annex H.1 and H.3.1.
4. The UL and DL Reference Measurement channels are set according to Table 7.8.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 7.8.1.4.3.

7.8.1.4.2 Test procedure

1. Send Uplink power control commands to the UE, to ensure that the UE output power is within [+0dB, -5dB] of the target level in Table 7.8.1.5-1 for at least the duration of the Throughput measurement.
2. Set the Downlink signal level to the value as defined in Table 7.8.1.5-1.
3. Set the Interfering signal levels to the values as defined in Table 7.8.1.5-1, using a modulated interferer bandwidth as defined in Annex D of the present document.
4. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G.2.

7.8.1.4.3 Message contents

Message contents are according to TS 36.508 [7] subclause 4.6 with the following exception.

Table 7.8.1.4.3-1: UplinkPowerControlDedicated

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
UplinkPowerControlDedicated-DEFAULT ::= SEQUENCE {			
p0-UePUSCH	0		
deltaMCS-Enabled	en0		
accumulationEnabled	TRUE		
p0-uePUCCH	0		
pSRS-Offset	3 (-6 dB)		
filterCoefficient	fc8	larger filter length is used to reduce the RSRP measurement variation	
}			

7.8.1.5 Test requirements

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex A.3.2 with parameters specified in Table 7.8.1.5-1 for the specified wanted signal mean power in the presence of two interfering signals.

Table 7.8.1.5-1: Test parameters for Wide band intermodulation

Rx Parameter	**Units**	**Channel bandwidth**					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Wanted signal mean power	dBm	REFSENS + channel bandwidth specific value below					
		[12]	[8]	6	6	7	9
$P_{Interferer\ 1}$ (CW)	dBm	-46					
$P_{Interferer\ 2}$ (Modulated)	dBm	-46					
$BW_{Interferer\ 2}$		1.4	3	5			
$F_{Interferer\ 1}$ (Offset)	MHz	-BW/2 –2.1 / +BW/2+ 2.1	-BW/2 –4.5 / +BW/2 + 4.5	-BW/2 – 7.5 / +BW/2 + 7.5			
$F_{Interferer\ 2}$ (Offset)	MHz	$2^*F_{Interferer\ 1}$					
NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power NOTE 2: The reference measurement channel is specified in Annex A.3.2 NOTE 3: The modulated interferer consists of the Reference measurement channel specified in Annex A.3.2 with set-up according to Annex C.3.1.The interfering modulated signal is 5MHz E-UTRA signal as described in Annex D for channel bandwidth ≥5MHz							

7.8.2 Void

7.9 Spurious emissions

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

FDD aspects missing or not yet determined:

- *The fixed power allocation for the RB(s) is undefined*
- *The Message contents are undefined*
- *Test case is not complete for FDD*

TDD aspects missing or not yet determined:

- *Test case is not complete for TDD*
- *The test cases in this clause have been verified to apply for both FDD and TDD*

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 Test Purpose

Test verifies the UE's spurious emissions meet the requirements described in clause 7.9.3.

Excess spurious emissions increase the interference to other systems.

7.9.2 Test Applicability

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

7.9.3 Minimum Conformance Requirements

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 7.9.3-1

Table 7.9.3-1: 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	

The normative reference for this requirement is TS 36.101 [2] clause 7.9.

7.9.4 Test Description

7.9.4.1 Initial Conditions

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

The initial test configurations consist of environmental conditions, test frequencies, and channel bandwidths based on E-UTRA bands specified in table 5.4.2.1-1. All of these configurations shall be tested with applicable test parameters for each channel bandwidth, and are shown in table 7.9.4.1-1. The details of the downlink and uplink reference measurement channels (RMCs) are specified in Annexes A.3 and A.2 respectively.

Table 7.9.4.1-1: Test Configuration Table

Initial Conditions						
Test Environment as specified in TS 36.508[7] subclause 4.1			NC			
Test Frequencies as specified in TS36.508 [7] subclause 4.3.1			Low range, Mid range, High range			
Test Channel Bandwidths as specified in TS 36.508 [7] subclause 4.3.1			Highest			
Test Parameters for Channel Bandwidths						
	Downlink Configuration			**Uplink Configuration**		
Ch BW	Mod'n	RB allocation		Mod'n	RB allocation	
		FDD	TDD		FDD	TDD
1.4MHz	QPSK	0	0	QPSK	0	0
3MHz	QPSK	0	0	QPSK	0	0
5MHz	QPSK	0	0	QPSK	0	0
10MHz	QPSK	0	0	QPSK	0	0
15MHz	QPSK	0	0	QPSK	0	0
20MHz	QPSK	0	0	QPSK	0	0
Note 1: Test Channel Bandwidths are checked separately for each E-UTRA band. The applicable channel bandwidths are specified in Table 7.3.3-2.						

1. Connect a spectrum analyzer (or other suitable test equipment) to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.8.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause 4.4.3.
3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.1.
4. The DL Reference Measurement channels are set according to Table 7.9.4.1-1.
5. Propagation conditions are set according to Annex B.0.
6. Ensure the UE is in State 3A according to TS 36.508 [7] clause 4.5.3A. Message contents are defined in clause 7.9.4.3.

7.9.4.2 Test Procedure

1. Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission.

7.9.4.3 Message Contents

Message contents are according to [clause FFS in reference FFS].

7.9.5 Test Requirement

The measured spurious emissions derived in step 1), shall not exceed the maximum level specified in Table 7.9.5-1

Table 7.9.5-1: 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	

8 Performance Requirement

8.1 General

The performance requirements for the physical channels specified in TS 36.211 [8] clause 6 (for downlink physical channels) shall be as defined in the respective sections below.

The requirements for the UE in this clause are specified for the downlink reference measurement channels specified in Annex A, the propagation conditions specified in Annex B and the downlink physical channels specified in Annex C.

Unelss otherwise stated the throughput measurements in clause 8 shall be performed according to the general rules for statistical testing in Annex G clause G.3.

The requirement for a UE that support 64QAM in uplink shall be tested according to the declared UE PUSCH category 5 specified in TS 36.306 [14].

The requirement for a UE that support E-UTRA in downlink shall be tested according to the declared UE PDSCH category.

8.1.1 Dual-antenna receiver capability

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

8.1.1.1 Simultaneous unicast and MBMS operations

8.1.1.2 Dual-antenna receiver capability in idle mode

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.

Table 8.2.1-1: Common Test Parameters (FDD)

Parameter	Unit	Value	Comments
Inter-TTI Distance		1	
Number of HARQ processes	Processes	8	For FDD, 8 HARQ processes in the DL, as specified in TS 36.213 [10] clause 7
Maximum number of HARQ transmission		4	It is always 4 for FDD, as specified in TS 36.213 [10] clause 8
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	4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths	The PCFICH carries information about the number of OFDM symbols used for transmission of PDCCHs in a subframe, as specified in TS 36.211 [8] clause 6.7
Cyclic Prefix		Normal	CP consist of the following physical resource blocks (RBs) parameters: 12 consecutive subcarriers at a 15 kHz spacing and 7 OFDM symbols, as specified in TS 36.211 [8] clause 6.2.3
NOTE: TBD			

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 SNR requirement applies for the UE categories given for each test.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.

8.2.1.1 FDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols)

8.2.1.1.1 FDD PDSCH Single Antenna Port Performance

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.1.1.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

8.2.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.2.1.1.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.1.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.1.1.3-2 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

Table 8.2.1.1.1.3-1: Test Parameters for Testing

Parameter		Unit	Test 1- 5	Test 6- 8	Test 9- 15	Test 16-18
Downlink power allocation	ρ_A	dB	0	0	0	0
	ρ_B	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98	TBD
Cell ID						0
Symbols for unused PRBs			-	-	-	OCNG (Note 2)
Modulation			QPSK	16QAM	64QAM	16QAM
Note 1: $P_B = 0$						
Note 2: Each unused physical resource block (PRB) is assigned to an individual virtual UE. The data for each virtual UE shall be uncorrelated with data from other virtual UEs over the period of any measurement. The data shall be QPSK modulated.						

Table 8.2.1.1.1.3-2: Minimum performance (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.2 FDD]	-	EVA5	1x2 Low	70	-1.0	1-5
2	10 MHz	[R.2 FDD]	-	ETU70	1x2 Low	70	-0.4	1-5
3	10 MHz	[R.2 FDD]	-	ETU300	1x2 Low	70	0.0	1-5
4	10 MHz	[R.2 FDD]	-	HST	1x2 Low	70	-2.4	1-5
5	1.4 MHz	[R.4 FDD]	-	EVA5	1x2 Low	70	-0.5	1-5
6	10 MHz	[R.3 FDD]	-	EVA5	1x2 Low	70	6.7	2-5
7	10 MHz	[R.3 FDD]	-	ETU70	1x2 Low	30	1.4	2-5
8	10 MHz	[R.3 FDD]	-	ETU300	1x2 High	70	9.4	2-5
9	3 MHz	[R.5 FDD]	-	EVA5	1x2 Low	70	17.6	1-5
10	5 MHz	[R.6 FDD]	-	EVA5	1x2 Low	70	17.4	2-5
11	10 MHz	[R.7 FDD]	-	EVA5	1x2 Low	70	17.7	2-5
12	10 MHz	[R.7 FDD]	-	ETU70	1x2 Low	70	19.0	2-5
13	10 MHz	[R.7 FDD]	-	EVA5	1x2 High	70	19.1	2-5
14	15 MHz	[R.8 FDD]	-	EVA5	1x2 Low	70	17.7	2-5
15	20 MHz	[R.9 FDD]	-	EVA5	1x2 Low	70	17.6	3-5
16	3 MHz	R.0 FDD	OP.1	ETU70	1x2 Low	30	1.9	1-5
17	10 MHz	R.1 FDD	OP.2	ETU70	1x2 Low	30	1.9	1-5
18	20 MHz	R.1 FDD	OP.3	ETU70	1x2 Low	30	1.9	1-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

8.2.1.1.1.4 Test description

8.2.1.1.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested for full allocation: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Frequencies to be tested for 1PRB allocation: Low Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.1.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 8.2.1-1and 8.2.1.1.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.1.1.1.4.3.

8.2.1.1.1.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.1.1.1.5-1as appropriate.

2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

3. Repeat steps from 1 to 2 for each subtest in Table 8.2.1.1.1.5-1 as appropriate.

8.2.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 8.2.1.1.1.4.3-1: *SystemInformationBlockType2*: Additional FDD PDSCH Single Antenna Port Performance for 1 PRB allocation test point 1 requirement for Test number [3.4]

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 SystemInformationBlockType2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
mbsfn-SubframeConfig ::= SEQUENCE {			
radioframeAllocationPeriod	n1	Every radio frame is with MBSFN subframe	
radioframeAllocationOffset	0		
subframeAllocation CHOICE {			
oneFrame	111111	Subframe 1, 2, 3, 6, 7, 8 is used for MBSFN	FDD
}			
}			

8.2.1.1.1.5 Test requirement

Table 8.2.1.1.1.3-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for each throughput test shall meet or exceed the specified value in Table 8.2.1.1.1.5-1 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.1.1.1.5-1: Test requirement (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.2 FDD]	-	EVA5	1x2 Low	70	-1.0+TT	1-5
2	10 MHz	[R.2 FDD]	-	ETU70	1x2 Low	70	-0.4+TT	1-5
3	10 MHz	[R.2 FDD]	-	ETU300	1x2 Low	70	0.0+TT	1-5
4	10 MHz	[R.2 FDD]	-	HST	1x2 Low	70	-2.4+TT	1-5
5	1.4 MHz	[R.4 FDD]	-	EVA5	1x2 Low	70	-0.5+TT	1-5
6	10 MHz	[R.3 FDD]	-	EVA5	1x2 Low	70	6.7+TT	2-5
7	10 MHz	[R.3 FDD]	-	ETU70	1x2 Low	30	1.4+TT	2-5
8	10 MHz	[R.3 FDD]	-	ETU300	1x2 High	70	9.4+TT	2-5
9	3 MHz	[R.5 FDD]	-	EVA5	1x2 Low	70	17.6+TT	1-5
10	5 MHz	[R.6 FDD]	-	EVA5	1x2 Low	70	17.4+TT	2-5
11	10 MHz	[R.7 FDD]	-	EVA5	1x2 Low	70	17.7+TT	2-5
12	10 MHz	[R.7 FDD]	-	ETU70	1x2 Low	70	19.0+TT	2-5
13	10 MHz	[R.7 FDD]	-	EVA5	1x2 High	70	19.1+TT	2-5
14	15 MHz	[R.8 FDD]	-	EVA5	1x2 Low	70	17.7+TT	2-5
15	20 MHz	[R.9 FDD]	-	EVA5	1x2 Low	70	17.6+TT	3-5
16	3 MHz	R.0 FDD	OP.1	ETU70	1x2 Low	30	1.9+TT	1-5
17	10 MHz	R.1 FDD	OP.2	ETU70	1x2 Low	30	1.9+TT	1-5
18	20 MHz	R.1 FDD	OP.3	ETU70	1x2 Low	30	1.9+TT	1-5

8.2.1.1.2 FDD PDSCH Single Antenna Port Performance with 1PRB

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.1.1.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS.

8.2.1.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.2.1.1.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.1, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.1.2.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.1.1.2.3-2, for the specified SNR.

Table 8.2.1.1.2.3-1: Test Parameters for Testing 1 PRB allocation

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	TBD
Cell ID			0
Symbols for MBSFN portion of MBSFN subframes (Note 2)			OCNG (Note 3)
Note 1: $P_B = 0$ Note 2: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the first slot. Note 3: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN subframes, QPSK modulated MBSFN data is used instead.			

Table 8.2.1.1.2.3-2: Minimum performance (FRC)

Test number	Bandwidth	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	R.29 FDD	OP.4 FDD	ETU70	1x2 Low	30	2.0	

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

8.2.1.1.2.4 Test description

8.2.1.1.2.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Low Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Tables 8.2.1.1.2.3-2as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.2.1.1.2.3-1as appropriate.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.1.1.2.4.3.

8.2.1.1.2.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.1.1.2.5-1as appropriate.

2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.1.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 8.2.1.1.2.4.3-1: *SystemInformationBlockType2*: Additional FDD PDSCH Single Antenna Port Performance for 1 PRB allocation test point 1 requirement for Test number [3.4]

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 SystemInformationBlockType2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
mbsfn-SubframeConfig ::= SEQUENCE {			
radioframeAllocationPeriod	n1	Every radio frame is with MBSFN subframe	
radioframeAllocationOffset	0		
subframeAllocation CHOICE {			
oneFrame	111111	Subframe 1, 2, 3, 6, 7, 8 is used for MBSFN	FDD
}			
}			

8.2.1.1.2.5 Test requirement

Table 8.2.1.1.2.3-1defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.1 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.1.2.5-1for the specified SNR including test tolerances for all throughput tests.

Table 8.2.1.1.2.5-1: Test requirement 1 PRB allocation (FRC) (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.29 FDD]	ETU70	1x2 Low	30	TBD + TT	

8.2.1.2 FDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols)

8.2.1.2.1 FDD PDSCH Transmit Diversity 2x2

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

- The Test system uncertainties applicable to this test are undefined
- Test tolerances for SNR have not yet been applied

8.2.1.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity (SFBC).

8.2.1.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.2.1.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.2.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.2.1.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 transmitter antennas as specified.

Table 8.2.1.2.1.3-1: Test Parameters for Testing Transmit Diversity Performance

Parameter		Unit	Test 1-2
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.1.2.1.3-2: Minimum performance Transmit Diversity (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.11 FDD]	EVA5	2x2 Medium	70	6.8	2-5
2	10 MHz	[R.10 FDD]	HST	2x2 Low	70	-2.3	1-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.

8.2.1.2.1.4 Test description

8.2.1.2.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.2.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.1.2.1.4.3.

8.2.1.2.1.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.2.1.5-1 as appropriate.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
3. Repeat steps from 1 to 2 for each test interval in Table 8.2.1.2.1.5-1 as appropriate.

8.2.1.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 8.2.1.2.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH transmit diversity performance downlink power allocation test point 1 requirement

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

8.2.1.2.1.5 Test requirement

Table 8.2.1.2.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.1.2.1.5-1: Test requirement Transmit Diversity (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.11 FDD]	EVA5	2x2 Medium	70	6.8 + TT	2-5
2	10 MHz	[R.10 FDD]	HST	2x2 Low	70	-2.3 + TT	1-5

8.2.1.2.2 FDD PDSCH Transmit Diversity 4x2

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

- The Test system uncertainties applicable to this test are undefined
- Test tolerances for SNR have not yet been applied

8.2.1.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity (SFBC).

8.2.1.2.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.2.1.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.2.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.2.2.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 4 transmitter antennas as specified.

Table 8.2.1.2.2.3-1: Test Parameters for Testing Transmit Diversity Performance

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.1.2.2.3-2: Minimum performance Transmit Diversity (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	1.4 MHz	[R.12 FDD]	EPA5	4x2 Medium	70	0.2	1-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.

8.2.1.2.2.4 Test description

8.2.1.2.2.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.2.2.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.1.2.2.4.3.

8.2.1.2.2.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.2.2.5-1 as appropriate.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.1.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 8.2.1.2.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH transmit diversity performance downlink power allocation test point 1 requirement

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

8.2.1.2.2.5 Test requirement

Table 8.2.1.2.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.1.2.2.5-1: Test requirement Transmit Diversity (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	1.4 MHz	[R.12 FDD]	EPA5	4x2 Medium	70	0.2 + TT	1-5

8.2.1.3 FDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

8.2.1.3.1 FDD PDSCH Open Loop Spatial Multiplexing 2x2

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.1.3.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

8.2.1.3.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.2.1.3.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.1.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.1.3-1 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

Table 8.2.1.3.1.3-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.1.3.1.3-2: Minimum performance Large Delay CDD (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz 16QAM 1/2	[R.11 FDD]	EVA70	2x2 Low	70	13.0	2-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

8.2.1.3.1.4 Test description

8.2.1.3.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.1.3-1, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.3.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.1.3.1.4.3.

8.2.1.3.1.4.2 Test procedure

1. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.1.3.1.5-1 as appropriate.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.1.3.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 8.2.1.3.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation test point

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 8.2.1.3.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation test point 2 requirement for Test numbers [4.3, 5.3]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-6		
}			

Table 8.2.1.3.1.4.3-3: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation test point 3 requirement for Test number [6.1 – 6.2]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm3		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

8.2.1.3.1.5 Test requirement

Table 8.2.1.3.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.1.5-1 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.1.3.1.5-1: Minimum performance Large Delay CDD (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz 16QAM 1/2	[R.11 FDD]	EVA70	2x2 Low	70	13.0 + TT	2-5

8.2.1.3.2 FDD PDSCH Open Loop Spatial Multiplexing 4x2

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.1.3.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

8.2.1.3.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.2.1.3.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.3.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.1.3.2.3-1 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

Table 8.2.1.3.2.3-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.1.3.2.3-2: Minimum performance Large Delay CDD (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Categor y
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.14 FDD]	EVA70	4x2 Low	70	14.3	2-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

8.2.1.3.2.4 Test description

8.2.1.3.2.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Table 8.2.1.3.1.3-1, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 for antenna configuration 4x2.

2. The parameter settings for the cell are set up according to Tables 8.2.1-1 and 8.2.1.3.2.3-1 as appropriate.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.1.3.2.4.3.

8.2.1.3.2.4.2 Test procedure

1. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.2.1.3.2.5-1 as appropriate.

2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

8.2.1.3.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 8.2.1.3.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation test point

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-6		
}			

Table 8.2.1.3.2.4.3-3: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH open loop spatial multiplexing performance downlink power allocation test point 3 requirement for Test number [6.1 – 6.2]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm3		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

8.2.1.3.2.5 Test requirement

Table 8.2.1.3.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.3.2.5-1 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.1.3.2.5-1: Minimum performance Large Delay CDD (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.14 FDD]	EVA70	4x2 Low	70	14.3 + TT	2-5

8.2.1.4 FDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

8.2.1.4.1 FDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 2 x 2

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.1.4.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

8.2.1.4.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.2.1.4.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.4.1.3-1 and 8.2.1.4.1.3-3 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.1.4.1.3-2 and 8.2.1.4.1.3-4 for the specified SNR. For single-layer spatial multiplexing closed loop rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

Table 8.2.1.4.1.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing

Parameter		Unit	Test [4.1]	Test [4.2]	Test [4.3]
Downlink power allocation	ρ_A	dB	-3	-3	-6
	ρ_B	dB	-3 (Note 1)	-3 (Note 1)	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98
Precoding granularity		PRB	6	50	6
PMI delay (Note 2)		ms	8	8	8
Reporting interval		ms	TBD	TBD	TBD
Reporting mode			PUSCH 1-2	PUSCH 3-1	PUSCH 1-2
Note 1: $P_B = 1$ Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)					

Table 8.2.1.4.1.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz QPSK 1/3	[R.10]	EVA5	2x2 Low	70	-2.5	1-5
2	10 MHz QPSK 1/3	[R.10]	EPA5	2x2 High	70	-2.8	1-5

Table 8.2.1.4.1.3-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing

Parameter		Unit	Test [5.1]	Test [5.2]	Test [5.3]
Downlink power allocation	ρ_A	dB	-3	-3	-6
	ρ_B	dB	-3 (Note 1)	-3 (Note 1)	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98
Precoding granularity		PRB	50	50	6
PMI delay (Note 2)		ms	8	8	8
Reporting interval		ms	TBD	TBD	TBD
Reporting mode			PUSCH 1-2	PUSCH 3-1	PUSCH 1-2
Note 1: $P_B = 1$ Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)					

Table 8.2.1.4.1.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.11 FDD]	EVA5	2x2 Low	70	12.9	2-5
2	10 MHz	[R.11 FDD]	ETU70	2x2 Low	70	14.3	2-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

8.2.1.4.1.4 Test description

8.2.1.4.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Tables 8.2.1.4.1.3-2 and 8.2.1.4.1.3-4 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2 or Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.2.1.4.1.3-1 and 8.2.1.4.1.3.-3 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.1.4.1.4.3.

8.2.1.4.1.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.4.1.5-1 and 8.2.1.4.1.5-2 as appropriate.

2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

3. Repeat steps from 1 to 2 for each test interval in Tables 8.2.1.4.1.5-1 and 8.2.1.4.1.5-2 as appropriate.

8.2.1.4.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 8.2.1.4.1.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation test point 1 requirement for Test numbers 1,2,3,4[4.1-4.2, 5.1-5.2]

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 8.2.1.4.1.4.3-3: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation test point 3 requirement for Test number [4.1 – 4.3]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 8.2.1.4.1.4.3-4: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation test point 4 requirement for Test number [5.1 – 5.3]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

8.2.1.4.1.5 Test requirement

Tables 8.2.1.4.3-1 and 8.2.1.4.3-3 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.4.1.5-1 and 8.2.1.4.1.5-2 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.1.4.1.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.10]	EVA5	2x2 Low	70	-2.5 + TT	1-5
2]	10 MHz	[R.10]	EPA5	2x2 High	70	-2.8 + TT	1-5

Table 8.2.1.4.1.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
3	10 MHz	[R.11 FDD]	EVA5	2x2 Low	70	12.9 + TT	2-5
4	10 MHz	[R.11 FDD]	ETU70	2x2 Low	70	14.3 + TT	2-5

8.2.1.4.2 FDD PDSCH Closed Loop Single/Multi Layer Spatial Multiplexing 4 x 2

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.1.4.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement

Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed-loop spatial multiplexing.

8.2.1.4.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.2.1.4.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.4.2.3-1 and 8.2.1.4.2.3-3 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.1.4.2.3-2 and 8.2.1.4.2.3-4 for the specified SNR. For single-layer spatial multiplexing closed loop rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

Table 8.2.1.4.2.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Precoding granularity		PRB	6
PMI delay (Note 2)		ms	8
Reporting interval		ms	TBD
Reporting mode			PUSCH 1-2
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 8.2.1.4.2.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.13]	EVA5	4x2 Low	70	-3.4	1-5

Table 8.2.1.4.2.3-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing

Parameter		Unit	Test 1
Downlink power allocation	ρ_A	dB	-6
	ρ_B	dB	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Precoding granularity		PRB	6
PMI delay (Note 2)		ms	8
Reporting interval		ms	TBD
Reporting mode			PUSCH 1-2
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 8.2.1.4.2.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.14 FDD]	EVA5	4x2 Low	70	10.5	2-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

8.2.1.4.2.4 Test description

8.2.1.4.2.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number in Tables 8.2.1.4.2.3-2 and 8.2.1.4.2.3-4 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.11 for antenna configuration 4x2.

2. The parameter settings for the cell are set up according to Tables 8.2.1-1, 8.2.1.4.2.3-1 and 8.2.1.4.2.3-3 as appropriate.

3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.1.4.2.4.3.

8.2.1.4.2.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.1.4.2.5-1 and 8.2.1.4.2.5-2 as appropriate.

2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

3. Repeat steps from 1 to 2 for each test interval in Tables 8.2.1.4.2.5-1 and 8.2.1.4.2.5-2 as appropriate.

8.2.1.4.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 8.2.1.4.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop spatial multiplexing performance downlink power allocation test point 1 requirement for Test numbers 1, 2

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-6		
}			

Table 8.2.1.4.2.4.3-3: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation test point 3 requirement for Test number [4.1 – 4.3]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 8.2.1.4.2.4.3-4: *PhysicalConfigDedicated-DEFAULT*: Additional FDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation test point 4 requirement for Test number [5.1 – 5.3]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

8.2.1.4.2.5 Test requirement

Tables 8.2.1.4.2.3-1 and 8.2.1.4.2.3-3 define the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.4.25-1 and 8.2.1.4.2.5-2 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.1.4.2.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
1	10 MHz	[R.13]	EVA5	4x2 Low	70	-3.4 + TT	1-5

Table 8.2.1.4.2.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
2	10 MHz	[R.14 FDD]	EVA5	4x2 Low	70	10.5 + TT	2-5

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.

Table 8.2.2-1: Common Test Parameters (TDD)

Parameter	Unit	Value	Comments
Uplink downlink configuration (Note 1)		1	
Special subframe configuration (Note 2)		4	
Inter-TTI Distance		1	
Number of HARQ processes	Processes	7	For TDD, 7 HARQ processes in the DL, as specified in TS 36.213 [10] clause 7
Maximum number of HARQ transmission		4	It is always 4 for TDD, as specified in TS 36.213 [10] clause 8
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	4 for 1.4 MHz bandwidth, 3 for 3 MHz and 5 MHz bandwidths, 2 for 10 MHz, 15 MHz and 20 MHz bandwidths	The PCFICH carries information about the number of OFDM symbols used for transmission of PDCCHs in a subframe, as specified in TS 36.211 [8] clause 6.7
Cyclic Prefix		Normal	CP consist of the following physical resource blocks (RBs) parameters: 12 consecutive subcarriers at a 15 kHz spacing and 7 OFDM symbols, as specified in TS 36.211 [8] clause 6.2.3
Note 1: as specified in Table 4.2-2 in TS 36.211 [8] Note 2: as specified in Table 4.2-1 in TS 36.211 [8]			

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 SNR requirement applies for the UE categories given for each test.

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.

8.2.2.1 TDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols)

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port with different channel models and MCS and also for the transmission on a single-antenna port with full RB or single RB allocation.

8.2.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.2.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.1, with the addition of the relevant parameters in Tables 8.2.2.1.3-1, 8.2.2.1.3-3 and 8.2.2.1.3-5 and 8.2.2.1.3-7 and the downlink physical channel setup according to table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.1.3-2, 8.2.2.1.3-4, 8.2.2.1.3-6 and 8.2.2.1.3-8 for the specified SNR.

Table 8.2.2.1.3-1: Test Parameters for Testing QPSK

Parameter		Unit	Test [1.1-1.4,2.1]
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 0$			

Table 8.2.2.1.3-2: Minimum performance QPSK (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[1.1]	10 MHz	[R.2 TDD]	EVA5	1x2 Low	70	-1.2	1-5
[1.2]	10 MHz	[R.2 TDD]	ETU70	1x2 Low	70	-0.6	1-5
[1.3]	10 MHz	[R.2 TDD]	ETU300	1x2 Low	70	-0.2	1-5
[1.4]	10 MHz	[R.2 TDD]	HST	1x2 Low	70	2.6	1-5
[2.1]	1.4 MHz	[R.4 TDD]	EVA5	1x2 Low	70	0.5	1-5

Table 8.2.2.1.3-3: Test Parameters for Testing 16QAM

Parameter		Unit	Test [1.5-1.7]
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 0$			

Table 8.2.2.1.3-4: Minimum performance 16QAM (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[1.5]	10 MHz	[R.3 TDD]	EVA5	1x2 Low	70	6.7	2-5
[1.6]	10 MHz	[R.3 TDD]	ETU70	1x2 Low	30	1.4	2-5
[1.7]	10 MHz	[R.3 TDD]	ETU300	1x2 High	70	9.3	2-5

Table 8.2.2.1.3-5: Test Parameters for Testing 64QAM

Parameter		Unit	Test [1.8-1.10,2.2-2.5]
Downlink power allocation	ρ_A	dB	0
	ρ_B	dB	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 0$			

Table 8.2.2.1.3-6: Minimum performance 64QAM (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[2.2]	3 MHz	[R.5 TDD]	EVA5	1x2 Low	70	17.6	1-5
[2.3]	5 MHz	[R.6 TDD]	EVA5	1x2 Low	70	17.6	2-5
[1.8]	10 MHz	[R.7 TDD]	EVA5	1x2 Low	70	17.6	2-5
[1.9]	10 MHz	[R.7 TDD]	ETU70	1x2 Low	70	19.1	2-5
[1.10]	10 MHz	[R.7 TDD]	EVA5	1x2 High	70	19.1	2-5
[2.4]	15 MHz	[R.8 TDD]	EVA5	1x2 Low	70	17.8	2-5
[2.5]	20 MHz	[R.9 TDD]	EVA5	1x2 Low	70	17.7	3-5

Table 8.2.2.1.3-7: Test Parameters for Testing 1 PRB allocation

Parameter		Unit	Test [3.1-3.3]	Test [3.4]
Downlink power allocation	ρ_A	dB	0	0
	ρ_B	dB	0 (Note 1)	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98
Cell ID			0	0
Symbols for unused PRBs			OCNG (Note 2)	OCNG (Note 2)
Symbols for MBSFN portion of MBSFN subframes (Note 3)			-	OCNG (Note 4)

Note 1: $P_B = 0$
Note 2: Each unused physical resource block (PRB) is assigned to an individual virtual UE. The data for each virtual UE shall be uncorrelated with data from other virtual UEs over the period of any measurement. The data shall be QPSK modulated.
Note 3: The MBSFN portion of an MBSFN subframe comprises the whole MBSFN subframe except the first two symbols in the first slot.
Note 4: The MBSFN portion of the MBSFN subframes shall contain QPSK modulated data. Cell-specific reference signals are not inserted in the MBSFN portion of the MBSFN subframes, QPSK modulated MBSFN data is used instead.

Table 8.2.2.1.3-8: Minimum performance 1 PRB allocation (FRC)

Test number	Bandwidth and MCS	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	
[3.1]	3 MHz 16QAM 1/2	[R.0 TDD]	OP.1 TDD	ETU70	1x2 Low	30	2.1	1-5
[3.2]	10 MHz 16QAM 1/2	[R.1 TDD]	OP.2 TDD	ETU70	1x2 Low	30	2.0	1-5
[3.3]	20 MHz 16QAM 1/2	[R.1 TDD]	OP.3 TDD	ETU70	1x2 Low	30	2.1	1-5
[3.4]	10MHz 16QAM 1/2	[R.29 TDD]	OP.4 TDD	ETU70	1x2 Low	30	2.0	1-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.

8.2.2.1.4 Test description

8.2.2.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested for full allocation: Mid Range , as defined in TS 36.508 [7] clause 4.3.1.2.

Frequencies to be tested for 1PRB allocation: Low Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.1.3-2, 8.2.2.1.3-4, 8.2.2.1.3-6 and 8.2.2.1.3-8 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9.

2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.2.2.1.3-1, 8.2.2.1.3-3, 8.2.2.1.3-5 and 8.2.2.1.3-7 as appropriate.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.2.1.4.3.

8.2.2.1.4.2 Test procedure

1. Set the parameters of the reference channel, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.2.1.5-1, 8.2.2.1.5-2 and 8.2.2.1.5-3 and 8.2.2.1.5-4 as appropriate.

2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

3. Repeat steps from 1 to 2 for each subtest in Tables 8.2.2.1.5-1, 8.2.2.1.5-2 and 8.2.2.1.5-3 and 8.2.2.1.5-4 as appropriate.

8.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions..

Table 8.2.2.1.4.3-1: *SystemInformationBlockType2*: Additional TDD PDSCH Single Antenna Port Performance for 1 PRB allocation test point 1 requirement for Test number [3.4]

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 SystemInformationBlockType2			
Information Element	**Value/remark**	**Comment**	**Condition**
SystemInformationBlockType2 ::= SEQUENCE {			
mbsfn-SubframeConfig ::= SEQUENCE {			
radioframeAllocationPeriod	n1	Every radio frame is with MBSFN subframe	
radioframeAllocationOffset	0		
subframeAllocation CHOICE {			
oneFrame	01001x	subframe 4 and 9 is used for MBSFN.	TDD
}			
}			
}			

8.2.2.1.5 Test requirement

Tables 8.2.2.1.3-1, 8.2.2.1.3-2 and 8.2.2.1.3-5 and 8.2.2.1.3-7 define the primary level settings including test tolerances for all throughput tests.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A for each throughput test shall meet or exceed the specified value in Tables 8.2.2.1.5-1, 8.2.2.1.5-2, 8.2.2.1.5-3 and 8.2.2.1.5-4 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.2.1.5-1: Test Requirement QPSK (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[1.1]	10 MHz	[R.2 TDD]	EVA5	1x2 Low	70	-1.2+TT	1-5
[1.2]	10 MHz	[R.2 TDD]	ETU70	1x2 Low	70	-0.6+TT	1-5
[1.3]	10 MHz	[R.2 TDD]	ETU300	1x2 Low	70	-0.2+TT	1-5
[1.4]	10 MHz	[R.2 TDD]	HST	1x2 Low	70	2.6+TT	1-5
[2.1]	1.4 MHz	[R.4 TDD]	EVA5	1x2 Low	70	0.5+TT	1-5

Table 8.2.2.1.5-2: Test Requirement 16QAM (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[1.5]	10 MHz	[R.3 TDD]	EVA5	1x2 Low	70	6.7+TT	2-5
[1.6]	10 MHz	[R.3 TDD]	ETU70	1x2 Low	30	1.4+TT	2-5
[1.7]	10 MHz	[R.3 TDD]	ETU300	1x2 High	70	9.3+TT	2-5

Table 8.2.2.1.5-3: Test Requirement 64QAM (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[2.2]	3 MHz	[R.5 TDD]	EVA5	1x2 Low	70	17.6+TT	1-5
[2.3]	5 MHz	[R.6 TDD]	EVA5	1x2 Low	70	17.6+TT	2-5
[1.8]	10 MHz	[R.7 TDD]	EVA5	1x2 Low	70	17.6+TT	2-5
[1.9]	10 MHz	[R.7 TDD]	ETU70	1x2 Low	70	19.1+TT	2-5
[1.10]	10 MHz	[R.7 TDD]	EVA5	1x2 High	70	19.1+TT	2-5
[2.4]	15 MHz	[R.8 TDD]	EVA5	1x2 Low	70	17.8+TT	2-5
[2.5]	20 MHz	[R.9 TDD]	EVA5	1x2 Low	70	17.7+TT	3-5

Table 8.2.2.1.5-4: Test Requirement 1 PRB allocation (FRC)

Test number	Bandwidth and MCS	Reference Channel	OCNG Pattern	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
						Fraction of Maximum Throughput (%)	SNR (dB)	1-5
[3.1]	31.4 MHz 16QAM 1/2	[R.0 TDD]	OP.1 TDD	ETU70	1x2 Low	30	2.1+TT	1-5
[3.2]	10 MHz 16QAM 1/2	[R.1 TDD]	OP.2 TDD	ETU70	1x2 Low	30	2.0+TT	1-5
[3.3]	20 MHz 16QAM 1/2	[R.1 TDD]	OP.3 TDD	ETU70	1x2 Low	30	2.1+TT	1-5
[3.4]	10 MHz 16QAM 1/2	[R.29 TDD]	OP.4 TDD	ETU70	1x2 Low	30	2.0+TT	1-5

8.2.2.2 TDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols)

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.2.2.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using transmit diversity (SFBC).

8.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.2.2.2.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.2.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.3.2.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Table 8.2.2.2.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 and 4 transmitter antennas as specified.

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

Parameter		Unit	Test [7.1-7-3]
Downlink power allocation	ρ_A	dB	-3
	ρ_B	dB	-3 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98
Note 1: $P_B = 1$			

Table 8.2.2.2.3-2: Minimum performance Transmit Diversity (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[7.1]	10 MHz 16QAM 1/2	[R.11 TDD]	EVA5	2x2 Medium	70	6.8	2-5
[7.2]	10 MHz QPSK 1/3	[R.10 TDD]	HST	2x2 Low	70	-2.3	1-5
[7.3]	1.4 MHz QPSK 1/3	[R.12 TDD]	EPA5	4x2 Medium	70	-0.2	1-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.2.

8.2.2.2.4 Test description

8.2.2.2.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2 or Figure A.11 for antenna configuration 4x2.

2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.2.3-1 as appropriate.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.2.2.4.3.

8.2.2.2.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.2.5-1 as appropriate.

2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.

3. Repeat steps from 1 to 2 for each test interval in Table 8.2.2.2.5-1 as appropriate.

8.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

Table 8.2.2.2.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH transmit diversity performance downlink power allocation test point 1 requirement for Test numbers [7.1-7-3]

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

8.2.2.2.5 Test requirement

Table 8.2.2.2.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Table 8.2.2.2.5-1 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.2.2.5-1: Test requirement Transmit Diversity (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[7.1]	10 MHz 16QAM 1/2	[R.11 TDD]	EVA5	2x2 Medium	70	6.8+TT	2-5
[7.2]	10 MHz QPSK 1/3	[R.10 TDD]	HST	2x2 Low	70	-2.3+TT	1-5
[7.3]	1.4 MHz QPSK 1/3	[R.12 TDD]	EPA5	4x2 Medium	70	-0.2+TT	1-5

8.2.2.3 TDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.2.3.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using large delay CDD.

8.2.2.3.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.2.2.3.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1 and 8.2.2.3.3-1 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.3.3-2 for the specified SNR. For open-loop spatial multiplexing performance with large delay CDD is specified.

Table 8.2.2.3.3-1: Test Parameters for Large Delay CDD (FRC)

Parameter		Unit	Test [6.1]	Test [6.2]	
Downlink power allocation	ρ_A	dB	-3	-6	
	ρ_B	dB	-3 (Note 1)	-6 (Note 1)	
N_{oc} at antenna port		dBm/15kHz	-98	-98	
Note 1: $P_B = 1$					

Table 8.2.2.3.3-2: Minimum performance Large Delay CDD (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[6.1]	10 MHz 16QAM 1/2	[R.11 TDD]	EVA70	2x2 Low	70	13.1	2-5
[6.2]	10 MHz 16QAM 1/2	[R.14 TDD]	EVA70	4x2 Low	70	14.2	2-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.

8.2.2.3.4 Test description

8.2.2.3.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Table 8.2.2.3.3-1 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2 or Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1 and 8.2.2.3.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.2.3.4.3.

8.2.2.3.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Table 8.2.2.3.5-1 as appropriate.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
3. Repeat steps from 1 to 2 for each test interval in Table 8.2.2.3.5-1 as appropriate.

8.2.2.3.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

Table 8.2.2.3.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation test point 1 requirement for Test number [6.1]

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 8.2.2.3.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation test point 2 requirement for Test number [6.2]

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-6		
}			

Table 8.2.2.3.4.3-3: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH open loop spatial multiplexing performance downlink power allocation test point 3 requirement for Test number [6.1 – 6.2]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm3		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

8.2.2.3.5 Test requirement

Table 8.2.2.3.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.2.2.3.5-1 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.2.3.5-1: Test requirement Large Delay CDD (FRC)Test number

	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[6.1]	10 MHz 16QAM 1/2	[R.11 TDD]	EVA70	2x2 Low	70	13.1+TT	2-5
[6.2]	10 MHz 16QAM 1/2	[R.14 TDD]	EVA70	4x2 Low	70	14.2+TT	2-5

8.2.2.4 TDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.2.4.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on two antenna ports using closed loop spatial multiplexing with wideband and frequency selective precoding.

8.2.2.4.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.2.2.4.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.2, with the addition of the relevant parameters in Tables 8.2.2-1, 8.2.2.4.3-1 and 8.2.2.4.3-3 and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.2.2.4.3-2 and 8.2.2.4.3-4 for the specified SNR. For single-layer spatial multiplexing closed loop rank-one performance with wideband and frequency selective precoding is specified. For multi-layer spatial multiplexing closed loop rank-two performance with wideband and frequency selective precoding is specified.

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

Parameter		Unit	Test [4.1]	Test [4.2]	Test [4.3]
Downlink power allocation	ρ_A	dB	-3	-3	-6
	ρ_B	dB	-3 (Note 1)	-3 (Note 1)	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98
Precoding granularity		PRB	6	50	6
Minimum PMI delay (Note 2)		ms	8	8	8
Reporting interval		ms	TBD	TBD	TBD
Reporting mode			PUSCH 1-2	PUSCH 3-1	PUSCH 1-2
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 8.2.2.4.3-2: Minimum performance Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[4.1]	10 MHz QPSK 1/3	[R.10]	EVA5	2x2 Low	70	-3.1	1-5
[4.2]	10 MHz QPSK 1/3	[R.10]	EPA5	2x2 High	70	-3.3	1-5
[4.3]	10 MHz QPSK 1/3	[R.13]	EVA5	4x2 Low	70	-3.7	1-5

Table 8.2.2.4.3-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing

Parameter		Unit	Test [5.1]	Test [5.2]	Test [5.3]
Downlink power allocation	ρ_A	dB	-3	-3	-6
	ρ_B	dB	-3 (Note 1)	-3 (Note 1)	-6 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98
Precoding granularity		PRB	50	50	6
Reporting interval		ms	TBD	TBD	TBD
Reporting mode			PUSCH 1-2	PUSCH 3-1	PUSCH 1-2
Minimum PMI delay (Note 2)		ms	8	8	8
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 8.2.2.4.3-4: Minimum performance Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[5.1]	10 MHz 16QAM 1/2	[R.11 TDD]	EVA5	2x2 Low	70	12.8	2-5
[5.2]	10 MHz 16QAM 1/2	[R.11 TDD]	ETU70	2x2 Low	70	13.9	2-5
[5.3]	10 MHz 16QAM 1/2	[R.14 TDD]	EVA5	4x2 Low	70	10.7	2-5

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.4.

8.2.2.4.4 Test description

8.2.2.4.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: As specified per test number in Tables 8.2.2.4.3-2 and 8.2.2.4.3-4 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2 or Figure A.11 for antenna configuration 4x2.
2. The parameter settings for the cell are set up according to Tables 8.2.2-1, 8.2.2.4.3-1 and 8.2.2.4.3-3 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.2.2.4.4.3.

8.2.2.4.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.2.2.4.5-1 and 8.2.2.4.5-2 as appropriate.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
3. Repeat steps from 1 to 2 for each test interval in Tables 8.2.2.4.5-1 and 8.2.2.4.5-2 as appropriate.

8.2.2.4.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions.

Table 8.2.2.4.4.3-1: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation test point 1 requirement for Test numbers [4.1-4.2, 5.1-5.2]

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 8.2.2.4.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop spatial multiplexing performance downlink power allocation test point 2 requirement for Test numbers [4.3, 5.3]

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-6		
}			

Table 8.2.2.4.4.3-3: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop single-layer spatial multiplexing performance downlink power allocation test point 3 requirement for Test number [4.1 – 4.3]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 8.2.2.4.4.3-4: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH closed loop multi-layer spatial multiplexing performance downlink power allocation test point 4 requirement for Test number [5.1 – 5.3]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

8.2.2.4.5 Test requirement

Tables 8.2.2.4.3-1 and 8.2.2.4.3-3 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.2, for each throughput test shall meet or exceed the specified value in Tables 8.2.2.4.5-1 and 8.2.2.4.5-2 for the specified SNR including test tolerances for all throughput tests.

Table 8.2.2.4.5-1: Test requirement Single-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[4.1]	10 MHz QPSK 1/3	[R.10]	EVA5	2x2 Low	70	-3.1+TT	1-5
[4.2]	10 MHz QPSK 1/3	[R.10]	EPA5	2x2 High	70	-3.3+TT	1-5
[4.3]	10 MHz QPSK 1/3	[R.13]	EVA5	4x2 Low	70	-3.7+TT	1-5

Table 8.2.2.4.5-2: Test requirement Multi-Layer Spatial Multiplexing (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[5.1]	10 MHz 16QAM 1/2	[R.11 TDD]	EVA5	2x2 Low	70	12.8+TT	2-5
[5.2]	10 MHz 16QAM 1/2	[R.11 TDD]	ETU70	2x2 Low	70	13.9+TT	2-5
[5.3]	10 MHz 16QAM 1/2	[R.14 TDD]	EVA5	4x2 Low	70	10.7+TT	2-5

8.3 Demodulation of PDSCH (User-Specific Reference Symbols)

8.3.1 FDD

[FFS]

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 DRS

Parameter	Unit	Value
Uplink downlink configuration (Note 1)		1
Special subframe configuration (Note 2)		4
Cyclic prefix		Normal
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 Time domain: 1 ms
Note 1: as specified in Table 4.2-2 in [TS 36.211] Note 2: as specified in Table 4.2-1 in [TS 36.211]		

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 SNR requirement applies for the UE categories given for each test.

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.

8.3.2.1 TDD PDSCH Performance (UE-Specific Reference Symbols)

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.3.2.1.1 Test purpose

To verify the UE's ability to receive a predefined test signal, representing a multi-path fading channel that is determined by the SNR with a percentage of the information bit throughput for a specified downlink Reference Measurement Channel (RMC) not falling below a specified value for transmission on a single-antenna port using user-specific reference signals with full RB or single RB allocation.

8.3.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.3.2.1.3 Minimum conformance requirements

The requirements are specified in terms of the percentage of information bit throughput for the downlink reference measurement channels specified in Annex A clause A.3.4.3, with the addition of the relevant parameters in Tables 8.3.2-1, 8.3.2.1.3-1, and the downlink physical channel setup according to Table C.3.2-1 in Annex C.

Using this configuration the fraction of maximum throughput percentage shall meet or exceed the minimum requirements specified in Tables 8.3.2.1.3-2 for the specified SNR.

Table 8.3.2.1.3-1: Test Parameters for Testing DRS

parameter		Unit	Test [11.1]	Test [11.2]	Test [11.3]	Test [11.4]
Downlink power allocation	ρ_A	dB	0	0	0	0
	ρ_B	dB	0 (Note 1)	0 (Note 1)	0 (Note 1)	0 (Note 1)
N_{oc} at antenna port		dBm/15kHz	-98	-98	-98	-98
Number of allocated resource blocks		PRB	50	50	50	1 (Note 2)
Note 1: $P_B = 0$ Note 2: Zeros shall be inserted for unused PRBs						

Table 8.3.2.1.3-2: Minimum performance DRS (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[11.1]	10 MHz QPSK 1/3	[R.25 TDD]	EPA5	1x2 Low	70	-0.8	1-5
[11.2]	10 MHz 16QAM 1/2	[R.26 TDD]	EPA5	1x2 Low	70	7.0	2-5
[11.3]	10 MHz 64QAM 3/4	[R.27 TDD]	EPA5	1x2 Low	70	17.0	2-5
[11.4]	10 MHz 16QAM 1/2	[R.28 TDD]	EPA5	1x2 Low	30	1.7	1-5

The normative reference for this requirement is TS 36.101 [2] clause 8.3.2.

8.3.2.1.4 Test description

8.3.2.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.2.

Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Tables 8.3.2-1 and 8.3.2.1.3-1 as appropriate.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.3.2.1.4.3.

8.3.2.1.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Table 8.3.2.1.5-1 as appropriate.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each test interval and decide pass or fail according to Tables G.3.5 and G.3.6 in Annex G clause G.3.
3. Repeat steps from 1 to 2 for each test interval in Tables 8.3.2.1.5-1 as appropriate.

8.3.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions .

Table 8.3.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*: Additional TDD PDSCH DRS performance downlink power allocation test point 1 requirement for Test number [11.1 – 11.4]

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm7		
}			
}			
}			

8.3.2.1.4.4 Test requirement

Table 8.3.2.1.3-1 defines the primary level settings.

The fraction of maximum throughput percentage for the downlink reference measurement channels specified in Annex A clause A.3.4.3 for each throughput test shall meet or exceed the specified value in Table 8.3.2.1.5-1 for the specified SNR including test tolerances for all throughput tests.

Table 8.3.2.1.5-1: Test requirement DRS

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix and Antenna Configuration	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[11.1]	10 MHz QPSK 1/3	[R.25 TDD]	EPA5	1x2 Low	70	-0.8+TT	1-5
[11.2]	10 MHz 16QAM 1/2	[R.26 TDD]	EPA5	1x2 Low	70	7.0+TT	2-5
[11.3]	10 MHz 64QAM 3/4	[R.27 TDD]	EPA5	1x2 Low	70	17.0+TT	2-5
[11.4]	10 MHz 16QAM 1/2	[R.28 TDD]	EPA5	1x2 Low	30	1.7+TT	1-5

8.4 Demodulation of PCFICH/PDCCH

8.4.1 FDD

8.4.1.1 FDD PCFICH/PDCCH Single-antenna Port Performance

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances have not yet been applied to the wanted and interfering signal levels*

8.4.1.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for a single-antenna port with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

8.4.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.4.1.1.3 Minimum conformance requirements

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.

Table 8.4.1.1.3-1: Test Parameters for PDCCH/PCFICH

Parameter		Unit	Test [8.1]		
Number of PDCCH symbols		symbols	2		
Number of PHICH groups (Ng)			1		
PHICH duration			Normal		
Cell ID			0		
Downlink power allocation	PCFICH_RA PDCCH_RA PHICH_RA	dB	0		
	PCFICH_RB PDCCH_RB PHICH_RB	dB	0		
N_{oc} at antenna port		dBm/15kHz	-98		
Cyclic prefix			Normal		

For the parameters specified in Table 8.4.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.1.3-2.

Table 8.4.1.1.3-2: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and Correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.1]	10 MHz	8 CCE	[R.15 FDD]	ETU70	1x2 Low	1	-1.6

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.

8.4.1.1.4 Test description

8.4.1.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.

2. The parameter settings for the cell are set up according to Table 8.4.1.1.3-1.

3. The downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clause B.0.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.4.1.1.4.3.

8.4.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, aggregation level, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.1.5-1 as appropriate.

2. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

8.4.1.1.4.3 Message contents

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

8.4.1.1.5 Test requirement

For the parameters specified in Table 8.4.1.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.1.1.5-1.

Table 8.4.1.1.5-1: Test requirement PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.1]	**10 MHz**	**8 CCE**	**[R.15 FDD]**	**ETU70**	1x2 **Low**	**1**	**-1.**6 **+ [TT]**

8.4.1.2 FDD PCFICH/PDCCH Transmit Diversity Performance

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances have not yet been applied to the wanted and interfering signal levels*

8.4.1.2.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.1 remains below a given reference value.

8.4.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.4.1.2.3 Minimum conformance requirements

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.

Table 8.4.1.2.3-1: Test Parameters for PDCCH/PCFICH

Parameter		Unit	Test [8.2, 8.3]		
Number of PDCCH symbols		symbols	2		
Number of PHICH groups (Ng)			1		
PHICH duration			Normal		
Cell ID			0		
Downlink power allocation	PCFICH_RA PDCCH_RA PHICH_RA	dB	-3		
	PCFICH_RB PDCCH_RB PHICH_RB	dB	-3		
N_{oc} at antenna port		dBm/15kHz	-98		
Cyclic prefix			Normal		

For the parameters specified in 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.

Table 8.4.1.2.3-2: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.2]	1.4 MHz	2 CCE	[R.16 FDD]	EPA5	2 x 2 Low	1	4.3
[8.3]	10 MHz	4 CCE	[R.17 FDD]	EVA5	4 x 2 Medium	1	0.9

The normative reference for this requirement is TS 36.101 [2] clause 8.4.1.

8.4.1.2.4 Test description

8.4.1.2.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range, as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 1.4MHz, 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.

2. The parameter settings for the cell are set up according to Table 8.4.1.2.3-1.

3. The downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B clauses B.0.

5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.4.1.2.4.3.

8.4.1.2.4.2 Test procedure

1. Set the parameters of bandwidth, aggregation level, reference Channel, the propagation condition, antenna configuration, the correlation matrix and the SNR according to Table 8.4.1.2.5-1 as appropriate.

2. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH during each subtest interval. Pm-dsg is the ratio (statDTX)/(NACK+ACK+statDTX).

3. Repeat steps from 1 to 2 for each test interval in Table 8.4.1.2.5-1 as appropriate.

8.4.1.2.4.3 Message contents

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

8.4.1.2.5 Test requirement

For the parameters specified in 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 8.4.1.2.5-1.

Table 8.4.1.2.5-1: Test requirement PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.2]	1.4 MHz	2 CCE	[R.16 FDD]	EPA5	2 x 2 Low	1	4.3 +[TT]
[8.3]	10 MHz	4 CCE	[R.17 FDD]	EVA5	4 x 2 Medium	1	0.9 +[TT]

8.4.2 TDD

8.4.2.1 TDD PCFICH/PDCCH Single-antenna Port Performance

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

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances have not yet been applied to the wanted and interfering signal levels*

8.4.2.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for a single-antenna port with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

8.4.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.4.2.1.3 Minimum conformance requirements

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.

Table 8.4.2.1.3-1: Test Parameters for PDCCH/PCFICH

Parameter		Unit	Test [8.1]		
Uplink downlink configuration (Note 1)			1		
Special subframe configuration (Note 2)			4		
Number of PDCCH symbols		symbols	2		
Number of PHICH groups (N_g)			1		
PHICH duration			Normal		
Cell ID			0		
Downlink power allocation	PCFICH_RA PDCCH_RA PHICH_RA	dB	0		
	PCFICH_RB PDCCH_RB PHICH_RB	dB	0		
N_{oc} at antenna port		dBm/15kHz	-98		
Cyclic prefix			Normal		
Note 1: as specified in Table 4.2-2 in TS 36.211 [8] Note 2: as specified in Table 4.2-1 in TS 36.211 [8]					

For the parameters specified in Table 8.4.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.1.3-2.

Table 8.4.2.1.3-2: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.1]	10 MHz	8 CCE	[R.15 TDD]	ETU70	1x2Low	1	-1.6

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.

8.4.2.1.4 Test description

8.4.2.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range , as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to 8.4.2.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State [3a] according to TS 36.508 [7] clause 4.5.3 and receiving payload data from the SS. Message contents are defined in clause 8.4.2.1.4.3.

8.4.2.1.4.2 Test procedure

Set the parameters of the bandwidth, aggregation level, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.2.1.5-1 as appropriate.

Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX)

8.4.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

Table 8.4.2.1.4.3-1: TDD-Configuration-DEFAULT

Derivation Path: 36.508 clause 4.6.4			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Configuration-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa1		
specialSubframePatterns	Ssp4		
}			

8.4.2.1.5 Test requirement

For the parameters specified in Table 8.4.2.1.3-1 the average probability of a missed downlink scheduling grant (Pm-dsg) shall be below the specified value in Table 8.4.2.1.5-1.

Table 8.4.2.1.5-1: Test requirement PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.1]	10 MHz	8 CCE	[R.15 TDD]	ETU70	1x2Low	1	-1.6 +TT

8.4.2.2 TDD PCFICH/PDCCH Transmit Diversity Performance

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

The Test system uncertainties applicable to this test are undefined

Test tolerances have not yet been applied to the wanted and interfering signal levels

8.4.2.2.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH for transmit diversity with a given SNR for which the average probability of miss-detection of the Downlink Scheduling Grant, tested jointly on PDCCH and PCFICH of the specified reference measurement channels in A.3.5.2 remains below a given reference value.

8.4.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.4.2.2.3 Minimum conformance requirements

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.

Table 8.4.2.2.3-1: Test Parameters for PDCCH/PCFICH

Parameter		Unit	Test [8.2, 8.3]		
Uplink downlink configuration (Note 1)			1		
Special subframe configuration (Note 2)			4		
Number of PDCCH symbols		symbols	2		
Number of PHICH groups (N_g)			1		
PHICH duration			Normal		
Cell ID			0		
Downlink power allocation	PCFICH_RA PDCCH_RA PHICH_RA	dB	-3		
	PCFICH_RA PDCCH_RB PHICH_RA	dB	-3		
N_{oc} at antenna port		dBm/15kHz	-98		
Cyclic prefix			Normal		
Note 1: as specified in Table 4.2-2 in TS 36.211 [8] Note 2: as specified in Table 4.2-1 in TS 36.211 [8]					

For the parameters specified in Table 8.4.2.1.3-2 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.

Table 8.4.2.2.3-2: Minimum performance PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.2]	1.4 MHz	2 CCE	[R.16 TDD]	EPA5	2 x 2 Low	1	4.2
[8.3]	10 MHz	4 CCE	[R.17 TDD]	EVA5	4 x 2 Medium	1	1.2

The normative reference for this requirement is TS 36.101 [2] clause 8.4.2.

8.4.2.2.4 Test description

8.4.2.2.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range , as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 1.4MHz,10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A.10 for antenna configuration 2x2 or Figure A.11 for antenna configuration 4x2.

2. The parameter settings for the cell are set up according to 8.4.2.2.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.

4. Propagation conditions are set according to Annex B.0.

5. Ensure the UE is in State [3a] according to TS 36.508 [7] clause 4.5.3 and receiving payload data from the SS. Message contents are defined in clause 8.4.2.2.4.3.

8.4.2.2.4.2 Test procedure

1. Set the parameters of the bandwidth, aggregation level, reference channel, the propagation condition, the correlation matrix, antenna configuration and the SNR according to Tables 8.4.2.2.5-1 as appropriate.

2. Measure the Pm-dsg for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during each subtest interval. Pm-dsg is the radio (statDTX)/(NACK +ACK+statDTX)

3. Repeat steps from 1 to 2 for each test interval in Table 8.4.2.2.5-1 as appropriate

8.4.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exception:.

Table 8.4.2.2.4.3-1: TDD-Configuration-DEFAULT

Derivation Path: 36.508 clause 4.6.4			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Configuration-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa1		
specialSubframePatterns	Ssp4		
}			

8.4.2.2.5 Test requirement

For the parameters specified in 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 8.4.2.2.5-1.

Table 8.4.2.2.5-1: Test requirement PDCCH/PCFICH

Test number	Bandwidth	Aggregation level	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.2]	1.4 MHz	2 CCE	[R.16 TDD]	EPA5	2 x 2 Low	1	4.2+TT
[8.3]	10 MHz	4 CCE	[R.17 TDD]	EVA5	4 x 2 Medium	1	1.2+TT

8.5 Demodulation of PHICH

8.5.1 FDD

8.5.1.1 FDD PHICH Single-antenna Port Performance

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

- *The test procedure is undefined.*
- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances have not yet been applied to the wanted and interfering signal levels*
- *Test numbers in minimum conformance requirements are undefined.*

8.5.1.1.1 Test purpose

This test verifies the demodulation performance of PHICH for a single antenna port with a given SNR for which the average probability of miss detection of Hybrid Indicator (“ACK to NACK”) of the specified reference measurement channels [clause FFS] remains below a specified value.

8.5.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.5.1.1.3 Minimum conformance requirements

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).

Table 8.5.1.1.3-1: Test Parameters for PHICH

Parameter		Unit	Test [TBD]		
Downlink power allocation	PHICH_RA	dB	0		
	PHICH_RB	dB			
	PCFICH_RA	dB			
	PCFICH_RB	dB	0		
	PDCCH_RA	dB			
	PDCCH_RB	dB			
PHICH duration			Normal		
Number of PHICH groups (Note 1)			Ng = 1		
PDCCH content			All PDCCH resources shall be occupied by non-zero data		
N_{oc} at antenna port		dBm/15kHz	-98		
Cyclic prefix			Normal		
Note 1: according to Clause 6.9 in TS 36.211[8]					

For the parameters specified in Table 8.5.1.1.3-1 the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.1.3-2.

Table 8.5.1.1.3-2: Minimum performance PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
[9.1]	10 MHz	[R.18]	ETU70	1 x 2 Low	0.1	5.5
[9.4]	10 MHz	[R.24]	ETU70	1 x 2 Low	0.1	0.6

The normative reference for this requirement is TS 36.101 [2] clause 8.5.

8.5.1.1.4 Test description

8.5.1.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 8.5.1.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.5.1.1.4.3.

8.5.1.1.4.2 Test procedure

1. SS shall schedule PUSCH transmissions to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.1.4.2-1 indicates the transmissions for one cycle.

Table 8.5.1.1.4.2-1: PHICH test pattern

TTI	1-4	5-8	9-12	13-16	17-20	21-24
PDCCH	S	S	-	-	S	S
PHICH	-	-	A	A	-	-
PUSCH		T	T	R	R	T
UL HARQ Process	1-4	5-8	1-4	5-8	1-4	5-8
Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test Note 2: Following notation is used: S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission A: represents the ACK transmission on PHICH T: represents a scheduled PUSCH transmission R: represents a potential PUSCH re-transmission due to a missed ACK						

2. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.
3. Repeat steps 1 – 2 for a duration sufficient to achieve statistical significance according to Annex G clause G.3 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).
4. Repeat the same procedure (steps 1 to 3) with test conditions according to the Table 8.5.1.1.5-1 for Test 2.

8.5.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions

Table 8.5.1.1.4.3-1: MAC-MainConfig-RBC

Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-MainConfig-RBC ::= SEQUENCE {			
dl-SCH-Config SEQUENCE {}	Not present		
ul-SCH-Config SEQUENCE {			
maxHARQ-Tx	n2	Only one retransmission per UL HARQ	
…			

8.5.1.1.5 Test requirement

For the parameters specified in Table 8.5.1.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.1.5-1.

Table 8.5.1.1.5-1: Test requirement PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
[9.1]	10 MHz	[R.18]	ETU70	1 x 2 Low	0.1	5.5 + [TT]
[9.4]	10 MHz	[R.24]	ETU70	1 x 2 Low	0.1	0.6 + [TT]

8.5.1.2 FDD PHICH Transmit Diversity Performance

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

- *The test procedure is undefined.*
- *The Message contents are undefined*
- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances have not yet been applied to the wanted and interfering signal levels*
- *Test numbers in minimum conformance requirements are undefined.*

8.5.1.2.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which the average probability of miss detection of Hybrid Indicator ("ACK to NACK") of the specified reference measurement channels [clause FFS] remains below a specified value.

8.5.1.2.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

8.5.1.2.3 Minimum conformance requirements

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).

Table 8.5.1.2.3-1: Test Parameters for PHICH

Parameter		Unit	Test [TBD]		
Downlink power allocation	PHICH_RA	dB	-3		
	PHICH_RB	dB			
	PCFICH_RA	dB			
	PCFICH_RB	dB	-3		
	PDCCH_RA	dB			
	PDCCH_RB	dB			
PHICH duration			Normal		
Number of PHICH groups (Note 1)			Ng = 1		
PDCCH content			All PDCCH resources shall be occupied by non-zero data		
N_{oc} at antenna port		dBm/15kHz	-98		
Cyclic prefix			Normal		
Note 1: according to Clause 6.9 in TS 36.211[10]					

For the parameters specified in Table 8.5.1.2.3-1 the average probability of a miss-detecting an ACK for a NACK (Pm-an) shall be below the specified value in Table 8.5.1.2.3-2

Table 8.5.1.2.3-2: Minimum performance PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
[9.2]	1.4 MHz	[R.19]	EPA5	2 x 2 Low	0.1	5.6
[9.3]	10 MHz	[R.20]	EVA5	4 x 2 Medium	0.1	6.0

The normative reference for this requirement is TS 36.101 [2] clause 8.5.

8.5.1.2.4 Test description

8.5.1.2.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 1.4MHz, 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the faders and AWGN noise sources to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10 or A.11.
2. The parameter settings for the cell are set up according to Table 8.5.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clauses B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 8.5.1.2.4.3.

8.5.1.2.4.2 Test procedure

1. SS shall schedule PUSCH transmissions to happen during 8 consecutive uplink TTIs via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions will transmit the associated ACKs. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.1.2.4.2-1 indicates the transmissions for one cycle.

Table 8.5.1.2.4.2-1: PHICH test pattern

TTI	1-4	5-8	9-12	13-16	17-20	21-24
PDCCH	S	S	-	-	S	S
PHICH	-	-	A	A	-	-
PUSCH		T	T	R	R	T
UL HARQ Process	1-4	5-8	1-4	5-8	1-4	5-8
Note 1: This table gives an example test pattern for HARQ process for FDD PHICH test Note 2: Following notation is used: S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission A: represents the ACK transmission on PHICH T: represents a scheduled PUSCH transmission R: represents a potential PUSCH re-transmission due to a missed ACK						

2. SS will only monitor for uplink retransmissions due to ACK missed-detections. Such re-transmissions (if they occur) will potentially happen in TTI 13 to 20. DTXs on TTI 13 to 20 are counted as successful ACK receptions while any transmission on these TTIs is counted as NACKs.

3. Repeat steps 1 – 2 for a duration sufficient to achieve statistical significance according to Annex G clause G.3 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

4. Repeat the same procedure (steps 1 to 3) with test conditions according to the table8.5.1.2.5-1 for Test 2.

8.5.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions

Table 8.5.1.2.4.3-1: MAC-MainConfig-RBC

Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-MainConfig-RBC ::= SEQUENCE {			
dl-SCH-Config SEQUENCE {}	Not present		
ul-SCH-Config SEQUENCE {			
maxHARQ-Tx	n2	Only one retransmission per UL HARQ	
…			

8.5.1.2.5 Test requirement

For the parameters specified in Table 8.5.1.2.3-1 the average probability of a miss-detecting ACK for NACK (Pm-dsg) shall be below the specified value in Table 8.5.1.2.5-1.

Table 8.5.1.2.5-1: Test requirement PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
[9.2]	1.4 MHz	[R.19]	EPA5	2 x 2 Low	0.1	5.6 + [TT]
[9.3]	10 MHz	[R.20]	EVA5	4 x 2 Medium	0.1	6.0 + [TT]

8.5.2 TDD

8.5.2.1 TDD PHICH Single-antenna Port Performance

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

- *A diagram showing connections between the SS, interfering source and the UE antenna port (s) is missing*
- *The test procedure is undefined*
- *The Message contents are undefined*
- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances have not yet been applied to the wanted and interfering signal levels*

8.5.2.1.1 Test purpose

This test verifies the demodulation performance of PHICH for a single antenna port with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of "NACK to ACK" and "ACK to NACK") of the specified reference measurement channels [clause FFS] is achieved.

8.5.2.1.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.5.2.1.3 Minimum conformance requirements

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 detection).

Table 8.5.2.1.3-1: Test Parameters for PHICH

<table>
<tr><th colspan="2">Parameter</th><th>Unit</th><th>Test [TBD]</th><th></th></tr>
<tr><td colspan="2">Uplink downlink configuration (Note 1)</td><td></td><td>1</td><td></td></tr>
<tr><td colspan="2">Special subframe configuration (Note 2)</td><td></td><td>4</td><td></td></tr>
<tr><td rowspan="6">Downlink power allocation</td><td>PHICH_RA</td><td>dB</td><td rowspan="3">0</td><td rowspan="3"></td></tr>
<tr><td>PHICH_RB</td><td>dB</td></tr>
<tr><td>PCFICH_RA</td><td>dB</td></tr>
<tr><td>PCFICH_RB</td><td>dB</td><td rowspan="3">0</td><td rowspan="3"></td></tr>
<tr><td>PDCCH_RA</td><td>dB</td></tr>
<tr><td>PDCCH_RB</td><td>dB</td></tr>
<tr><td colspan="2">PHICH duration</td><td></td><td>Normal</td><td></td></tr>
<tr><td colspan="2">Number of PHICH groups (Note 3)</td><td></td><td>Ng = 1</td><td></td></tr>
<tr><td colspan="2">PDCCH content</td><td></td><td>All PDCCH resources shall be occupied by non-zero data</td><td></td></tr>
<tr><td colspan="2">N_{oc} at antenna port</td><td>dBm/15kHz</td><td>-98</td><td></td></tr>
<tr><td colspan="2">Cyclic prefix</td><td></td><td>Normal</td><td></td></tr>
<tr><td colspan="5">Note 1: as specified in Table 4.2-2 in [TS 36.211]
Note 2: as specified in Table 4.2-1 in [TS 36.211]
Note 3: according to Clause 6.9 in [TS 36.211]</td></tr>
</table>

For the parameters specified in Table 8.5.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.1.3-2.

Table 8.5.2.1.3-2: Minimum performance of PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
[9.1]	10 MHz	[R.18]	ETU70	1 x 2 Low	0.1	5.8
[9.4]	10 MHz	[R.24]	ETU70	1 x 2 Low	0.1	1.3

The normative reference for this requirement is TS 36.101 [2] clause 8.5.

8.5.2.1.4 Test description

8.5.2.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range , as defined in TS 36.508 [7] clause 4.3.1.1

Bandwidths to be tested: As specified per test number in Tables 8.5.2.1.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS, the faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A,Figure A.9.
2. The parameter settings for the cell are set up according to 8.5.2.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 3 according to TS 36.508 [7] clause 4.5.3 and receiving payload data from the SS. Message contents are defined in clause 8.5.2.4.3.

8.5.2.1.4.2 Test procedure

1. In Each HARQ process (4 HARQ processes for UL/DL configuration 1), SS shall schedule PUSCH transmissions via PDCCH DCI format 0 with new data indicator set to true. Since the UE has no payload, the UE shall send uplink MAC padding bits in PUSCH. SS upon receiving the PUSCH transmissions shall transmit the associated ACKs. SS will only transmit PDCCH to schedule PUSCH transmission in the appropriate sub-frames. Table 8.5.2.1.4.2-1 indicates the transmissions for one cycle.
2. SS will only monitor for uplink retransmissions due to ACK missed-detections. DTX from the UE side is counted as successful ACK reception, while any transmission on these subframes is counted as NACKs.

Table 8.5.2.1.4.2-1: PHICH test pattern

Subframe Index	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
PDCCH		S			S		S			S										
PHICH												A			A		A			A
PUSCH			R?	R?				T	T				T	T				R?	R?	
HARQ process		1	3	4	2		3	1	2	4		1	3	4	2		3	1	2	4

Note 1: This table gives an example test pattern for HARQ process for TDD PHICH test
Note 2: Following notation is used:
S: represents sending PDCCH DCI format 0 to schedule a future PUSCH transmission
A: represents the ACK transmission on PHICH
T: represents a scheduled PUSCH transmission
R: represents a potential PUSCH re-transmission due to a missed ACK
Note 3:TDD UL/DL configuration 1 is used here, special subframe is denoted as blue

3. Repeat steps 1 – 2 for a duration sufficient to achieve statistical significance according to Annex G clause G.3 and measure Pm-an. Pm-an is (NACK) / (ACK + NACK).

4. Repeat the same procedure (steps 1 to 3) with test conditions according to the Table 8.5.2.1.5-1 for Test 2.

8.5.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6, with the following exceptions

Table 8.5.1.1.4.3-1: MAC-MainConfig-RBC

Derivation Path: TS 36.508 [7] clause 4.8.2.1.5, Table 4.8.2.1.5-1			
Information Element	**Value/remark**	**Comment**	**Condition**
MAC-MainConfig-RBC ::= SEQUENCE {			
dl-SCH-Config SEQUENCE {}	Not present		
ul-SCH-Config SEQUENCE {			
maxHARQ-Tx	n2	Only one retransmission per UL HARQ	
…			

8.5.2.1.5 Test requirement

For the parameters specified in Table 8.5.2.1.3-1 the average probability of a miss-detecting ACK for NACK (Pm-an) shall be below the specified value in Table 8.5.2.1.5-1.

Table 8.5.2.1.5-1: Test requirement of PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	**SNR (dB)**
[9.1]	10 MHz	[R.18]	ETU70	1 x 2 Low	0.1	5.8+TT
[9.4]	10 MHz	[R.24]	ETU70	1 x 2 Low	0.1	1.3+TT

8.5.2.2 TDD PHICH Transmit Diversity Performance

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

- *A diagram showing connections between the SS, interfering source and the UE antenna port (s) is missing*
- *The test procedure is undefined*
- *The Message contents are undefined*

- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances have not yet been applied to the wanted and interfering signal levels*

8.5.2.2.1 Test purpose

This test verifies the demodulation performance of PHICH for transmit diversity with a given SNR for which a certain Hybrid Indicator detection error rate (i.e. missed detection of “NACK to ACK” and “ACK to NACK”) of the specified reference measurement channels [clause FFS] is achieved.

8.5.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

8.5.2.2.3 Minimum conformance requirements

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 detection).

Table 8.5.2.2.3-1: Test Parameters for PHICH

Parameter		Unit	Test [TBD]	
Uplink downlink configuration (Note 1)			1	
Special subframe configuration (Note 2)			4	
Downlink power allocation	PHICH_RA	dB	-3	
	PHICH_RB	dB		
	PCFICH_RA	dB		
	PCFICH_RB	dB	-3	
	PDCCH_RA	dB		
	PDCCH_RB	dB		
PHICH duration			Normal	
Number of PHICH groups (Note 3)			Ng = 1	
PDCCH content			All PDCCH resources shall be occupied by non-zero data	
N_{oc} at antenna port		dBm/15kHz	-98	
Cyclic prefix			Normal	
Note 1: as specified in Table 4.2-2 in [TS 36.211] Note 2: as specified in Table 4.2-1 in [TS 36.211] Note 3: according to Clause 6.9 in [TS 36.211]				

For the parameters specified in 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.

Table 8.5.2.2.3-2: Minimum performance of PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
[9.2]	1.4 MHz	[R.19]	EPA5	2 x 2 Low	0.1	5.3
[9.3]	10 MHz	[R.20]	EVA5	4 x 2 Medium	0.1	6.1

The normative reference for this requirement is TS 36.101 [2] clause 8.5.

8.5.2.2.4 Test description

8.5.2.2.4.1 Initial conditions

Test Environment: Normal, as defined in TS 36.508 [7] clause 4.1

Frequencies to be tested: Mid Range , as defined in TS 36.508 [7] clause 4.3.1.1

Bandwidths to be tested: As specified per test number in Tables 8.5.2.2.3-2 as defined in TS 36.508 [7] clause 4.3.1.2.

1. Connect the SS to the UE antenna connector (s) as shown in Figure [FFS in clause FFS of this document].
2. The parameter settings for the cell are set up according to [clause FFS in reference FFS].
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 clause FFS and receiving payload data from the SS. Message contents are defined in clause 8.5.2.2.4.3.

8.5.2.2.4.2 Test procedure

[FFS]

8.5.2.2.4.3 Message contents

Message contents are according to [clause FFS in reference FFS].

8.5.2.2.5 Test requirement

For the parameters specified in 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 8.5.2.2.5-1.

Table 8.5.2.2.5-1: Test requirement of PHICH

Test number	Bandwidth	Reference Channel	Propagation Condition	Antenna configuration and correlation Matrix	Reference value	
					Pm-an (%)	SNR (dB)
[9.2]	1.4 MHz	[R.19]	EPA5	2 x 2 Low	0.1	5.3+TT
[9.3]	10 MHz	[R.20]	EVA5	4 x 2 Medium	0.1	6.1+TT

8.6 Demodulation of PBCH

RAN4 will specify the PBCH performance requirements and has recommended that these requirements do not need to be tested.

9 Reporting of Channel State Information

9.1 General

Editor's note: The following aspects are either missing or not yet determined:

- *The different combination of transmission modes and reporting modes applicable to verify the the reporting of CSI are undefined*
- *Methods for testng CQI reporting under fading still FFS*
- *Testing of PMI/RI reporting performance still FFS*
- *Test parameters and static levels are undefined.*

This section includes requirements for the reporting of channel state information (CSI).

9.2 CQI Reporting 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 36.211].

9.2.1 CQI Reporting under AWGN conditions - PUCCH 1-0

9.2.1.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-0

Editor's note: The following aspects are either missing or not yet determined:

- Brackets [ ] need to be removed in table 9.2.1.1.3-1
- The Test procedure and test requirements are undefined

9.2.1.1.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based median CQI-1 and median CQI or the transport format based median CQI and median CQI +1.

9.2.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.1.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to Table A.4-1 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI +1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI –1) shall be less than or equal to 0.1

Table 9.2.1.1.3-1: PUCCH 1-0 static test

Parameter		Unit	Test 1	Test 2
Bandwidth		MHz	10	
PDSCH transmission mode			1	
Downlink power allocation	ρ_A	dB	0	
	ρ_B	dB	0	
Propagation condition and antenna configuration			AWGN (1 x 2)	
SNR		dB	[0]	[6]
$N_{oc}^{(j)}$		dB[mW/15kHz]	[-98]	[-98]
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	[-98]	[-92]
Max number of HARQ transmissions			1	
PUCCH Format			[Format 2]	
PUCCH Report Type			4	
Reporting periodicity		ms	[N_P = 5 ms]	
cqi-pmi-ConfigurationIndex			5	
Note: Reference measurement channel according to Table A.4-1				

9.2.1.1.4 Test description

9.2.1.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.2.1.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.2.1.1.4.3.

9.2.1.1.4.2 Test procedure

[FFS]

9.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.1.1.4.3-1: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			CQI_PERIODIC
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	5	(see Table 7.2.2-1A in TS 36.213)	FDD
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL	(see Table 7.2.2-1B in TS 36.213)	FDD
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.2.1.1.5 Test requirement

[FFS]

9.2.1.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-0

Editor's note: The following aspects are either missing or not yet determined:

- Brackets[ ] need to be removed in table 9.2.1.2.3-1
- The Test procedure and test requirements are undefined

9.2.1.2.1 Test purpose

To verify the variance of the wideband CQI reports is within the limits defined and a PDSCH BLER of 10% falls between the transport format based on median CQI-1 and median CQI or the transport format based on median CQI and median CQI +1.

9.2.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.2.1.2.3-1, and using the downlink physical channels specified in tables C.3.2-1 and C.3.2-2, the reported CQI value according to Table A.4-2 shall be in the range of ±1 of the reported median more than 90% of the time. If the PDSCH BLER using the transport format indicated by median CQI is less than or equal to 0.1, the BLER using the transport format indicated by the (median CQI +1) shall be greater than 0.1. If the PDSCH BLER using the transport format indicated by the median CQI is greater than 0.1, the BLER using transport format indicated by (median CQI –1) shall be less than or equal to 0.1.

Table 9.2.1.2.3-1: PUCCH 1-0 static test (TDD)

Parameter		Unit	Test 1	Test 2
Bandwidth		MHz	10	
PDSCH transmission mode			1	
Uplink downlink configuration			1	
Special subframe configuration			4	
Downlink power allocation	ρ_A	dB	0	
	ρ_B	dB	0	
Propagation condition and antenna configuration			AWGN (1 x 2)	
SNR		dB	[0]	[6]
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	[-98]	[-92]
Maximum number of HARQ transmissions			1	
PUCCH Format			[Format 2]	
PUCCH Report Type			4	
Reporting periodicity		ms	$N_P = 5$	
cqi-pmi-ConfigurationIndex			4	
Note: Reference measurement channel according to clause A.4				

9.2.1.2.4 Test description

9.2.1.2.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS,faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.9.
2. The parameter settings for the cell are set up according to Table 9.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.2.1.2.4.3.

9.2.1.2.4.2 Test procedure

[FFS]

9.2.1.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.1.2.4.3-1: CQI-ReportConfig-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	4		
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	NULL		
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.2.1.2.4.3-2: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	sa2		
specialSubframePatterns	ssp4		
}			

9.2.1.2.5 Test requirement

[FFS]

9.2.2 CQI Reporting under AWGN conditions - PUCCH 1-1

9.2.2.1 FDD CQI Reporting under AWGN conditions – PUCCH 1-1

Editor's note: The following aspects are either missing or not yet determined:

- Brackets[ ] need to be removed in table 9.2.2.1.3-1
- The Test procedure and test requirements are undefined

9.2.2.1.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #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 and 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.

9.2.2.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.2.2.1.3 Minimum conformance requirements

The minimum requirements for dual codeword transmission are defined in terms of a reporting spread of the wideband spatial differential CQI between codeword #0 and 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.

For the parameters specified in table 9.2.2.1.3-1, 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]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 - \text{Codeword 1 offset level}$$

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 +1} for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0 – 1 and median CQI_1 – 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0 + 1 and median CQI_1 + 1 shall be greater than or equal to 0.1.

Table 9.2.2.1.3-1: PUCCH 1-1 static test (FDD)

Parameter		Unit	Test 1	Test 2
Bandwidth		MHz	10	
PDSCH transmission mode			4	
Downlink power allocation	ρ_A	dB	-3	
	ρ_B	dB	-3	
Propagation condition and antenna configuration			Clause B.1 (2 x 2)	
CodeBookSubsetRestriction bitmap			010000	
SNR		dB	[10]	[16]
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	[-88]	[-82]
Max number of HARQ transmissions			1	
PUCCH Format			[Format 2]	
PUCCH Report Type			2	
Reporting periodicity		ms	N_P = 5	
cqi-pmi-ConfigurationIndex			5	
ri-ConfigurationInd			[966 (M_{RI} = OFF)]	
Note 1: Reference measurement channel according to clause A.4				

9.2.2.1.4 Test description

9.2.2.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.

2. The parameter settings for the cell are set up according to Table 9.2.2.1.3-1.

3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.2.2.1.4.3.

9.2.2.1.4.2 Test procedure

[FFS]

9.2.2.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.2.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
codebookSubsetRestriction CHOICE {			
n2TxAntenna-tm4	010000		
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 9.2.2.1.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 9.2.2.1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			CQI_PERIODIC
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	5	(see Table 7.2.2-1A in TS 36.213)	FDD
cqi-FormatIndicatorPeriodic CHOICE {			
subbandCQI	NULL		
}			
ri-ConfigIndex	[966]	(see Table 7.2.2-1B in TS 36.213)	FDD
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

9.2.2.1.5 Test requirement

[FFS]

9.2.2.2 TDD CQI Reporting under AWGN conditions – PUCCH 1-1

- Brackets[ ] need to be removed in table 9.2.2.1.3-1
- The Test procedure and test requirements are undefined

9.2.2.2.1 Test purpose

To verify the variance of the wideband spatial differential CQI between codeword #0 and codeword #1 are within the limits defined and for both codeword #0 and codeword #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 and 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.

9.2.2.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.2.2.2.3 Minimum conformance requirements

For the parameters specified in table 9.2.2.2.3-1, 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]) shall be used to determine the wideband CQI index for codeword #1 as

$$\text{wideband } CQI_1 = \text{wideband } CQI_0 - \text{Codeword 1 offset level}$$

The wideband CQI_1 shall be within the set {median CQI_1 -1, median CQI_1 +1} for more than 90% of the time, where the resulting wideband values CQI_1 shall be used to determine the median CQI values for codeword #1. For both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0 – 1 and median CQI_1 – 1 shall be less than or equal to 0.1. Furthermore, for both codewords #0 and #1, the PDSCH BLER using the transport format indicated by the respective median CQI_0 + 1 and median CQI_1 + 1 shall be greater than or equal to 0.1.

Table 9.2.2.2.3-1: PUCCH 1-1 static test (TDD)

Parameter		Unit	Test 1	Test 2
Bandwidth		MHz	10	
PDSCH transmission mode			4	
Uplink downlink configuration			1	
Special subframe configuration			4	
Downlink power allocation	ρ_A	dB	-3	
	ρ_B	dB	-3	
Propagation condition and antenna configuration			Clause B.1 (2 x 2)	
CodeBookSubsetRestriction bitmap			010000	
SNR		dB	[10]	[16]
$N_{oc}^{(j)}$		dB[mW/15kHz]	-98	-98
$\hat{I}_{or}^{(j)}$		dB[mW/15kHz]	[-88]	[-82]
Maximum number of HARQ transmissions			1	
PUCCH Format			[Format 2]	
PUCCH Report Type			2	
Reporting periodicity		ms	$N_P = 5$	
cqi-pmi-ConfigurationIndex			4	
ri-ConfigurationInd			[966 (M_{RI} = OFF)]	
Note 1: Reference measurement channel according to clause A.4				

9.2.2.2.4 Test description

9.2.2.2.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS, faders and AWGN noise source to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.2.2.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2 and uplink signals according to Annex H1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.2.2.2.4.3.

9.2.2.2.4.2 Test procedure

[FFS]

9.2.2.2.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.2.2.2.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
antennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm4		
}			
codebookSubsetRestriction CHOICE {			
n2TxAntenna-tm4	010000		
ue-TransmitAntennaSelection CHOICE {			
release	NULL		
}			
}			
}			

Table 9.2.2.2.4.3-2: *PDSCH-ConfigDedicated-DEFAULT*

Derivation Path: TS 36.508 [7] clause 4.6.3, Table 4.6.3-6 PDSCH-ConfigDedicated-DEFAULT			
Information Element	**Value/remark**	**Comment**	**Condition**
PDSCH-ConfigDedicated-DEFAULT ::= SEQUENCE {			
p-a	dB-3		
}			

Table 9.2.2.2.4.3-3: CQI-ReportConfig-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	Not present		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic CHOICE {			
setup SEQUENCE {			
cqi-PUCCH-ResourceIndex	0		
cqi-pmi-ConfigIndex	4		
cqi-FormatIndicatorPeriodic CHOICE {			
widebandCQI	NULL		
}			
ri-ConfigIndex	[966]		
simultaneousAckNackAndCQI	FALSE		
}			
}			
}			

Table 9.2.2.2.4.3-4: TDD-Config-DEFAULT

Derivation Path: 36.508 clause 4.6.3			
Information Element	**Value/remark**	**Comment**	**Condition**
TDD-Config-DEFAULT ::= SEQUENCE {			
subframeAssignment	Sa2		
specialSubframePatterns	Ssp4		
}			

9.2.2.2.5 Test requirement

[FFS]

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 any one of 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* [36.213].

9.3.1.1 Frequency-selective scheduling mode - PUSCH 3-0

9.3.1.1.1 FDD Frequency-selective scheduling mode – PUSCH 3-0

Editor's note: The following aspects are either missing or not yet determined:

- Physical channels used are undefined
- The Initial Conditions including UE setup are undefined
- The Test procedure and test requirements are undefined
- The Message contents are undefined
- The Test system uncertainties applicable to this test are undefined
- Test tolerances for SNR have not yet been applied

9.3.1.1.1.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

9.3.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.3.1.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.1.1.3-1, [and using the downlink physical channels specified in Annex C,] the minimum requirements are specified in Table 9.3.1.1.1.3-2 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 obtained when transmitting on any one of 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) [BLER requirement]

[Editors note: use of requirement (c) is TBD]

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. 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 [TS 36.213] that corresponds to the sub-band size.

Table 9.3.1.1.1.3-1 Sub-band test for single antenna transmission (FDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	10 MHz	
Transmission mode		1 (port 0)	
SNR	dB	[9]	[14]
$N_{oc}^{(j)}$	dB[mW/15kHz]	[-98]	[-98]
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	[-89]	[-84]
Propagation channel		[Clause B.2.4 with $\tau_d = 0.45\,\mu$s, a = 1, $f_D = 5$ Hz]	
Correlation		[Full]	
Reporting interval	ms	[5]	
CQI delay		8	
Reporting mode		PUSCH 3-0	
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) NOTE2: Reference measurement channel according to Table A.4-4			

Table 9.3.1.1.1.3-2 Minimum requirement (FDD)

	Test 1	Test 2	
α [%]	TBD	TBD	
β [%]	TBD	TBD	
γ	TBD	TBD	

9.3.1.1.1.4 Test description

9.3.1.1.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [FFS].
2. The parameter settings for the cell are set up according to Table 9.3.1.1.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.3.1.1.1.4.3.

9.3.1.1.1.4.2 Test procedure

[FFS]

9.3.1.1.1.4.3 Message contents

Message contents are according to [clause FFS in reference FFS].

9.3.1.1.1.5 Test requirement

[FFS]

9.3.1.1.2 TDD Frequency-selective scheduling mode – PUSCH 3-0

9.3.1.1.2.1 Test purpose

To verify that preferred sub-bands can be used for frequently-selective scheduling.

9.3.1.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.3.1.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.1.1.2.3-1, [and using the downlink physical channels specified in Annex C,] the minimum requirements are specified in Table 9.3.1.1.2.3-2 and by the following

a) a sub-band differential CQI offset level of 0 shall be reported at least α% of the time but less than β% for each sub-band;

b) the ratio of the throughput obtained when transmitting on any one of 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) [BLER requirement]

[Editors note: details of additional requirements (c) is TBD]

The requirements only apply for sub-bands of full size and the random scheduling across the sub-bands is done by selecting a new sub-band in each available downlink transmission instance]. 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 [TS 36.213] that corresponds to the sub-band size.

Table 9.3.1.1.2.3-1: Sub-band test for single antenna transmission (TDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	10 MHz	
Transmission mode		1 (port 0)	
Uplink downlink configuration		1	
Special subframe configuration		4	
SNR	dB	[9]	[14]
$N_{oc}^{(j)}$	dB[mW/15kHz]	[-98]	[-98]
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	[-89]	[-84]
Propagation channel		[Clause B.2.4 with $\tau_d = 0.45\,\mu$s a = 1, $f_D = 5$ Hz]	
Correlation		[Full]	
Reporting interval	ms	[5]	
Minimum CQI delay	ms	8	
Reporting mode		PUSCH 3-0	
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)			

Table 9.3.1.1.2.3-2: Minimum requirement (TDD)

	Test 1	Test 2	
α [%]	TBD	TBD	
β [%]	TBD	TBD	
γ	TBD	TBD	

9.3.1.1.2.4 Test description

9.3.1.1.2.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [FFS].
2. The parameter settings for the cell are set up according to Table 9.3.1.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B.0
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.3.1.1.2.4.3.

9.3.1.1.2.4.2 Test procedure

[FFS]

9.3.1.1.2.4.3 Message contents

Message contents are according to [clause FFS in FFS].

9.3.1.1.2.5 Test requirement

[FFS]

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 a double-sided percentile of the reported CQI, 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.

9.3.2.1 Frequency non-selective scheduling mode – PUCCH 1-0

9.3.2.1.1 FDD Frequency non-selective scheduling mode – PUCCH 1-0

Editor's note: The following aspects are either missing or not yet determined:

- Measurement channel used is undefined
- Physical channels used are undefined
- The Initial Conditions including UE setup are undefined
- The Test procedure and test requirements are undefined
- The Message contents are undefined
- The Test system uncertainties applicable to this test are undefined
- Test tolerances for SNR have not yet been applied

9.3.2.1.1.1 Test purpose

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

9.3.2.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.3.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.1.1.3-1, [and using the downlink physical channels specified in Annex C,] the minimum requirements are specified in Table 9.3.2.1.1.3-2 and by the following

a) CQI index not in the set {median CQI -1, 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 TBD

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 [36.213] that corresponds to the maximum transmission configuration (Table 5.6-1).

Table 9.3.2.1.1.3-1 Fading test for single antenna (FDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	10 MHz	
Transmission mode		1 (port 0)	
SNR	dB	6	12
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	-98
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-92	-86
Propagation channel		EPA5	
Correlation		High	
Reporting mode		PUCCH 1-0	
Reporting periodicity	ms	[N_P = 2]	
CQI delay	ms	8	
PUCCH Format		[Format 2]	
PUCCH Report Type		4	
cqi-pmi-ConfigurationIndex		[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 according to Table A.4-1			

Table 9.3.2.1.1.3-2 Minimum requirement (FDD)

	Test 1	Test 2	
α [%]	[20]	[20]	
γ	TBD	TBD	

9.3.2.1.1.4 Test description

9.3.2.1.1.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [FFS].
2. The parameter settings for the cell are set up according to Table 9.3.2.1.1.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.3.2.1.1.4.3.

9.3.2.1.1.4.2 Test procedure

[FFS]

9.3.2.1.1.4.3 Message contents

Message contents are according to [clause FFS in reference FFS].

9.3.2.1.1.5 Test requirement

[FFS]

9.3.2.1.2 TDD Frequency non-selective scheduling mode – PUCCH 1-0

9.3.2.1.2.1 Test purpose

To verify that the UE is tracking the channel variations and selecting the transport format according to the prevailing channel state for frequently non-selective scheduling

9.3.2.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.3.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.3.2.1.2.3-1, [and using the downlink physical channels specified in Annex C,] the minimum requirements are specified in Table 9.3.2.1.2.3-2 and by the following

a) a CQI index not in the set {median CQI -1, 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 TBD

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 [36.213] that corresponds to the maximum transmission configuration (Table 5.6-1).

Table 9.3.2.1.2.3-1: Fading test for single antenna (TDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	10 MHz	
Transmission mode		1 (port 0)	
Uplink downlink configuration		1	
Special subframe configuration		4	
SNR	dB	6	12
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	-98
$\hat{I}_{or}^{(j)}$	dB[mW/15kHz]	-92	-86
Propagation channel		EPA5	
Correlation		High	
Reporting mode		PUCCH 1-0	
Reporting periodicity	ms	[N_P = 1]	
CQI delay	ms	8	
Minimum CQI delay	ms	8	
PUCCH Format		[Format 2]	
PUCCH Report Type		4	
cqi-pmi-ConfigurationIndex		[0]	
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)			

Table 9.3.2.1.2.3-2: Minimum requirement (TDD)

	Test 1	Test 2	
α [%]	[20]	[20]	
γ	TBD	TBD	

9.3.2.1.2.4 Test description

9.3.2.1.2.4.1 Initial conditions

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

Configurations of PDSCH and PDCCH before measurement are specified in Annex C.2.

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [FFS].
2. The parameter settings for the cell are set up according to Table 9.3.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C0, C.1 and Annex C.3.2, and uplink signals according to Annex H.3.2.
4. Propagation conditions are set according to Annex B.0.
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.3.2.1.2.4.3.

9.3.2.1.2.4.2 Test procedure

[FFS]

9.3.2.1.2.4.3 Message contents

Message contents are according to [clause FFS in reference FFS].

9.3.2.1.2.5 Test requirement

[FFS]

9.4 Reporting of Precoding Matrix Indicator (PMI)

[Editors note: the test procedure described in this setion is still FFS]

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 . Transmission mode [8] is used with a fixed transport format (FRC) configured. The requirements are specified in terms of the ratio $\gamma = \frac{t_{ue}}{t_{rnd}}$

Where 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.

9.4.1 Single PMI

9.4.1.1 Single PMI – PUSCH 3-1

9.4.1.1.1 FDD Single PMI – PUSCH 3-1

Editor's note: The following aspects are either missing or not yet determined:

- The Test system uncertainties applicable to this test are undefined
- Test tolerances for SNR have not yet been applied

9.4.1.1.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.1.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.4.1.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.1.1.3-1, [and using the downlink physical channels specified in Annex C,] the minimum requirements are specified in Table 9.4.1.1.1.3-2.

Table 9.4.1.1.1.3-1 PMI test for single-layer (FDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	10	
Transmission mode		6	
Propagation channel		EVA5	
Precoding granularity		50	
Correlation and antenna configuration		Low 2 x 2	
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	
Reporting mode		PUSCH 3-1	
Reporting interval	Ms	[1]	
PMI delay (Note 2)	Ms	8	
Measurement channel		[R.10 FDD]	
Max number of HARQ transmissions		4	
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 9.4.1.1.1.3-2 Minimum requirement (FDD)

	Test 1	Test 2
γ	[1.1]	

9.4.1.1.1.4 Test description

9.4.1.1.1.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.1.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.4.1.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.4.1.1.1.4.3.

9.4.1.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.1.1.3-1 as appropriate. Set SNR to [x] dB.
2. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.

3. If throughput is more than or equal to 60% of the maximum throughput according to Tables G.3.5 and G.3.6 in Annex G clause G.3, go to step 4. Otherwise go to step 5.

4. Decrease SNR by [y] dB and do the same procedure as step 2 until throughput is below 60% of the maximum throughput. Once throughput is below 60% of the maximum throughput, declair current SNR+[y] as SNR_{rnd} and the throughput at SNR_{rnd} as t_{rnd}. Then go to step 6.5. Increase SNR by [y] dB and do the same procedure as step 2 until throughput is more than or equal to 60% of the maximum throughput. Once throughput is more than or equal to 60% of the maximum throughput, declair current SNR as SNR_{rnd} and the throughput at SNR_{rnd} as t_{rnd}. Then go to step 6.

6. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. Measure the average throughput. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.

If the ratio (throughput / t_{rnd}) $\geq \gamma$ which is specified in table 9.4.1.1.1.5-1, then pass the UE. Otherwise fail the UE.

7. Repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.4.1.1.1.3-1 for Test 2.

9.4.1.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.1.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.1.1.1.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction	Not present		
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			

Table 9.4.1.1.1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm31		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.1.1.1.5 Test requirement

Table 9.4.1.1.1.5-1 Test requirement (FDD)

	Test 1	Test 2
γ	[1.1+TT]	

The ratio of throughput using precoding matrix of PMI reports from the UE to using random precoding matrix shall equal or exceed the value specified in table 9.4.1.1.1.5.

9.4.1.1.2 TDD Single PMI – PUSCH 3-1

9.4.1.1.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.1.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.4.1.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.1.1.2.3-1, [and using the downlink physical channels specified in Annex C,] the minimum requirements are specified in 9.4.1.1.2.3-2.

Table 9.4.1.1.2.3-1 PMI test for single-layer (TDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	10	
Transmission mode		6	
Uplink downlink configuration		1	
Special subframe configuration		4	
Propagation channel		EVA5	
Precoding granularity		50	
Correlation and antenna configuration		Low 2 x 2	
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	
Reporting mode		PUSCH 3-1	
Reporting interval	Ms	[1]	
Minimum PMIdelay (Node-2)	Ms	8	
Measurement channel		[R.2 TDD]	
Max number of HARQ transmissions		4	
Note 1: For random precoder selection, the precoder shall be updated in each available downlink transmission instance Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 9.4.1.1.2.3-2 Minimum requirement (TDD)

	Test 1	Test 2
γ	[1.1]	

9.4.1.1.2.4 Test description

9.4.1.1.2.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [FFS].
2. The parameter settings for the cell are set up according to Table 9.4.1.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.4.1.1.2.4.3.

9.4.1.1.2.4.2 Test procedure

[FFS]

9.4.1.1.2.4.3 Message contents

Message contents are according to [clause FFS in FFS].

9.4.1.1.2.5 Test requirement

[FFS]

9.4.2 Multiple PMI

9.4.2.1 Multiple PMI – PUSCH 1-2

9.4.2.1.1 FDD Multiple PMI – PUSCH 1-2

Editor's note: The following aspects are either missing or not yet determined:

- The Test system uncertainties applicable to this test are undefined
- Test tolerances for SNR have not yet been applied

9.4.2.1.1.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.1.1.2 Test applicability

This test applies to all types of E-UTRA FDD UE release 8 and forward.

9.4.2.1.1.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.1.3-1, [and using the downlink physical channels specified in Annex C,] the minimum requirements are specified in 9.4.2.1.1.3-2.

Table 9.4.2.1.1.3-1 PMI test for single-layer (FDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	20	
Transmission mode		6	
Propagation channel		EPA5	
Precoding granularity		8	
Correlation and antenna configuration		Low 2 x 2	
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	
Reporting mode		PUSCH 1-2	
Reporting interval	Ms	[1]	
PMI delay	Ms	8	
Measurement channel		[R.30 FDD]	
Max number of HARQ transmissions		4	
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 eNB downlink before SF#(n+4)			

Table 9.4.2.1.1.3-2 Minimum requirement (FDD)

	Test 1	Test 2
γ	[1.2]	

9.4.2.1.1.4 Test description

9.4.2.1.1.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 20MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure A.10.
2. The parameter settings for the cell are set up according to Table 9.4.2.1.1.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.4.2.1.1.4.3.

9.4.2.1.1.4.2 Test procedure

1. Set the parameters of bandwidth, the propagation condition, antenna configuration and measurement channel according to Table 9.4.1.1.1.3-1 as appropriate. Set SNR to [x] dB.
2. The SS shall transmit PDSCH with randomly selected precoding matrix from codebook (Table 6.3.4.2.3-1 in TS 36.213 [10]) every subframe regardless of PMI reports from the UE. Note that each precoding matrix shall be selected in equal probabilities. Measure the average throughput for a duration sufficient to achieve statistical

significance according to Annex G clause G.3. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.

3. If throughput is more than or equal to 60% of the maximum throughput according to Tables G.3.5 and G.3.6 in Annex G clause G.3, go to step 4. Otherwise go to step 5.
4. Decrease SNR by [y] dB and do the same procedure as step 2 until throughput is below 60% of the maximum throughput. Once throughput is below 60% of the maximum throughput, declair current SNR+[y] as SNR_{rnd} and the throughput at SNR_{rnd} as t_{rnd}. Then go to step 6.
5. Increase SNR by [y] dB and do the same procedure as step 2 until throughput is more than or equal to 60% of the maximum throughput. Once throughput is more than or equal 60% of the maximum throughput, declair current SNR as SNR_{rnd} and the throughput at SNR_{rnd} as t_{rnd}. Then go to step 6.
6. Set SNR to SNR_{rnd}. The SS shall transmit PDSCH with precoding matrix according to PMI report from the UE. Measure the average throughput. Count the number of NACKs, ACKs and statDTXs on the UL during the test interval.

   If the ratio (throughput / t_{rnd}) $\geq \gamma$ which is specified in table 9.4.2.1.1.5-1, then pass the UE. Otherwise fail the UE.

7. Repeat the same procedure (steps 1 to 6) with test conditions according to the table 9.4.2.1.1.3-1 for Test 2.

9.4.2.1.1.4.3 Message contents

Message contents are according to TS 36.508 [7] clause 4.6 with the following exceptions:

Table 9.4.2.1.1.4.3-1: *PhysicalConfigDedicated-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
PhysicalConfigDedicated-DEFAULT ::= SEQUENCE {			
antennaInfo CHOICE {			
explicitValue	AntennaInfoDedicated		
}			
}			

Table 9.4.2.1.1.4.3-2: *AntennaInfoDedicated*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
AntennaInfoDedicated ::= SEQUENCE {			
transmissionMode	tm6		
codebookSubsetRestriction	Not present		
ue-TransmitAntennaSelection CHOICE{			
release	NULL		
}			

Table 9.4.2.1.1.4.3-3: *CQI-ReportConfig-DEFAULT*

Derivation Path: 36.331 clause 6.3.2			
Information Element	**Value/remark**	**Comment**	**Condition**
CQI-ReportConfig-DEFAULT ::= SEQUENCE {			
cqi-ReportModeAperiodic	rm12		
nomPDSCH-RS-EPRE-Offset	0		
cqi-ReportPeriodic	Not present		
}			

9.4.2.1.1.5 Test requirement

Table 9.4.2.1.1.5-1 Test requirement (FDD)

	Test 1	Test 2
γ	[1.2+TT]	

9.4.2.1.2 TDD Multiple PMI – PUSCH 1-2

9.4.2.1.2.1 Test purpose

To test the accuracy of the Precoding Matrix Indicator (PMI) reporting such that the system throughput is maximized based on the precoders configured according to the UE reports.

9.4.2.1.2.2 Test applicability

This test applies to all types of E-UTRA TDD UE release 8 and forward.

9.4.2.1.2.3 Minimum conformance requirements

For the parameters specified in Table 9.4.2.1.2.3-1, [and using the downlink physical channels specified in Annex C,] the minimum requirements are specified in 9.4.2.1.2.3-2.

Table 9.4.2.1.2.3-1 PMI test for single-layer (TDD)

Parameter	Unit	Test 1	Test 2
Bandwidth	MHz	20	
Transmission mode		6	
Uplink downlink configuration		1	
Special subframe configuration		4	
Propagation channel		EPA5	
Precoding granularity		8	
Correlation and antenna configuration		Low 2 x 2	
$N_{oc}^{(j)}$	dB[mW/15kHz]	-98	
Reporting mode		PUSCH 1-2	
Reporting interval	Ms	[1]	
Minimum PMI delay	Ms	8	
Measurement channel		[16QAM 1/2]	
Max number of HARQ transmissions		4	
Note 1: For random precoder selection, the precoders shall be updated in each available downlink transmission instance Note 2: If the UE reports in an available uplink reporting instance at subrame SF#n based on PMI estimation at a downlink SF not later than SF#(n-4), this reported PMI cannot be applied at the eNB downlink before SF#(n+4)			

Table 9.4.2.1.2.3-2 Minimum requirement (TDD)

	Test 1	Test 2
γ	[1.2]	

9.4.2.1.2.4 Test description

9.4.2.1.2.4.1 Initial conditions

Test Environment: Normal as defined in TS 36.508 [7] clause 4.1.

Frequencies to be tested: Mid Range as defined in TS 36.508 [7] clause 4.3.1.2.

Channel Bandwidths to be tested: 10MHz, as defined in TS 36.508 [7] clause 4.3.1.2

1. Connect the SS to the UE antenna connector (s) as shown in TS 36.508 [7] Annex A, Figure [FFS].
2. The parameter settings for the cell are set up according to Table 9.4.2.1.2.3-1.
3. Downlink signals are initially set up according to Annex C.1 and Annex C.3.2, and uplink signals according to Annex H.1 and H.3.2.
4. Propagation conditions are set according to Annex B clause B.0
5. Ensure the UE is in State 4 according to TS 36.508 [7] clause 4.5.4 and receiving payload data from the SS. Message contents are defined in clause 9.4.2.1.2.4.3.

9.4.2.1.2.4.2 Test procedure

[FFS]

9.4.2.1.2.4.3 Message contents

Message contents are according to [clause FFS in FFS].

9.4.2.1.2.5 Test requirement

[FFS]

Annex A (normative): Measurement Channels

A.1 General

A schematic overview of the encoding process for the reference measurement channels is provided in Figure A-1.

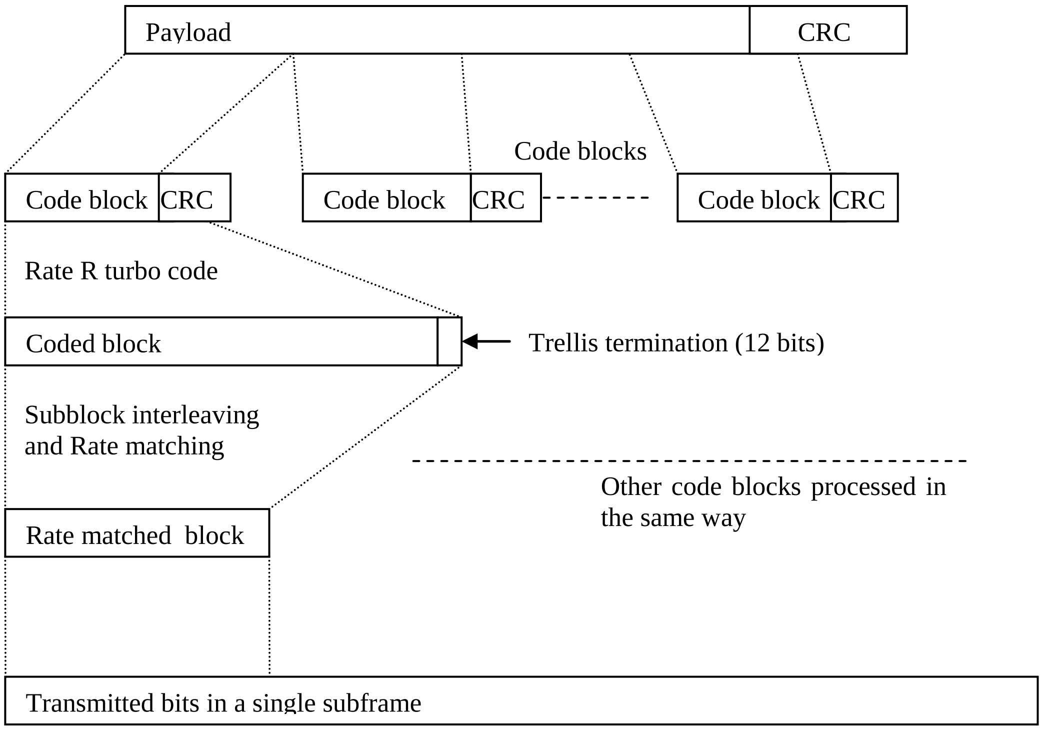

Figure A-1: Schematic overview of the encoding process

A.2 UL reference measurement channels

A.2.1 General

A.2.1.1 Applicability and common parameters

The following sections define the UL signal applicable to the Transmitter Characteristics (clause 6) and for the Receiver Characteristics (clause 7) where the UL signal is relevant.

The Reference channels in this section assume transmission of PUSCH and Demodulation Reference signal only. The following conditions apply:

- HARQ transmission
- Cyclic Prefix normal

- PUSCH hopping off
- Link adaptation off
- Demodulation Reference signal as per TS 36.211 [8] subclause 5.5.2.1.2.

Where ACK/NACK is transmitted, it is assumed to be multiplexed on PUSCH as per TS 36.212 [9] 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,

$$\min\left|R-(A+24)/N_{ch}\right|,$$

subject to

a) A is a valid TB size according to clause 7.1.7 of TS 36.213 [10] assuming an allocation of N_{RB} resource blocks.

b) Segmentation is not included in this formula, but should be considered in the TBS calculation.

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.

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	Value					
Channel bandwidth	**MHz**	**1.4**	**3**	**5**	**10**	**15**	**20**
Allocated resource blocks		6	15	25	50	75	100
DFT-OFDM Symbols per subframe		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 - C		1	1	1	1	1	1
Code block CRC size	Bits	0	0	0	0	0	0
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		1-5	1-5	1-5	1-5	1-5	1-5

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	Value					
Channel bandwidth	**MHz**	**1.4**	**3**	**5**	**10**	**15**	**20**
Allocated resource blocks		6	15	25	50	75	100
DFT-OFDM Symbols per subframe		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 - C		1	1	1	4	4	4
Code block CRC size	Bits	0	0	0	24	24	24
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		1-5	1-5	1-5	2-5	2-5	2-5

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

Table A.2.2.2.1-1: Reference Channels for 1.4MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**1.4**	**1.4**
Allocated resource blocks		1	5
DFT-OFDM Symbols per subframe		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/3
Payload size	Bits	72	424
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame	Bits	288	1440
Total symbols per sub-frame		144	720
UE Category		1-5	1-5

Table A.2.2.2.1-2: Reference Channels for 3MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**3**	**3**
Allocated resource blocks		1	4
DFT-OFDM Symbols per subframe		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/3
Payload size	Bits	72	392
Transport block CRC	Bits	24	24
Number of code blocks – C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame	Bits	288	1152
Total symbols per sub-frame		144	576
UE Category		1-5	1-5

Table A.2.2.2.1-3: Reference Channels for 5MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	**MHz**	**5**	**5**	**5**
Allocated resource blocks		1	8	20
DFT-OFDM Symbols per subframe		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3
Payload size	Bits	72	808	1736
Transport block CRC	Bits	24	24	24
Number of code blocks - C		1	1	1
Code block CRC size	Bits	0	0	0
Total number of bits per sub-frame	Bits	288	2304	5760
Total symbols per sub-frame		144	1152	2880
UE Category		1-5	1-5	1-5

Table A.2.2.2.1-4: Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value
Channel bandwidth	**MHz**	**10**	**10**	**10**	**10**
Allocated resource blocks		1	12	20	25
DFT-OFDM Symbols per subframe		12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3
Payload size	Bits	72	1224	1736	2216
Transport block CRC	Bits	24	24	24	24
Number of code blocks - C		1	1	1	1
Code block CRC size	Bits	0	0	0	0
Total number of bits per sub-frame	Bits	288	3456	5760	7200
Total symbols per sub-frame		144	1728	2880	3600
UE Category		1-5	1-5	1-5	1-5

Table A.2.2.2.1-5: Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	**MHz**	**15**	**15**	**15**
Allocated resource blocks		1	16	50
DFT-OFDM Symbols per subframe		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3
Payload size	Bits	72	1384	5160
Transport block CRC	Bits	24	24	24
Number of code blocks - C		1	1	1
Code block CRC size	Bits	0	0	0
Total number of bits per sub-frame	Bits	288	4608	14400
Total symbols per sub-frame		144	2304	7200
UE Category		1-5	1-5	1-5

Table A.2.2.2.1-6: Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	**MHz**	**20**	**20**	**20**	**20**	**20**
Allocated resource blocks		1	18	25	50	75
DFT-OFDM Symbols per subframe		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5
Payload size	Bits	72	1864	2216	5160	3492
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks - C		1	1	1	1	1
Code block CRC size	Bits	0	0	0	0	0
Total number of bits per sub-frame	Bits	288	5184	7200	14400	21600
Total symbols per sub-frame		144	2592	3600	7200	10800
UE Category		1-5	1-5	1-5	1-5	1-5

A.2.2.2.2 16-QAM

Table A.2.2.2.2-1: Reference Channels for 1.4MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**1.4**	**1.4**
Allocated resource blocks		1	5
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	2152
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame	Bits	576	2880
Total symbols per sub-frame		144	720
UE Category		1-5	1-5

Table A.2.2.2.2-2: Reference Channels for 3MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**3**	**3**
Allocated resource blocks		1	4
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	1736
Transport block CRC	Bits	24	24
Number of code blocks – C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame	Bits	576	2304
Total symbols per sub-frame		144	576
UE Category		1-5	1-5

Table A.2.2.2.2-3: Reference Channels for 5MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**5**	**5**
Allocated resource blocks		1	8
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	3496
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame	Bits	576	4608
Total symbols per sub-frame		144	1152
UE Category		1-5	1-5

Table A.2.2.2.2-4: Reference Channels for 10MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**10**	**10**
Allocated resource blocks		1	12
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size	Bits	408	5160
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame	Bits	576	6912
Total symbols per sub-frame		144	1728
UE Category		1-5	1-5

Table A.2.2.2.2-5: Reference Channels for 15MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**15**	**15**
Allocated resource blocks		1	16
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	1/2
Payload size	Bits	408	4584
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame	Bits	576	9216
Total symbols per sub-frame		144	2304
UE Category		1-5	1-5

Table A.2.2.2.2-6: Reference Channels for 20MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	**MHz**	**20**	**20**
Allocated resource blocks		1	18
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	1/2
Payload size	Bits	408	5160
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame	Bits	576	10368
Total symbols per sub-frame		144	2592
UE Category		1-5	1-5

A.2.2.2.3 64-QAM

[FFS]

A.2.3 Reference measurement channels for TDD

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

A.2.3.1 Full RB allocation

A.2.3.1.1 QPSK

Table A.2.3.1.1-1: Reference Channels for QPSK with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration		1	1	1	1	1	1
DFT-OFDM Symbols per subframe		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 - C		1	1	1	1	1	1
Code block CRC size	Bits	0	0	0	0	0	0
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		1-5	1-5	1-5	1-5	1-5	1-5

A.2.3.1.2 16-QAM

Table A.2.3.1.2-1: Reference Channels for 16-QAM with full RB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration		1	1	1	1	1	1
DFT-OFDM Symbols per subframe		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	1736	4264	4968	21384	21384	19848
Transport block CRC	Bits	24	24	24	24	24	24
Number of code blocks - C		1	1	1	4	4	4
Code block CRC size	Bits	0	0	0	24	24	24
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		1-5	1-5	1-5	2-5	2-5	2-5

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 1.4MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	1.4	1.4
Allocated resource blocks		1	5
Uplink-Downlink Configuration		1	1
DFT-OFDM Symbols per subframe		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/3
Payload size			
For Sub-Frame 2,3,7,8	Bits	72	424
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame			
For Sub-Frame 2,3,7,8	Bits	288	1440
Total symbols per sub-frame			
For Sub-Frame 2,3,7,8		144	720
UE Category		1-5	1-5

Table A.2.3.2.1-2: Reference Channels for 3MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	3	3
Allocated resource blocks		1	4
Uplink-Downlink Configuration		1	1
DFT-OFDM Symbols per subframe		12	12
Modulation		QPSK	QPSK
Target Coding rate		1/3	1/3
Payload size			
For Sub-Frame 2,3,7,8	Bits	72	392
Transport block CRC	Bits	24	24
Number of code blocks – C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame			
For Sub-Frame 2,3,7,8	Bits	288	1152
Total symbols per sub-frame			
For Sub-Frame 2,3,7,8		144	576
UE Category		1-5	1-5

Table A.2.3.2.1-3: Reference Channels for 5MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	MHz	5	5	5
Allocated resource blocks		1	8	20
Uplink-Downlink Configuration		1	1	1
DFT-OFDM Symbols per subframe		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3
Payload size				
For Sub-Frame 2,3,7,8	Bits	72	808	1736
Transport block CRC	Bits	24	24	24
Number of code blocks - C		1	1	1
Code block CRC size	Bits	0	0	0
Total number of bits per sub-frame	Bits			
For Sub-Frame 2,3,7,8		288	2304	5760
Total symbols per sub-frame				
For Sub-Frame 2,3,7,8		144	1152	2880
UE Category		1-5	1-5	1-5

Table A.2.3.2.1-4: Reference Channels for 10MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value
Channel bandwidth	MHz	10	10	10	10
Allocated resource blocks		1	12	20	25
Uplink-Downlink Configuration		1	1	1	1
DFT-OFDM Symbols per subframe		12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3
Payload size					
For Sub-Frame 2,3,7,8	Bits	72	1224	1736	2216
Transport block CRC	Bits	24	24	24	24
Number of code blocks - C		1	1	1	1
Code block CRC size	Bits	0	0	0	0
Total number of bits per sub-frame					
For Sub-Frame 2,3,7,8	Bits	288	3456	5760	7200
Total symbols per sub-frame					
For Sub-Frame 2,3,7,8		144	1728	2880	3600
UE Category		1-5	1-5	1-5	1-5

Table A.2.3.2.1-5: Reference Channels for 15MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value
Channel bandwidth	MHz	15	15	15
Allocated resource blocks		1	16	50
Uplink-Downlink Configuration		1	1	1
DFT-OFDM Symbols per subframe		12	12	12
Modulation		QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3
Payload size				
For Sub-Frame 2,3,7,8	Bits	72	1384	5160
Transport block CRC	Bits	24	24	24
Number of code blocks - C		1	1	1
Code block CRC size	Bits	0	0	0
Total number of bits per sub-frame				
For Sub-Frame 2,3,7,8	Bits	288	4608	14400
Total symbols per sub-frame				
For Sub-Frame 2,3,7,8		144	2304	7200
UE Category		1-5	1-5	1-5

Table A.2.3.2.1-6: Reference Channels for 20MHz QPSK with partial RB allocation

Parameter	Unit	Value	Value	Value	Value	Value
Channel bandwidth	MHz	20	20	20	20	20
Allocated resource blocks		1	18	25	50	75
Uplink-Downlink Configuration		1	1	1	1	1
DFT-OFDM Symbols per subframe		12	12	12	12	12
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding rate		1/3	1/3	1/3	1/3	1/5
Payload size						
For Sub-Frame 2,3,7,8	Bits	72	1864	2216	5160	4392
Transport block CRC	Bits	24	24	24	24	24
Number of code blocks - C		1	1	1	1	1
Code block CRC size	Bits	0	0	0	0	0
Total number of bits per sub-frame						
For Sub-Frame 2,3,7,8	Bits	288	5184	7200	14400	21600
Total symbols per sub-frame						
For Sub-Frame 2,3,7,8		144	2592	3600	7200	10800
UE Category		1-5	1-5	1-5	1-5	1-5

A.2.3.2.2 16-QAM

Table A.2.3.2.2-1: Reference Channels for 1.4MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	1.4	1.4
Allocated resource blocks		1	5
Uplink-Downlink Configuration		1	1
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	2152
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame			
For Sub-Frame 2,3,7,8	Bits	576	2880
Total symbols per sub-frame			
For Sub-Frame 2,3,7,8		144	720
UE Category		1-5	1-5

Table A.2.3.2.2-2: Reference Channels for 3MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	3	3
Allocated resource blocks		1	4
Uplink-Downlink Configuration		1	1
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	1736
Transport block CRC	Bits	24	24
Number of code blocks – C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame			
For Sub-Frame 2,3,7,8	Bits	576	2304
Total symbols per sub-frame			
For Sub-Frame 2,3,7,8		144	576
UE Category		1-5	1-5

Table A.2.3.2.2-3: Reference Channels for 5MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	5	5
Allocated resource blocks		1	8
Uplink-Downlink Configuration		1	1
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	3496
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame			
For Sub-Frame 2,3,7,8	Bits	576	4608
Total symbols per sub-frame			
For Sub-Frame 2,3,7,8		144	1152
UE Category		1-5	1-5

Table A.2.3.2.2-4: Reference Channels for 10MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	10	10
Allocated resource blocks		1	12
Uplink-Downlink Configuration		1	1
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	3/4
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	5160
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame			
For Sub-Frame 2,3,7,8	Bits	576	6912
Total symbols per sub-frame			
For Sub-Frame 2,3,7,8		144	1728
UE Category		1-5	1-5

Table A.2.3.2.2-5: Reference Channels for 15MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	15	15
Allocated resource blocks		1	16
Uplink-Downlink Configuration		1	1
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	1/2
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	4584
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame			
For Sub-Frame 2,3,7,8	Bits	576	9216
Total symbols per sub-frame			
For Sub-Frame 2,3,7,8		144	2304
UE Category		1-5	1-5

Table A.2.3.2.2-6: Reference Channels for 20MHz 16-QAM with partial RB allocation

Parameter	Unit	Value	Value
Channel bandwidth	MHz	20	20
Allocated resource blocks		1	18
Uplink-Downlink Configuration		1	1
DFT-OFDM Symbols per subframe		12	12
Modulation		16QAM	16QAM
Target Coding rate		3/4	1/2
Payload size			
For Sub-Frame 2,3,7,8	Bits	408	5160
Transport block CRC	Bits	24	24
Number of code blocks - C		1	1
Code block CRC size	Bits	0	0
Total number of bits per sub-frame			
For Sub-Frame 2,3,7,8	Bits	576	10368
Total symbols per sub-frame			
For Sub-Frame 2,3,7,8		144	2592
UE Category		1-5	1-5

A.2.3.2.3 64-QAM

[FFS]

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,

$$\min\left|R-(A+24)/N_{ch}\right|,$$

subject to

a) A is a valid TB size (according to TS 36.213 [10] clause 7.1.7) assuming an allocation of N_{RB} resource blocks]

b) Segmentation is not included in this formula, but should be considered in the TBS calculation

3. If there is more than one *A* that minimizes the equation above, then the larger value is chosen per default.
4. For TDD, the measurement channel is based on DL/UL configuration ratio of 2DL+DwPTS (12 OFDM symbol): 2UL

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 sub-clause 7.4 (Maximum input level).

Tables A.3.2-3 and A.3.2-4 are applicable for sub-clause 7.4 (Maximum input level).

Tables A.3.2-1 and A.3.2-2 also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

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

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
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 subframe(see Note 4)		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	1143.2	1952.8	3952.8	6040.8	7884
		1-5	1-5	1-5	1-5	1-5	1-5

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 [8]

NOTE 3: The RLC should be configured to Unacknowledged Mode

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.3.2-2: Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit	Value					
Channel Bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Uplink-Downlink Configuration		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		4	4+2	4+2	4+2	4+2	4+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 (see Note 5)							
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 1frame	kbps	102.4	564	932	1965.6	3007.2	3970.4
UE Category		1-5	1-5	1-5	1-5	1-5	1-5

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.

Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance

Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 4: The RLC should be configured to Unacknowledged Mode

Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

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

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
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 (see Note 4)		1	2	3	5	8	11
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	18900	41400	62100	82800
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	n/a	8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	12547	27294	42046	55498

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz
Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 3: The RLC should be configured to Unacknowledged Mode
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.3.2-3a: Fixed Reference Channel for Maximum input level for UE Category 1 (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks (see Note 5)		6	15	16 (Note 5)	16 (Note 5)	16 (Note 5)	16 (Note 5)
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
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	7480	9912	9912	9912
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (see Note 4)		1	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	13824	13824	13824	13824
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	10008	13248	13248	13248
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	8984.8	9228	9228	9228

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 [8]
Note 3: The RLC should be configured to Unacknowledged Mode
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: In case of partial allocation, the unallocated RB-s are filled with OCNG (Annex A.5). The total signal mean power and the power density over the channel bandwidth configuration i.e. for data (allocated RB-s) and OCNG (unallocated RB-s) remain the same as for full allocation.

Table A.3.2-3b: Fixed Reference Channel for Maximum input level for UE Category 2 (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks (see Note 5)		6	15	25	50	75	80 (Note 5)
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
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	48936
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (see Note 4)		1	2	3	5	8	9 8
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4104	11340	18900	41400	62100	69120
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	64152
Max. Throughput averaged over 1 frame	kbps	2387.2	7448.8	12547	27294	42046	4571,3

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 [8]

Note 3: The RLC should be configured to Unacknowledged Mode

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: In case of partial allocation, the unallocated RB-s are filled with OCNG (Annex A.5). The total signal mean power and the power density over the channel bandwidth configuration i.e. for data (allocated RB-s) and OCNG (unallocated RB-s) remain the same as for full allocation.

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

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration		1	1	1	1	1	1
Allocated subframes per Radio Frame		4	4+2	4+2	4+2	4+2	4+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 (see Note 5)							
For Sub-Frames 4,9		1	2	3	5	8	11
For Sub-Frames 1,6		n/a	2	3	5	7	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	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	16380	39312	60012	80712
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	27877

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.
Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: The RLC should be configured to Unacknowledged Mode
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).

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

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks (see Note 6)		6	15	16 (Note 6)	16 (Note 6)	16 (Note 6)	16 (Note 6)
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration		1	1	1	1	1	1
Allocated subframes per Radio Frame		4	4+2	4+2	4+2	4+2	4+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	7480	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	7480	9912	9912	9912
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (see Note 5)							
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	13824	13824	13824	13824
For Sub-Frames 1,6		n/a	9828	10512	10944	10944	10944
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	10008	13248	13248	13248
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	4303.2	4546.4	4546.4	4546.4

Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs.

Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance

Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 4: The RLC should be configured to Unacknowledged Mode

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: In case of partial allocation, the unallocated RB-s are filled with OCNG (Annex A.5). The total signal mean power and the power density over the channel bandwidth configuration i.e. for data (allocated RB-s) and OCNG (unallocated RB-s) remain the same as for full allocation.

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

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks (see Note 6)		6	15	25	50	75	80 (Note 6)
Subcarriers per resource block		12	12	12	12	12	12
Uplink-Downlink Configuration		1	1	1	1	1	1
Allocated subframes per Radio Frame		4	4+2	4+2	4+2	4+2	4+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	37888
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	48936
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per Sub-Frame (see Note 5)							
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	8
Binary Channel Bits per Sub-Frame							
For Sub-Frames 4,9	Bits	4104	11340	18900	41400	62100	69120
For Sub-Frames 1,6		n/a	9828	16668	33768	50868	54288
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	64152
Max. Throughput averaged over 1 frame	kbps	596.8	3791.2	6369.6	13910	20945	22676
Note 1: For normal subframes(0,4,5,9), 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For special subframe (1&6), only 2 OFDM symbols are allocated to PDCCH for all BWs. Note 2: For 1.4MHz, no data shall be scheduled on special subframes(1&6) to avoid problems with insufficient PDCCH performance Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8] Note 4: The RLC should be configured to Unacknowledged Mode 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 5: In case of partial allocation, the unallocated RB-s are filled with OCNG (Annex A.5). The total signal mean power and the power density over the channel bandwidth configuration i.e. for data (allocated RB-s) and OCNG (unallocated RB-s) remain the same as for full allocation.							

A.3.2A Downlink Reference measurement channel for TX characteristics

Tables A.3.2A-1 and A.3.2A-2 describes the reference measurement channels to be used on the downlink during Transmitter Characteristics (clause 6) for FDD and TDD respectively. The number of allocated resource blocks have been defined (partial allocation) to allow the transmission of PBCH, PSS/SSS and system information mapped on PDSCH.

Table A.3.2A-1: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (FDD)

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	4	8	16	25	30
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		10	10	10	10	10	10
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		(NOTE 5)	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							
For Sub-Frames 0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Bits	152	328	680	1384	2216	2664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks per subframe		1	1	1	1	1	1
Code block CRC size	Bits	0	0	0	0	0	0
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1, 2, 3, 4, 6, 7, 8, 9	Bits	1368	1008	2016	4416	6900	8280
For Sub-Frames 5		1080	1008	2016	4416	6900	8280
For Sub-Frames 0		528	1008	2016	4416	6900	8280
Max. Throughput averaged over 1 frame	kbps	152	328	680	1384	2216	2664

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10MHz channel BW. 3 symbols allocated to PDCCH for 5 MHz and 3 MHz. 4 symbols allocated to PDCCH for 1.4 MHz

Note 2: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]

Note 3: The RLC should be configured to Unacknowledged Mode

Note 4: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel bandwidth and transmitted in the resource blocks not containing PBCH, PSS/SSS.

Note 5: To ensure constant transport block size in 1.4MHz, the code rate for subframes varies approx. within {1/6-1/3}

Table A.3.2A-2: Fixed DL PDSCH Dedicated Reference Channel for TX Requirements (TDD)

Parameter	Unit	Value					
Channel Bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	4	8	16	25	30
Uplink-Downlink Configuration(NOTE 7)		1	1	1	1	1	1
Allocated subframes per Radio Frame (D+S)		4	4	4	4	4	4
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		(NOTE 6)	1/3	1/3	1/3	1/3	1/3
Information Bit Payload per Sub-Frame	Bits						
For Sub-Frame 1, 6		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 0, 4, 5, 9		208	328	680	1384	2216	2664
Transport block CRC	Bits	24	24	24	24	24	24
Number of Code Blocks		1	1	1	1	1	1
Code block CRC size		0	0	0	0	0	0
Binary Channel Bits Per Sub-Frame	Bits						
For Sub-Frame 1, 6		n/a	n/a	n/a	n/a	n/a	n/a
For Sub-Frame 4, 9		1368	1008	2016	4416	6900	8280
For Sub-Frame 0		672	1008	2016	4416	6900	8280
For Sub-Frame 5		1224	1008	2016	4416	6900	8280
Max. Throughput averaged over one frame	kbps	83.2	131.2	272	553.6	886.4	1065.6

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 simplicity, no data shall be scheduled on special subframes (1&6).
Note 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: The RLC should be configured to Unacknowledged Mode
Note 5: The PDSCH shall be assigned to the UE under test with a set of allocated localized virtual resource blocks starting from one end of the channel bandwidth and transmitted in the resource blocks not containing PBCH, PSS/SSS.
NOTE 6: To ensure constant transport block size in 1.4MHz, the code rate for subframes varies approx. within {1/6-1/3}. In order to have a constant transport block size for 1.4MHz, the code rate for different subframes varies in a range approx. {1/6-1/3}.
NOTE 7: as per Table 4.2-2 in TS 36.211 [8]

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

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

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

Parameter	Unit	Value					
Reference channel		[R.4 FDD]			[R.2 FDD]		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Allocated subframes per Radio Frame		10			10		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408			4392		
For Sub-Frame 5	Bits	n/a			n/a		
For Sub-Frame 0	Bits	152			4392		
Number of Code Blocks per Sub-Frame (see Note 3)		1			1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1368			13800		
For Sub-Frame 5	Bits	n/a			n/a		
For Sub-Frame 0	Bits	528			12960		
Max. Throughput averaged over 1 frame	Mbps	0.342			3.953		
UE Category		1-5			1-5		
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 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.3.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel					[R.3 FDD]		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Allocated subframes per Radio Frame					10		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits				14112		
For Sub-Frame 5	Bits				n/a		
For Sub-Frame 0	Bits				12960		
Number of Code Blocks per Sub-Frame (see Note 3)					3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits				27600		
For Sub-Frame 5	Bits				n/a		
For Sub-Frame 0	Bits				25920		
Max. Throughput averaged over 1 frame	Mbps				12.586		
UE Category					2-5		
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 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

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

Parameter	Unit	Value					
Reference channel			[R.5 FDD]	[R.6 FDD]	[R.7 FDD]	[R.8 FDD]	[R.9 FDD]
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks			15	25	50	75	100
Allocated subframes per Radio Frame			10	10	10	10	10
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 (see Note 3)			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			1-5	2-5	2-5	2-5	3-5
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 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

Table A.3.3.1-4: Fixed Reference Channel Single PRB (Channel Edge)

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			10		10		
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 (see Note 3)			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			1-5		1-5		
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 [8] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)							

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

Parameter	Unit	Value
Reference channel		R.29 FDD (MBSFN)
Channel bandwidth	MHz	10
Allocated resource blocks		1
MBSFN Configuration		TBD
Allocated subframes per Radio Frame		4
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 4,9	Bits	256
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	256
For Sub-Frame 1,2,3,6,7,8	Bits	0 (MBSFN)
Number of Code Blocks per subframe (see Note 3)		1
Binary Channel 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. Throughput averaged over 1 frame	kbps	102.4
UE Category		
Note 1: 2 symbols allocated to PDCCH Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [4] Note 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit		

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

A.3.3.2.1 Two antenna ports

Table A.3.3.2.1-1: Fixed Reference Channel two antenna ports

Parameter	Unit	Value					
Reference channel			[R.10 FDD]	[R.11 FDD]			
Channel bandwidth	MHz		10	10			
Allocated resource blocks			50	50			
Allocated subframes per Radio Frame			10	10			
Modulation			QPSK	16QAM			
Target Coding Rate			1/3	1/2			
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		4392	12960			
For Sub-Frame 5	Bits		n/a	n/a			
For Sub-Frame 0	Bits		4392	12960			
Number of Code Blocks per Sub-Frame (see Note 3)			1	3			
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits		13200	26400			
For Sub-Frame 5	Bits		n/a	n/a			
For Sub-Frame 0	Bits		12384	24768			
Max. Throughput averaged over 1 frame	Mbps		3.953	11.664			
UE Category			1-5	2-5			
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 [8] 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.3.3.2.2 Four antenna ports

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

Parameter	Unit	Value					
Reference channel		[R.12 FDD]	[R.13 FDD]	[R.14 FDD]			
Channel bandwidth	MHz	1.4	10	10			
Allocated resource blocks		6	50	50			
Allocated subframes per Radio Frame		10	10	10			
Modulation		QPSK	QPSK	16QAM			
Target Coding Rate		1/3	1/3	1/2			
Information Bit Payload							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	4392	12960			
For Sub-Frame 5	Bits	n/a	n/a	n/a			
For Sub-Frame 0	Bits	152	3624	11448			
Number of Code Blocks per Sub-Frame (see Note 3)							
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	3			
For Sub-Frame 5		n/a	n/a	n/a			
For Sub-Frame 0		1	1	2			
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	1248	12800	25600			
For Sub-Frame 5	Bits	n/a	n/a	n/a			
For Sub-Frame 0	Bits	480	12032	24064			
Max. Throughput averaged over 1 frame	Mbps	0.342	3.876	11.513			
UE Category		1-5	1-5	2-5			

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 [8]
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.3.4 Reference measurement channel for PDSCH performance requirements (TDD)

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

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

Parameter	Unit	Value					
Reference channel		[R.4 TDD]			[R.2 TDD]		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6			50		
Uplink-Downlink Configuration (Note 3)		1			1		
Allocated subframes per Radio Frame (D+S)		4+2			4+2		
Modulation		QPSK			QPSK		
Target Coding Rate		1/3			1/3		
Information Bit Payload							
For Sub-Frames 4,9	Bits	408			4392		
For Sub-Frames 1,6	Bits	n/a			3240		
For Sub-Frame 5	Bits	n/a			n/a		
For Sub-Frame 0	Bits	208			4392		
Number of Code Blocks per Sub-Frame (see Note 5)		1			1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits	1368			13800		
For Sub-Frames 1,6	Bits	n/a			11256		
For Sub-Frame 5	Bits	n/a			n/a		
For Sub-Frame 0	Bits	672			13104		
Max. Throughput averaged over 1 frame	Mbps	0.102			1.966		
UE Category		1-5			1-5		

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.
Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: as per Table 4.2-2 in TS 36.211 [8]
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.4.1-2: Fixed Reference Channel 16QAM R=1/2

Parameter	Unit	Value					
Reference channel					[R.3 TDD]		
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks					50		
Uplink-Downlink Configuration (Note 3)					1		
Allocated subframes per Radio Frame (D+S)					4+2		
Modulation					16QAM		
Target Coding Rate					1/2		
Information Bit Payload							
For Sub-Frames 4,9	Bits				14112		
For Sub-Frames 1,6	Bits				11448		
For Sub-Frame 5	Bits				n/a		
For Sub-Frame 0	Bits				12960		
Number of Code Blocks per Sub-Frame (see Note 4)							
For Sub-Frames 4,9					3		
For Sub-Frames 1,6					2		
For Sub-Frame 5					n/a		
For Sub-Frame 0					3		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits				27600		
For Sub-Frames 1,6	Bits				22512		
For Sub-Frame 5	Bits				n/a		
For Sub-Frame 0	Bits				26208		
Max. Throughput averaged over 1 frame	Mbps				6.408		
UE Category					2-5		

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 [8]

Note 3: as per Table 4.2-2 in TS 36.211 [8]

Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

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

Parameter	Unit	Value					
Reference channel			[R.5 TDD]	[R.6 TDD]	[R.7 TDD]	[R.8 TDD]	[R.9 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)			4+2	4+2	4+2	4+2	4+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 (see 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			1-5	2-5	2-5	2-5	3-5

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 [8]
Note 3: as per Table 4.2-2 TS 36.211 [8]
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.3.4.1-4: Fixed Reference Channel Single PRB

Parameter	Unit	Value					
Reference channel			[R.0 TDD]		[R.1 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)			4+2		4+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 (see Note 4)			1		1		
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits		504		552		
For Sub-Frames 1,6	Bits		456		456		
For Sub-Frame 5	Bits		n/a		n/a		
For Sub-Frame 0	Bits		504		552		
Max. Throughput averaged over 1 frame	Mbps		0.109		0.118		
UE Category			1-5		1-5		

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 [8]
Note 3: as per Table 4.2-2 in TS 36.211 [8]
Note 4: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

Table A.3.4.1-5: Fixed Reference Channel Single PRB (MBSFN Configuration)

Parameter	Unit	Value
Reference channel		[R.29 TDD] (MBSFN)
Channel bandwidth	MHz	10
Allocated resource blocks		1
MBSFN Configuration		[TBD]
Uplink-Downlink Configuration (Note 3)		1
Allocated subframes per Radio Frame (D+S)		2+2
Modulation		16QAM
Target Coding Rate		1/2
Information Bit Payload		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	208
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	256
Number of Code Blocks per Sub-Frame (see Note 4)		1
Binary Channel Bits Per Sub-Frame		
For Sub-Frames 4,9	Bits	0 (MBSFN)
For Sub-Frames 1,6	Bits	456
For Sub-Frame 5	Bits	n/a
For Sub-Frame 0	Bits	552
Max. Throughput averaged over 1 frame	kbps	67.2
UE Category		1-5
Note 1: 2 symbols allocated to PDCCH Note 2: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8] Note 3: as per Table 4.2-2 in TS 36.211 [8] 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.3.4.2 Multi-antenna transmission (Common Reference Symbols)

A.3.4.2.1 Two antenna ports

Table A.3.4.2.1-1: Fixed Reference Channel two antenna ports

Parameter	Unit	Value						
Reference channel			[R.10 TDD]	[R.11 TDD]				
Channel bandwidth	MHz		10	10				
Allocated resource blocks			50	50				
Uplink-Downlink Configuration (Note 3)			1	1				
Allocated subframes per Radio Frame (D+S)			4+2	4+2				
Modulation			QPSK	16QAM				
Target Coding Rate			1/3	1/2				
Information Bit Payload								
For Sub-Frames 4,9	Bits		4392	12960				
For Sub-Frames 1,6			3240	9528				
For Sub-Frame 5	Bits		n/a	n/a				
For Sub-Frame 0	Bits		4392	12960				
Number of Code Blocks per Sub-Frame (see Note 4)								
For Sub-Frames 4,9			1	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		13200	26400				
For Sub-Frames 1,6			10656	21312				
For Sub-Frame 5	Bits		n/a	n/a				
For Sub-Frame 0	Bits		12528	25056				
Max. Throughput averaged over 1 frame	Mbps		1.966	5.794				
UE Category			1-5	2-5				

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 [8]
Note 3: as per Table 4.2-2 in TS 36.211 [8]
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.3.4.2.2 Four antenna ports

Table A.3.4.2.2-1: Fixed Reference Channel four antenna ports

Parameter	Unit	Value					
Reference channel		[R.12 TDD]	[R.13 TDD]	[R.14 TDD]			
Channel bandwidth	MHz	1.4	10	10			
Allocated resource blocks		6	50	50			
Uplink-Downlink Configuration (Note 4)		1	1	1			
Allocated subframes per Radio Frame (D+S)		4+2	4+2	4+2			
Modulation		QPSK	QPSK	16QAM			
Target Coding Rate		1/3	1/3	1/2			
Information Bit Payload							
For Sub-Frames 4,9	Bits	408	4392	12960			
For Sub-Frames 1,6	Bits	n/a	3240	9528			
For Sub-Frame 5	Bits	n/a	n/a	n/a			
For Sub-Frame 0	Bits	208	4392	11448			
Number of Code Blocks per Sub-Frame (see Note 5)							
For Sub-Frames 4,9		1	1	3			
For Sub-Frames 1,6		n/a	1	2			
For Sub-Frame 5		n/a	n/a	n/a			
For Sub-Frame 0		1	1	2			
Binary Channel Bits Per Sub-Frame							
For Sub-Frames 4,9	Bits	1248	12800	25600			
For Sub-Frames 1,6		n/a	10256	20512			
For Sub-Frame 5	Bits	n/a	n/a	n/a			
For Sub-Frame 0	Bits	624	12176	24352			
Max. Throughput averaged over 1 frame	Mbps	0.102	1.966	5.642			
UE Category		1-5	1-5	2-5			

Note 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 10 MHz channel BW; 3 symbols allocated to PDCCH for 5 MHz and 3 MHz; 4 symbols allocated to PDCCH for 1.4 MHz. For subframe 1&6, only 2 OFDM symbols are allocated to PDCCH.
Note 2: For BW=1.4 MHz, the information bit payloads of special subframes are set to zero (no scheduling) to avoid problems with insufficient PDCCH performance at the test point.
Note 3: Reference signal, synchronization signals and PBCH allocated as per TS 36.211 [8]
Note 4: as per Table 4.2-2 in TS 36.211 [8]
Note 5: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

A.3.4.3 UE-Specific Reference Symbols

Table A.3.4.3-1: Fixed Reference Channel for UE-specific reference symbols

Parameter	Unit	Value			
Reference channel		[R.25 TDD]	[R.26 TDD]	[R.27 TDD]	[R.28 TDD]
Channel bandwidth	MHz	10	10	10	10
Allocated resource blocks		50 [4]	50 [4]	50 [4]	1
Uplink-Downlink Configuration (Note 3)		1	1	1	1
Allocated subframes per Radio Frame (D+S)		4+2	4+2	4+2	4+2
Modulation		QPSK	16QAM	64QAM	16QAM
Target Coding Rate		1/3	1/2	3/4	1/2
Information Bit Payload					
For Sub-Frames 4,9	Bits	4392	12960	28336	224
For Sub-Frames 1,6	Bits	3240	9528	22920	176
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	2984	9528	22152	224
Number of Code Blocks per Sub-Frame (see Note 5)					
For Sub-Frames 4,9		1	3	5	1
For Sub-Frames 1,6		1	2	4	1
For Sub-Frame 5		n/a	n/a	n/a	n/a
For Sub-Frame 0		1	2	4	1
Binary Channel Bits Per Sub-Frame					
For Sub-Frames 4,9	Bits	12600	25200	37800	504
For Sub-Frames 1,6	Bits	10356	20712	31068	420
For Sub-Frame 5	Bits	n/a	n/a	n/a	n/a
For Sub-Frame 0	Bits	10332	20664	30996	504
Max. Throughput averaged over 1 frame	Mbps	1.825	5.450	12.466	0.102
UE Category		1-5	2-5	2-5	1-5

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 [8]
Note 3: as per Table 4.2-2 in TS 36.211 [8]
Note 4: For R.25, R.26 and R.27, 50 resource blocks are allocated in sub-frames 1–9 and 41 resource blocks (RB0–RB20 and RB30–RB49) 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)

A.3.5 Reference measurement channels for PDCCH/PCFICH performance requirements

A.3.5.1 FDD

Table A.3.5.1-1: Reference Channel FDD

Parameter	Unit	Value		
Reference channel		[R.15 FDD]	[R.16 FDD]	[R.17 FDD]
Number if transmitter antennas		1	2	4
Channel bandwidth	MHz	10	1.4	10
Number of OFDM symbols for PDCCH	symbols	2	2	2
Aggregation level	CCE	8	2	4
DCI Format		Format 1	Format 1	Format 2
Cell ID		0	0	0
Payload (without CRC)	Bits	31	32+1	46

Table A.3.5.1-2: Additional PDSCH Reference Channel FDD

Parameter	Unit	Value		
Number of transmitter antennas		1	2	4
Channel bandwidth	MHz	10	1.4	10
Allocated Resource Blocks		50	6	50
Modulation		QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3
Information Bit Payload				
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	4392	504	4392
For Sub-Frame 0,5	Bits	FFS	FFS	FFS
Number of Code Blocks per subframe				
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	1
For Sub-Frame 0,5		FFS	FFS	FFS
Binary Channel Bits Per Sub-Frame				
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	13800	1584	12800
For Sub-Frame 0,5	Bits	FFS	FFS	FFS
Note 1: 2 symbols allocated to PDCCH for all BW.				

A.3.5.2 TDD

Table A.3.5.2-1: Reference Channel TDD

Parameter	Unit	Value		
Reference channel		[R.15 TDD]	[R.16 TDD]	[R.17 TDD]
Number if transmitter antennas		1	2	4
Channel bandwidth	MHz	10	1.4	10
Number of OFDM symbols for PDCCH	symbols	2	2	2
Aggregation level	CCE	8	2	4
DCI Format		Format 1	Format 1	Format 2
Cell ID		0	0	0
Payload (without CRC)	Bits	34	35	49

Table A.3.5.2-2: Additional PDSCH Reference Channel TDD

Parameter	Unit	Value		
Number of transmitter antennas		1	2	4
Channel bandwidth	MHz	10	1.4	10
Uplink-Downlink Configuration (Note 2)		1	1	1
Allocated Resource Blocks		50	6	50
Modulation		QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3
Information Bit Payload				
For Sub-Frames 4,9	Bits	4392	504	4392
For Sub-Frame 0,5	Bits	FFS	FFS	FFS
For Sub-Frame 1,6	Bits	3624	n/a	3624
Number of Code Blocks per subframe				
For Sub-Frames 4,9		1	1	1
For Sub-Frame 0,5	Bits	FFS	FFS	FFS
For Sub-Frame 1,6			n/a	
Binary Channel Bits Per Sub-Frame				
For Sub-Frames 4,9	Bits	13800	1584	12800
For Sub-Frame 0,5	Bits	FFS	FFS	FFS
For Sub-Frame 1,6	Bits	11256	n/a	10256
Note 1: 2 symbols allocated to PDCCH for all BW. Note 2: as per Table 4.2-2 in TS 36.211 [8]				

A.4 CQI reference measurement channels

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

The reference channels in Table A.4-1, A.4-2, A.4-4 and A.4-5 comply with the CQI definition specified in Sec. 7.2.3 of TS 36.213 [10]. Table A.4-3 and A.4-6 specify the transport format corresponding to each CQI.

Table A.4-1: Reference channel for CQI requirements (FDD) full PRB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	8	8	8	8	8
Modulation					Table A.4-3		
Target coding rate					Table A.4-3		
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead Note 3: The RLC should be configured to Unacknowledged Mode							

Table A.4-2: Reference channel for CQI requirements (TDD) full PRB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	15	25	50	75	100
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		4	4	4	4	4	4
Modulation					Table A.4-3		
Target coding rate					Table A.4-3		
Number of HARQ Processes	Processes	10	10	10	10	10	10
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead Note 3: The RLC should be configured to Unacknowledged Mode							

Table A.4-3: Transport format corresponding to each CQI index for 50 PRB allocation

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	12600	-
1	QPSK	0.0762	0	1384	12600	0.1117
2	QPSK	0.1172	0	1384	12600	0.1117
3	QPSK	0.1885	2	2216	12600	0.1778
4	QPSK	0.3008	4	3624	12600	0.2895
5	QPSK	0.4385	6	5160	12600	0.4114
6	QPSK	0.5879	8	6968	12600	0.5549
7	16QAM	0.3691	11	8760	25200	0.3486
8	16QAM	0.4785	13	11448	25200	0.4552
9	16QAM	0.6016	16	15264	25200	0.6067
10	64QAM	0.4551	18	16416	37800	0.4349
11	64QAM	0.5537	21	21384	37800	0.5663
12	64QAM	0.6504	23	25456	37800	0.6741
13	64QAM	0.7539	25	28336	37800	0.7503
14	64QAM	0.8525	27	31704	37800	0.8394
15	64QAM	0.9258	28	36696	37800	0.9714

Table A.4-4: Reference channel for CQI requirements (FDD) 6 PRB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	6	6	6	6	6
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		8	8	8	8	8	8
Modulation		N/A	N/A	N/A	Table A.4-6	N/A	N/A
Target coding rate		N/A	N/A	N/A	Table A.4-6	N/A	N/A
Number of HARQ Processes	Processes	8	8	8	8	8	8
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH Note 2: Only subframes 1,2,3,4,6,7,8, and 9 are allocated to avoid PBCH and synchronization signal overhead Note 3: The RLC should be configured to Unacknowledged Mode							

Table A.4-5: Reference channel for CQI requirements (TDD) 6 PRB allocation

Parameter	Unit	Value					
Channel bandwidth	MHz	1.4	3	5	10	15	20
Allocated resource blocks		6	6	6	6	6	6
Subcarriers per resource block		12	12	12	12	12	12
Allocated subframes per Radio Frame		4	4	4	4	4	4
Modulation		N/A	N/A	N/A	Table A.4-6	N/A	N/A
Target coding rate		N/A	N/A	N/A	Table A.4-6	N/A	N/A
Number of HARQ Processes	Processes	10	10	10	10	10	10
Maximum number of HARQ transmissions		1	1	1	1	1	1
Note 1: 3 symbols allocated to PDCCH Note 2: UL-DL configuration 2 is used and only subframes 3, 4, 8, and 9 are allocated to avoid PBCH and synchronization signal overhead Note 3: The RLC should be configured to Unacknowledged Mode							

Table A.4-6: Transport format corresponding to each CQI index for 6 PRB allocation

CQI index	Modulation	Target code rate	Imcs	Information Bit Payload (Subframes 1,2,3,4,6,7,8,9)	Binary Channel Bits Per Sub-Frame (Subframes 1,2,3,4,6,7,8,9)	Actual Code rate
0	out of range	out of range	DTX	-	1512	-
1	QPSK	0.0762	0	152	1512	0.1005
2	QPSK	0.1172	0	152	1512	0.1005
3	QPSK	0.1885	2	256	1512	0.1693
4	QPSK	0.3008	4	408	1512	0.2698
5	QPSK	0.4385	6	600	1512	0.3968
6	QPSK	0.5879	8	808	1512	0.5344
7	16QAM	0.3691	11	1032	3024	0.3413
8	16QAM	0.4785	13	1352	3024	0.4471
9	16QAM	0.6016	16	1800	3024	0.5952
10	64QAM	0.4551	19	2152	4536	0.4744
11	64QAM	0.5537	21	2600	4536	0.5732
12	64QAM	0.6504	23	2984	4536	0.6578
13	64QAM	0.7539	25	3496	4536	0.7707
14	64QAM	0.8525	27	3752	4536	0.8272
15	64QAM	0.9258	28	4392	4536	0.9683

A.5 OFDMA Channel Noise Generator (OCNG)

A.5.1 OCNG Patterns for FDD

A.5.1.1 OCNG FDD pattern 1: 14 RB OCNG allocation in 3 MHz

Table A.5.1.1-1: OP.1 FDD: OCNG FDD Pattern 1

<table>
<tr><th rowspan="5">Allocation
n_{PRB}</th><th rowspan="5">CP length</th><th colspan="9">Relative power level γ_{PRB} [dB]</th><th rowspan="5">PDSCH Data</th></tr>
<tr><th colspan="9">Subframe</th></tr>
<tr><th colspan="3">0</th><th colspan="3">5</th><th colspan="3">1 – 4, 6 – 9</th></tr>
<tr><th colspan="9">Control region OFDM symbols[Note 2]</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>1</th><th>2</th><th>3</th><th>1</th><th>2</th><th>3</th></tr>
</table>

1 – 14	N	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.
Note 2: The control region consists of PCFICH, PHICH and PDCCH. Number of OFDM symbols belonging to the control region may vary between subframes.
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 [10].

N: Normal

A.5.1.2 OCNG FDD pattern 2: 49 RB OCNG allocation in 10 MHz

Table A.5.1.2-1: OP.2 FDD: OCNG FDD Pattern 2

Allocation n_{PRB}	CP length	Relative power level γ_{PRB} [dB]						PDSCH Data
		Subframe						
		0		5		1 – 4, 6 – 9		
		Control region OFDM symbols[Note 2]						
		1	2	1	2	1	2	
1 – 49	N	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.
Note 2: The control region consists of PCFICH, PHICH and PDCCH. Number of OFDM symbols belonging to the control region may vary between subframes.
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 [10].

N: Normal

A.5.1.3 OCNG FDD pattern 3: 99 RB OCNG allocation in 20 MHz

Table A.5.1.3-1: OP.3 FDD: OCNG FDD Pattern 3

Allocation n_{PRB}	CP length	Relative power level γ_{PRB} [dB]						PDSCH Data
		Subframe						
		0		5		1 – 4, 6 – 9		
		Control region OFDM symbols[Note 2]						
		1	2	1	2	1	2	

1 – 99	N	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.
Note 2: The control region consists of PCFICH, PHICH and PDCCH. Number of OFDM symbols belonging to the control region may vary between subframes.
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 [10].

N: Normal

A.5.1.4 OCNG FDD pattern 4: 49 RB OCNG allocation with MBSFN in 10 MHz

Table A.5.1.4-1: OP.4 FDD: OCNG FDD Pattern 4

Allocation n_{PRB}	**CP length**	**Relative power level γ_{PRB} [dB]**								**PDSCH Data**	**PMCH Data**
		Subframe									
		0		5		4, 9		1 – 3, 6 – 8			
		Control region OFDM symbols[Note 2]									
		1	2	1	2	1	2	1	2		
1 – 49	N	0		0		0		N/A		Note 1	N/A
0 – 49	N	N/A		N/A		N/A		0		N/A	Note 3

Note 1: These physical resource blocks are assigned to an arbitrary number of virtual UEs with one PDSCH per virtual UE; the data transmitted over the OCNG PDSCHs shall be uncorrelated pseudo random data, which is QPSK modulated.
Note 2: The control region consists of PCFICH, PHICH and PDCCH. Number of OFDM symbols belonging to the control region may vary between subframes.
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 subframes shall contain cell-specific Reference Signals only in the first symbol of the first time slot.
The parameter γ_{PRB} is used to scale the power of PMCH.
Note 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 [10].

N: Normal
N/A: Not Applicable

Annex B (normative): Propagation Conditions

The propagation conditions and channel models for various environments are specified. For each environment a propagation model is used to evaluate the propagation pathless due to the distance. Channel models are formed by combining delay profiles with a Doppler spectrum, with the addition of correlation properties in the case of a multi-antenna scenario.

B.0 No interference

The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects.

B.1 Static propagation condition

The downlink connection between the System Simulator and the UE is an Additive White Gaussian Noise (AWGN) environment with no fading or multipath effects.

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

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

B.1.1 Definition of Additive White Gaussian Noise (AWGN) Interferer

Note that the AWGN interferer can be used in static propagation conditions, or in conjunction with multi-path fading.

[FFS]

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.

B.2.1 Delay profiles

The delay profiles are selected to be representative of low, medium and high delay spread environments. The resulting model parameters are defined in Table B.2.1-1 and the tapped delay line models are defined in Tables B.2.1-2, B.2.1-3 and B.2.1-4.

Table B.2.1-1: Delay profiles for E-UTRA channel models

Model	Number of channel taps	Delay spread (r.m.s.)	Maximum excess tap delay (span)
Extended Pedestrian A (EPA)	7	45 ns	410 ns
Extended Vehicular A model (EVA)	9	357 ns	2510 ns
Extended Typical Urban model (ETU)	9	991 ns	5000 ns

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

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

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

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

Table B.2.1-4: Extended Typical Urban model (ETU)

Excess tap delay [ns]	Relative power [dB]
0	-1.0
50	-1.0
120	-1.0
200	0.0
230	0.0
500	0.0
1600	-3.0
2300	-5.0
5000	-7.0

B.2.2 Combinations of channel model parameters

Table B.2.2-1 shows propagation conditions that are used for the performance measurements in multi-path fading environment for low, medium and high Doppler frequencies

Table B.2.2-1: Channel model parameters

Model	Maximum Doppler frequency
EPA 5Hz	5 Hz
EVA 5Hz	5 Hz
EVA 70Hz	70 Hz
ETU 70Hz	70 Hz
ETU 300Hz	300 Hz

B.2.3 MIMO Channel Correlation Matrices

B.2.3.1 Definition of MIMO Correlation Matrices

Table B.2.3.1-1 defines the correlation matrix for the eNodeB

Table B.2.3.1-1: eNodeB correlation matrix

	One antenna	Two antennas	Four antennas
eNode B Correlation	$R_{eNB} = 1$	$R_{eNB} = \begin{pmatrix} 1 & \alpha \\ \alpha^* & \mathbf{1} \end{pmatrix}$	$R_{eNB} = \begin{pmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9*} & \alpha^{1/9*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9*} & \alpha^{1/9*} & 1 \end{pmatrix}$

Table B.2.3.1-2 defines the correlation matrix for the UE:

Table B.2.3.1-2: UE correlation matrix

	One antenna	Two antennas	Four antennas
UE Correlation	$R_{UE} = 1$	$R_{UE} = \begin{pmatrix} 1 & \beta \\ \beta^* & \mathbf{1} \end{pmatrix}$	$R_{UE} = \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9*} & \beta^{1/9*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9*} & \beta^{1/9*} & 1 \end{pmatrix}$

Table B.2.3.1-3 defines the channel spatial correlation matrix R_{spat}. The parameters, α and β in Table B.2.3.1-3 defines the spatial correlation between the antennas at the eNodeB and UE.

Table B.2.3.1-3: R_{spat} correlation matrices

1x2 case	$R_{spat} = R_{UE} = \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
2x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha \\ \alpha^* & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix} = \begin{bmatrix} 1 & \beta & \alpha & \alpha\beta \\ \beta^* & 1 & \alpha\beta^* & \alpha \\ \alpha^* & \alpha^*\beta & 1 & \beta \\ \alpha^*\beta^* & \alpha^* & \beta^* & 1 \end{bmatrix}$
4x2 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9^*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9^*} & \alpha^{1/9^*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9^*} & \alpha^{1/9^*} & 1 \end{bmatrix} \otimes \begin{bmatrix} 1 & \beta \\ \beta^* & 1 \end{bmatrix}$
4x4 case	$R_{spat} = R_{eNB} \otimes R_{UE} = \begin{bmatrix} 1 & \alpha^{1/9} & \alpha^{4/9} & \alpha \\ \alpha^{1/9^*} & 1 & \alpha^{1/9} & \alpha^{4/9} \\ \alpha^{4/9^*} & \alpha^{1/9^*} & 1 & \alpha^{1/9} \\ \alpha^* & \alpha^{4/9^*} & \alpha^{1/9^*} & 1 \end{bmatrix} \otimes \begin{pmatrix} 1 & \beta^{1/9} & \beta^{4/9} & \beta \\ \beta^{1/9^*} & 1 & \beta^{1/9} & \beta^{4/9} \\ \beta^{4/9^*} & \beta^{1/9^*} & 1 & \beta^{1/9} \\ \beta^* & \beta^{4/9^*} & \beta^{1/9^*} & 1 \end{pmatrix}$

For cases with more antennas at either eNodeB or UE or both, the channel spatial correlation matrix can still be expressed as the Kronecker product of R_{eNB} and R_{UE} according to $R_{spat} = R_{eNB} \otimes R_{UE}$.

B.2.3.2 MIMO Correlation Matrices at High, Medium and Low Level

The α and β for different correlation types are given in Table B.2.3.2-1.

Table B.2.3.2-1

Low correlation		Medium Correlation		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.2.3.2-2, B.2.3.2-3 and B.2.3.2-4,as below.

The values in the Table B.2.3.2-2 table have been adjusted for the 4x2 and 4x4 high correlation cases to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision. This is done using the equation:

$$\mathbf{R}_{high} = [\mathbf{R}_{spatial} + aI_n]/(1+a)$$

Where the value "a" is a scaling factor such that the smallest value is used to obtain a positive semi-definite result. For the 4x2 high correlation case, a=0.00010. For the 4x4 high correlation case, a=0.00012.

The same method is used to adjust the 4x4 medium correlation matrix in Table B.2.3.2-3 to insure the correlation matrix is positive semi-definite after round-off to 4 digit precision with a = 0.00012.

Table B.2.3.2-2: MIMO correlation matrices for high correlation

1x2 case	$R_{high} = \begin{pmatrix} 1 & 0.9 \\ 0.9 & 1 \end{pmatrix}$
2x2 case	$R_{high} = \begin{pmatrix} 1 & 0.9 & 0.9 & 0.81 \\ 0.9 & 1 & 0.81 & 0.9 \\ 0.9 & 0.81 & 1 & 0.9 \\ 0.81 & 0.9 & 0.9 & 1 \end{pmatrix}$
4x2 case	$R_{high} = \begin{bmatrix} 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 & 0.8999 & 0.8099 \\ 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 & 0.8099 & 0.8999 \\ 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 & 0.9542 & 0.8587 \\ 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 & 0.8587 & 0.9542 \\ 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 & 0.9883 & 0.8894 \\ 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 & 0.8894 & 0.9883 \\ 0.8999 & 0.8099 & 0.9542 & 0.8587 & 0.9883 & 0.8894 & 1.0000 & 0.8999 \\ 0.8099 & 0.8999 & 0.8587 & 0.9542 & 0.8894 & 0.9883 & 0.8999 & 1.0000 \end{bmatrix}$
4x4 case	$R_{high} = \begin{bmatrix} 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.8999 & 0.8894 & 0.8587 & 0.8099 \\ 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.8894 & 0.8999 & 0.8894 & 0.8587 \\ 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.8587 & 0.8894 & 0.8999 & 0.8894 \\ 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8099 & 0.8587 & 0.8894 & 0.8999 \\ 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 0.9541 & 0.9430 & 0.9105 & 0.8587 \\ 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9430 & 0.9541 & 0.9430 & 0.9105 \\ 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9105 & 0.9430 & 0.9541 & 0.9430 \\ 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8587 & 0.9105 & 0.9430 & 0.9541 \\ 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.9882 & 0.9767 & 0.9430 & 0.8894 \\ 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.9767 & 0.9882 & 0.9767 & 0.9430 \\ 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.9430 & 0.9767 & 0.9882 & 0.9767 \\ 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.8894 & 0.9430 & 0.9767 & 0.9882 \\ 0.8999 & 0.8894 & 0.8587 & 0.8099 & 0.9541 & 0.9430 & 0.9105 & 0.8587 & 0.9882 & 0.9767 & 0.9430 & 0.8894 & 1.0000 & 0.9882 & 0.9541 & 0.8999 \\ 0.8894 & 0.8999 & 0.8894 & 0.8587 & 0.9430 & 0.9541 & 0.9430 & 0.9105 & 0.9767 & 0.9882 & 0.9767 & 0.9430 & 0.9882 & 1.0000 & 0.9882 & 0.9541 \\ 0.8587 & 0.8894 & 0.8999 & 0.8894 & 0.9105 & 0.9430 & 0.9541 & 0.9430 & 0.9430 & 0.9767 & 0.9882 & 0.9767 & 0.9541 & 0.9882 & 1.0000 & 0.9882 \\ 0.8099 & 0.8587 & 0.8894 & 0.8999 & 0.8587 & 0.9105 & 0.9430 & 0.9541 & 0.8894 & 0.9430 & 0.9767 & 0.9882 & 0.8999 & 0.9541 & 0.9882 & 1.0000 \end{bmatrix}$

Table B.2.3.2-3: MIMO correlation matrices for medium correlation

1x2 case	N/A
2x2 case	$R_{medium} = \begin{pmatrix} 1 & 0.9 & 0.3 & 0.27 \\ 0.9 & 1 & 0.27 & 0.3 \\ 0.3 & 0.27 & 1 & 0.9 \\ 0.27 & 0.3 & 0.9 & 1 \end{pmatrix}$
4x2 case	$R_{medium} = \begin{pmatrix} 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 & 0.3000 & 0.2700 \\ 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 & 0.2700 & 0.3000 \\ 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 & 0.5856 & 0.5271 \\ 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 & 0.5271 & 0.5856 \\ 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 & 0.8748 & 0.7873 \\ 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 & 0.7873 & 0.8748 \\ 0.3000 & 0.2700 & 0.5856 & 0.5271 & 0.8748 & 0.7873 & 1.0000 & 0.9000 \\ 0.2700 & 0.3000 & 0.5271 & 0.5856 & 0.7873 & 0.8748 & 0.9000 & 1.0000 \end{pmatrix}$
4x4 case	$R_{medium} = \begin{pmatrix} 1.0000 & 0.9882 & 0.9541 & 0.8999 & 0.8747 & 0.8645 & 0.8347 & 0.7872 & 0.5855 & 0.5787 & 0.5588 & 0.5270 & 0.3000 & 0.2965 & 0.2862 & 0.2700 \\ 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.2965 & 0.3000 & 0.2965 & 0.2862 \\ 0.9541 & 0.9882 & 1.0000 & 0.9882 & 0.8347 & 0.8645 & 0.8747 & 0.8645 & 0.5588 & 0.5787 & 0.5855 & 0.5787 & 0.2862 & 0.2965 & 0.3000 & 0.2965 \\ 0.8999 & 0.9541 & 0.9882 & 1.0000 & 0.7872 & 0.8347 & 0.8645 & 0.8747 & 0.5270 & 0.5588 & 0.5787 & 0.5855 & 0.2700 & 0.2862 & 0.2965 & 0.3000 \\ 0.8747 & 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 & 0.5270 \\ 0.8645 & 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 & 0.5588 \\ 0.8347 & 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 & 0.5787 \\ 0.7872 & 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 & 0.5855 \\ 0.5855 & 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 & 0.7872 \\ 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 & 0.8645 & 0.8747 & 0.8645 & 0.8347 \\ 0.5588 & 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 & 0.8645 \\ 0.5270 & 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 & 0.8747 \\ 0.3000 & 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 & 0.8999 \\ 0.2965 & 0.3000 & 0.2965 & 0.2862 & 0.5787 & 0.5855 & 0.5787 & 0.5588 & 0.8645 & 0.8747 & 0.8645 & 0.8347 & 0.9882 & 1.0000 & 0.9882 & 0.9541 \\ 0.2862 & 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 & 0.9882 \\ 0.2700 & 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 & 1.0000 \end{pmatrix}$

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.2.4 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.]

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

$$f_s(t) = f_d \cos\theta(t) \quad \text{(B.3.1)}$$

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

$$\cos\theta(t) = \frac{D_s/2 - vt}{\sqrt{D_{\min}{}^2 + (D_s/2 - vt)^2}}, \ 0 \le t \le D_s/v \quad \text{(B.3.2)}$$

$$\cos\theta(t) = \frac{-1.5D_s + vt}{\sqrt{D_{\min}{}^2 + (-1.5D_s + vt)^2}}, \ D_s/v < t \le 2D_s/v \quad \text{(B.3.3)}$$

$$\cos\theta(t) = \cos\theta(t \mod (2D_s/v)), \ t > 2D_s/v \quad \text{(B.3.4)}$$

where $D_s/2$ is the initial distance of the train form 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 is shown in Figure B.3-1 are applied for all frequency bands.

Table B.3-1: High speed train scenario

Parameter	Value
D_s	300 m
$D_{\min}$	2 m
v	300 km/h
f_d	750 Hz

NOTE1: Parameters for HST conditions in table B.3-1 including f_d and Doppler shift trajectories presented on figure B.3-1 were derived for Band7.

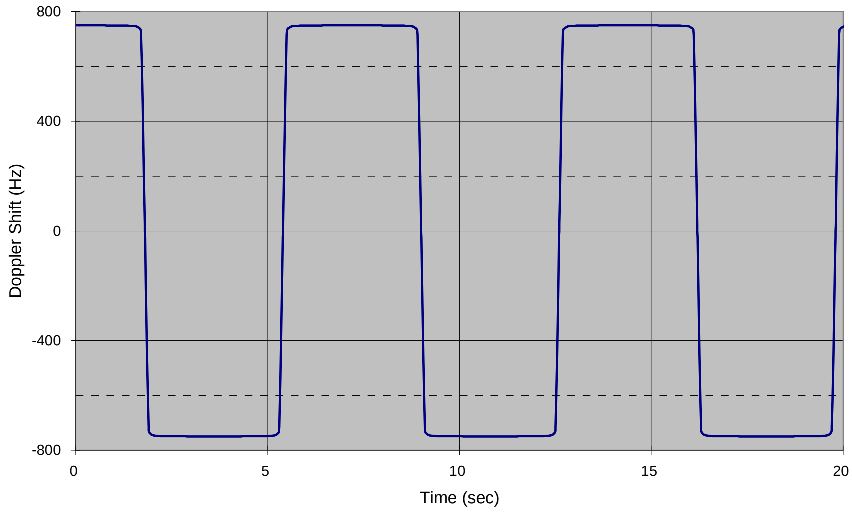

Figure B.3-1: Doppler shift trajectory

Annex C (normative): Downlink Physical Channels

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.0 Downlink signal levels

The downlink power settings in Table C.0-1 are used unless otherwise specified in a test case.

If the UE has two Rx antennas, the downlink signal is applied to each one. Both UE Rx antennas shall be connected.

If the UE has one Rx antenna, the downlink signal is applied to it.

Table C.0-1: Default Downlink power levels

	Unit	Channel bandwidth					
		1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Number of RBs		6	15	25	50	75	100
Channel BW Power	dBm	-66	-62	-60	-57	-55	-54
RS EPRE	dBm/15kHz	-85	-85	-85	-85	-85	-85
Note 1: The channel bandwidth powers and RB allocations are informative, based on -85dBm/15kHz RS_EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed in this calculation, but allocation may vary during setup. Note 2: The power level is specified at each UE Rx antenna.							

The default signal level uncertainty is +/-3dB at each test port, for any level specified. If the uncertainty value is critical for the test purpose, a tighter uncertainty is specified for the related test case in Annex F.

C.1 General

Table C.1-1 describes the mapping of downlink physical channels and signals to physical resources for FDD.

Table C.1-2 describes the mapping of downlink physical channels and signals to physical resources for TDD.

Table C.1-1: Mapping of downlink physical channels and signals to physical resources for FDD

Physical channel	Time Domain Location	Frequency Domain Location	Note
RS	Symbols 0, 4 of each subframe for antenna port 0 & 1 Symbol 1 of each subframe for antenna port 2 & 3	Downlink system bandwidth dependent.	Mapping rule is specified in TS36.211 6.10.1.2 - CELL_ID = 0
PBCH	Symbols 0 to 3 of slot 1 of subframe 0 of each radio frame	Occupies 72 subcarriers centered on the DC subcarrier	Mapping rule is specified in TS36.211 Section 6.6.4 (*2)
PSS	Symbol 6 of slot 0 and 10 of each radio frame	Occupies 62 subcarriers centered on the DC subcarrier	Mapping rule is specified in TS36.211 Section 6.11.1.2
SSS	Symbol 5 of slots 0 and 10 of each radio frame	Occupies 62 subcarriers centered on the DC subcarrier	Mapping rule is specified in TS36.211 Section 6.11.2.2
PCFICH	Symbol 0 of each subframe	Downlink system bandwidth dependent. Maps into 4 REGs uniformly spread in the frequency domain over the whole system bandwidth.	Mapping rule is specified in TS36.211 Section 6.7.4 (*1) - CELL_ID = 0
PHICH	Symbol 0 of each subframe	Downlink system bandwidth dependent. Each PHICH group maps into 3 REGs in the frequency domain on the REGs not assigned to PCFICH over the whole system bandwidth,	Mapping rule is specified in TS36.211 Section 6.9.3 (*1) - CELL_ID = 0 - Ng = 1 - Normal PHICH duration
PDCCH	Symbols 0, 1, 2, 3 of each subframe for 1.4 MHz Symbols 0, 1, 2, of each subframe for 3 and 5 MHz Symbols 0, 1 of each subframe for 10, 15 and 20 MHz	The remaining REGs not allocated to both PCFICH and PHICH are used for PDCCH	Mapping rule is specified in TS36.211 Section 6.8.5 (*1)
PDSCH	All remaining OFDM symbols of each subframe not allocated to PDCCH	For Subframe 0, REs not allocated to RS, PSS, SSS and PBCH, is allocated to PDSCH For Subframe 5, REs not allocated to RS, PSS and SSS, is allocated to PDSCH For other subframes, REs not allocated to RS, is allocated to PDSCH	Note that there are reserved REs that are not used for transmission of any physical channels (*3) & (*4) which need to be taken into account when allocating REs to PDSCH
NOTE 1: In case a single cell-specific RS is configured, cell-specific RS shall be assume to be present on antenna ports 0 and 1 for the purpose of mapping a symbol-quadruplet to a REG (resource-element group). (See TS 36.211 Section 6.2.4). NOTE 2: PBCH is mapped into RE assuming RS from 4 antennas are used at the eNB transmitter, irrespective of the actual number of Tx antenna. Resource elements assumed to be reserved for RS but not used for transmission of RS shall not be used for transmission of any physical channel. (See TS 36.211 Section 6.6.4). NOTE 3: In slot 0 and slot 10 of each radioframe, there are reserved REs for PSS and SSS that are not used for transmission of any physical channels. (See TS 36.211 Section 6.11.1.2 & 6.11.2.2). NOTE 4: REs used for RS transmission on any of the antenna ports in a slot shall not be used for any transmission on any other antenna port in the same slot and set to zero. (See TS 36.211 Section 6.10.1.2).			

Table C.1-2: Mapping of downlink physical channels and signals to physical resources for TDD

Physical channel	Time Domain Location	Frequency Domain Location	Note
RS	Symbols 0, 4 of each subframe for antenna port 0 & 1 Symbol 1 of each subframe for antenna port 2 & 3	Downlink system bandwidth dependent.	Mapping rule is specified in TS36.211[8] 6.10.1.2 - CELL_ID = 0
PBCH	Symbols 0 to 3 of slot 1 of subframe 0 of each radio frame	Occupies 72 subcarriers centered on the DC subcarrier	Mapping rule is specified in TS36.211[8] Section 6.6.4 (*3)
PSS	Symbol 2 of slot 2 and 12 of each radio frame	Occupies 62 subcarriers centered on the DC subcarrier	Mapping rule is specified in TS36.211[8] Section 6.11.1.2
SSS	Symbol 6 of slots 1 and 11 of each radio frame	Occupies 62 subcarriers centered on the DC subcarrier	Mapping rule is specified in TS36.211[8] Section 6.11.2.2
PCFICH	Symbol 0 of each subframe and special subframe	Downlink system bandwidth dependent. Maps into 4 REGs uniformly spread in the frequency domain over the whole system bandwidth.	Mapping rule is specified in TS36.211[8] Section 6.7.4 (*2) - CELL_ID = 0
PHICH	Symbol 0 of each subframe and special subframe	Downlink system bandwidth dependent. Each PHICH group maps into 3 REGs in the frequency domain on the REGs not assigned to PCFICH over the whole system bandwidth,	Mapping rule is specified in TS36.211[8] Section 6.9.3 (*2) - CELL_ID = 0 - Ng = 1 - Normal PHICH duration
PDCCH	For normal subframes(0,4,5,9) Symbols 0, 1, 2, 3 of each subframe for 1.4 MHz Symbols 0, 1, 2, of each subframe for 3 and 5 MHz Symbols 0, 1 of each subframe for 10, 15 and 20 MHz For special subframe (1&6) Symbols 0, 1 of each subframe for all BWs	The remaining REGs not allocated to both PCFICH and PHICH are used for PDCCH	Mapping rule is specified in TS36.211[8] Section 6.8.5 (*2)
PDSCH	,All remaining OFDM symbols of each subframe not allocated to PDCCH with the following exception: For 1.4MHz,no data shall be scheduled on special subframes (1&6) to avoid problems with insufficient PDCCH performance	For Subframe 0, REs not allocated to RS, SSS and PBCH, is allocated to PDSCH For Subframe 5, REs not allocated to RS and SSS, is allocated to PDSCH For Subframe 1 and 6, REs not allocated to RS, PSS, GP and UpPTS is allocated to PDSCH For other downlink subframes, REs not allocated to RS is allocated to PDSCH	Note that there are reserved REs that are not used for transmission of any physical channels (*4) & (*5) which need to be taken into account when allocating REs to PDSCH

NOTE 1: The mapping is based on the default TDD configuration for subframe assignment and special subframe patterns (see 36.508 [7]subclause 4.6.3)

NOTE 2: In case a single cell-specific RS is configured, cell-specific RS shall be assume to be present on antenna ports 0 and 1 for the purpose of mapping a symbol-quadruplet to a REG (resource-element group). (See TS 36.211[8] Section 6.2.4).

NOTE 3: PBCH is mapped into RE assuming RS from 4 antennas are used at the eNB transmitter, irrespective of the actual number of Tx antenna. Resource elements assumed to be reserved for RS but not used for transmission of RS shall not be used for transmission of any physical channel. (See TS 36.211[8] Section 6.6.4).

NOTE 4: In slot 1,2,11 and 12 of each radio frame, there are reserved REs for PSS and SSS that are not used for transmission of any physical channels. (See TS 36.211[8] Section 6.11.1.2 & 6.11.2.2).

NOTE 5: REs used for RS transmission on any of the antenna ports in a slot shall not be used for any transmission on any other antenna port in the same slot and set to zero. (See TS 36.211[8] Section 6.10.1.2).

C.2 Set-up

Table C.2-1 describes the downlink Physical Channels that are required for connection set up.

Table C.2-1: Downlink Physical Channels required for connection set-up

Physical Channel
PBCH
SSS
PSS
PCFICH
PDCCH
PHICH
PDSCH

Table C.2-2 describes the configuration of PDSCH and PDCCH before measurement for FDD and Table C.2-3 for TDD.

Table C.2-2: PDSCH and PDCCH configuration for FDD

Parameter	Unit	Value	Comments
Allocated resource blocks		[6]	
MCS Index		[0]	
Number of HARQ processes	Processes	8	
Maximum number of HARQ transmission		[1]	
Aggregation level	CCE	[FFS]	
DCI Format for PDSCH		[Format 1A]	
DCI Format for PUSCH		[Format 0]	
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: The PDSCH shall be occupied 6 resource blocks centered on the DC subcarrier.			

Table C.2-3: PDSCH and PDCCH configuration for TDD

Parameter	Unit	Value	Comments
Allocated resource blocks		[6]	
MCS Index		[0]	
Number of HARQ processes (Note 1)	Processes	7	
Maximum number of HARQ transmission		[1]	
Aggregation level	CCE	[FFS]	
DCI Format for PDSCH		[Format 1A]	
DCI Format for PUSCH		Format 0	
Note 1: Number of HARQ processes shall be determined by UL/DL configuration,for configuration other than 1,the process number shall be set per TS 36.213 [10] Table 8-1. Note 2: For normal downlink subframes, 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 3: Reference signal, Synchronization signals and PBCH allocated as per TS 36.211 [4]. Note 4: The PDSCH shall be occupied 6 resource blocks centered on the DC subcarrier.			

C.3 Connection

The following clauses describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

C.3.0 Measurement of Transmitter Characteristics

Table C.3.0-1 is applicable for measurements on the Transmitter Characteristics (clause 6).

Table C.3.0-1: 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	
PHICH	PHICH_RB = 0 dB	

NOTE 1: No boosting is applied.

Table C.3.0-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS} / I_{or}		0 dB	

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	
PHICH	PHICH_RB = 0 dB	

NOTE 1: No boosting is applied.

Table C.3.1-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS}/I_{or}		0 dB	

C.3.2 Measurement of Performance requirements

Table C.3.2-1 is applicable for measurements in which uniform RS-to-EPRE boosting for all downlink physical channels.

Table C.3.2-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Physical Channel	EPRE Ratio	
PBCH	PBCH_RA = ρ_A	
	PBCH_RB = ρ_B	
PSS	PSS_RA = ρ_A	
SSS	SSS_RA = ρ_A	
PCFICH	PCFICH_RB = ρ_B	
PDCCH	PDCCH_RA = ρ_A	
	PDCCH_RB = ρ_B	
PDSCH	PDSCH_RA = ρ_A	
	PDSCH_RB = ρ_B	
PHICH	PHICH_RB = ρ_B	

NOTE 1: $\rho_A = \rho_B$ = 0 dB means no RS boosting.

NOTE 2: ρ_A denotes the ratio of PDSCH EPRE to cell-specific RS EPRE among PDSCH REs in all the OFDM symbols not containing cell-specific RS. ρ_B denotes the ratio of PDSCH EPRE to cell-specific RS EPRE among PDSCH REs in all the OFDM symbols containing cell-specific RS.

Table C.3.2-2: Power allocation for OFDM symbols and reference signals

Parameter	Unit	Value	Note
Total transmitted power spectral density I_{or}	dBm/15 kHz	Test specific	1. I_{or} shall be kept constant throughout all OFDM symbols
Cell-specific reference signal power ratio E_{RS}/I_{or}		Test specific	1. Applies for antenna port *p*

Annex D (normative): Characteristics of the Interfering Signal

D.1 General

Some RF performance requirements for the E-UTRA UE receiver are defined with interfering signals present in addition to the wanted signal. When the wanted channel band width is wider than or equal to 5MHz, a modulated 5MHz full band width E-UTRA down link signal, and in some cases an additional CW signal, are used. For wanted channel band widths below 5MHz, the band width of the modulated interferer should be equal to the channel band width of the wanted signal.

D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel band width options.

Table D.2-1: Description of modulated E-UTRA interferer

	Channel bandwidth					
	1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
RB	6	15	25	25	25	25
$BW_{Interferer}$	1.4 MHz	3 MHz	5 MHz	5 MHz	5 MHz	5 MHz

Annex E (normative): Global In-Channel TX-Test

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

- *An average EVM, comprising 20 individual values, is defined and compared against the test limit. The other sub-results of the Global In channel TX-Test deliver one value per slot, hence 20 values. It is tbd, how to compare this individual values against the test limit.*
- *Clause E.2.2 to E.4.5 describe EVM, including the subresults IQ offset, Frequency error, Inband emissions(image IQ and general) and spectral flatness for PUSCH.*

Clause E.4.6 describe EVM of the DMRS.

Clause E.5 to E.5.9.3 describe EVM and inband emissions of PUCCH.

Clause E.6 to E.6.9.2 describe EVM of PRACH.

Clauses E.2.2 to E.5.9.3 are descriptions, which exclude any transients due to power on/off or power change.

EVM for PRACH and transition periods due to on/off power change are not yet implemented

E.1 General

The global in-channel TX test enables the measurement of all relevant parameters that describe the in-channel quality of the output signal of the TX under test in a single measurement process.

The parameters describing the in-channel quality of a transmitter, however, are not necessarily independent. The algorithm chosen for description inside this annex places particular emphasis on the exclusion of all interdependencies among the parameters.

E.2 Signals and results

E.2.1 Basic principle

The process is based on the comparison of the actual **output signal of the TX under test**, received by an ideal receiver, with a **reference signal**, that is generated by the measuring equipment and represents an ideal error free received signal. All signals are represented as equivalent (generally complex) baseband signals.

The description below uses numbers as examples. These numbers are taken from frame structure 1 with normal CP length and 20 MHz bandwidth. The application of the text below, however, is not restricted to this frame structure and bandwidth.

E.2.2 Output signal of the TX under test

The output signal of the TX under test is acquired by the measuring equipment and stored for further processsing. It is sampled at a sampling rate of 30.72 Msps. In the time domain it comprises at least 10 consecutive uplink subframes. It is named z(v). Each slot is modelled as a signal with the following parameters: demodulated data content, carrier frequency, amplitude and phase for each subcarrier, timing, IQ offset.

NOTE 1: TDD

For frame structure type 2, subframes with special fields (UpPTS) do not undergo any evaluation. Since the uplink subframes are not continuous, the 20 slots should be extracted from more than 1 continuous radio frame:

Figure E.2.2-1 is an example for uplink-downlink configuration 1 (DSUUDDSUUD) as specified in TS 36.211 [8] Table 4.2-2,assuming all uplink subframes are active.

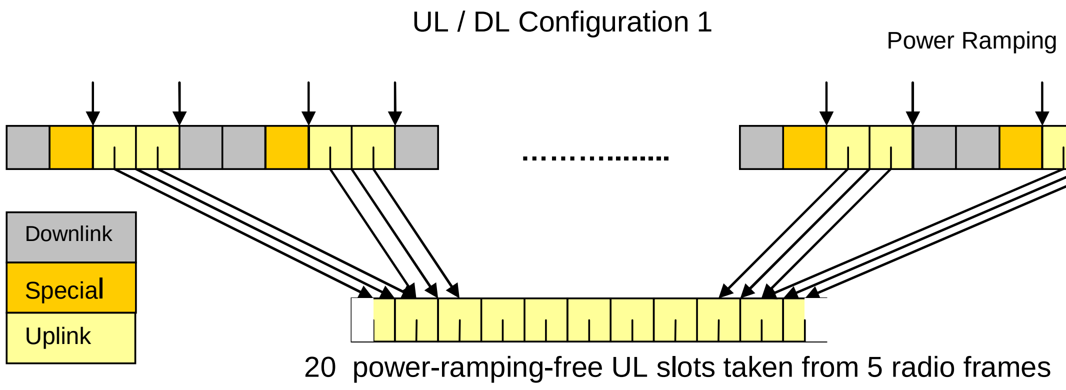

Figure E.2.2-1: Example of uplink – downlink configuration 1

E.2.3 Reference signal

Two types of reference signal are defined:

The reference signal $i_1(\nu)$ is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: demodulated data content, nominal carrier frequency, nominal amplitude and phase for each subcarrier, nominal timing, no IQ offset. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

The reference signal $i_2(\nu)$ is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: restricted data content: nominal reference symbols, (all modulation symbols for user data symbols are set to 0V) , nominal carrier frequency, nominal amplitude and phase for each applicable subcarrier, nominal timing, no IQ offset. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

NOTE: The PUCCH is not tested and is off during the time under test.

E.2.4 Measurement results

The measurement results, achieved by the global in channel TX test are the following:

- Carrier Frequency error
- EVM (Error Vector Magnitude)
- Origin offset
- Unwanted emissions, falling into non allocated resource blocks.
- Spectrum flatness

E.2.5 Measurement points

The unwanted emission falling into non-allocated RB(s) is calculated directly after the FFT as described below. In contrast to this, the EVM for the allocated RB(s) is calculated after the IDFT. The samples after the TX-RX chain equalizer are used to calculate spectrum flatness. Carrier frequency error and IQ offset is calculated in the block “RF correction”.

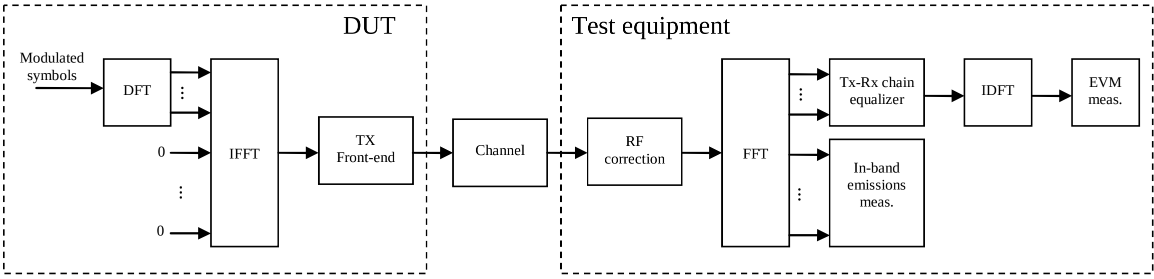

Figure E.2.5-1: EVM measurement points

E.3 Signal processing

E.3.1 Pre FFT minimization process

Before applying the pre-FFT minimization process, z(ν) and i(ν) are portioned into 20 pieces, comprising one slot each. Each slot is processed separately. Sample timing, Carrier frequency and I/Q offset in z(ν) are jointly varied in order to minimise the difference between z(ν) and i(ν). Best fit (minimum difference) is achieved when the RMS difference value between z(ν) and i(ν) is an absolute minimum.

The carrier frequency variation and the IQ variation are the measurement results: Carrier Frequency Error and Origin Offset.

From the acquired samples 20 carrier frequencies and 20 IQ offsets can be derived.

NOTE 1: The minimisation process, to derive IQ offset and RF error can be supported by Post FFT operations. However the minimisation process defined in the pre FFT domain comprises all acquired samples (i.e. it does not exclude the samples in between the FFT widths and it does not exclude the bandwidth outside the transmission bandwidth configuration. This corresponds to the definition of the observation period in 36.101 Clause 6.5.1)

NOTE 2: The algorithm would allow to derive Carrier Frequency error and Sample Frequency error of the TX under test separately. However there are no requirements for Sample Frequeny error. Hence the algorithm models the RF and the sample frequency commonly (not independently). It returns one error and does not distinuish between both.

After this process the samples z(ν) are called $z^0(\nu)$.

E.3.2 Timing of the FFT window

The FFT window length is 2048 samples per OFDM symbol. 7 FFTs (14336 samples) cover less than the acquired number of samples (15360 samples) The position in time for FFT must be determined.

In an ideal signal, the FFT may start at any instant within the cyclic prefix without causing an error. The TX filter, however, reduces the window. The EVM requirements shall be met within a window W<CP. There are three different instants for FFT:

Centre of the reduced window, called $\Delta\tilde{c}$, $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

The timing of the measured signal is determined in the pre FFT domain as follows, using $z^0(\nu)$ and $i_2(\nu)$:

1. The measured signal is delay spread by the TX filter. Hence the distinct boarders between the OFDM symbols and between Data and CP are also spread and the timing is not obvious.

2. In the Reference Signal $i_2(\nu)$ the timing is known.

3. Correlation between (1.) and (2.) will result in a correlation peak. The meaning of the correlation peak is approx. the “impulse response” of the TX filter. The meaning of “impulse response” assumes that the autocorrelation of the reference signal $i_2(v)$ is a Dirac peak and that the correlation between the reference signal $i_2(v)$ and the data in the measured signal is 0. The correlation peak, (the highest, or in case of more than one, the earliest) indicates the timing in the measured signal.

From the acquired samples 20 timings can be derived.

For all calculations, except EVM, the number of samples in $z^0(v)$ is reduced to 7 blocks of samples, comprising 2048 samples (FFT width) and starting with $\Delta\tilde{c}$ in each OFDM symbol including the demodulation reference signal.

For the EVM calculation the output signal under test is reduced to 14 blocks of samples, comprising 2048 samples (FFT width) and starting with $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 in each OFDM symbol including the demodulation reference signal.

The number of samples, used for FFT is reduced compared to $z^0(v)$. This subset of samples is called z’(v).

The timing of the centre $\Delta\tilde{c}$ with respect to the different CP length in a slot is as follows: (Frame structure 1, normal CP length)

$\Delta\tilde{c}$ is on T_f=72 within the CP of length 144 (in OFDM symbol 1 to 6)

$\Delta\tilde{c}$ is on T_f=88 (=160-72) within the CP of length 160 (in OFDM symbol 0)

E.3.3 Post FFT equalisation

Perform 7 FFTs on z’(v), one for each OFDM symbol in a slot using the timing $\Delta\tilde{c}$, including the demodulation reference symbol. The result is an array of samples, 7 in the time axis t times 2048 in the frequency axis f. The samples represent the DFT coded data symbols (in OFDM-symbol 0,1,2,4,5and 6 in each slot) and demodulation reference symbols (OFDM symbol 3 in each slot) in the allocated RBs and inband emissions in the non allocated RBs within the transmission BW.

Only the allocated resource blocks in the frequency domain are used for equalisation.

The nominal demodulation reference symbols and nominal DFT coded data symbols are used to equalize the measured data symbols. (Location for equalization see Figure E.2.5-1)

NOTE: (The nomenclature inside this note is local and not valid outside)

The nominal DFT coded data symbols are created by a demodulation process. The location to gain the demodulated data symbols is “EVM” in Figure E.2.5-1. A demodulation process as follows is recommended:

1. Equalize the measured DFT coded data symbols using the reference symbols for equalisation. Result: Equalized DFT coded data symbols
2. iDFT transform the equalized DFT coded data symbols: Result: Equalized data symbols
3. Decide for the nearest constellation point: Result: Nominal data symbols
4. DFT transform the nominal data symbols: Result: Nominal DFT coded data symbols

At this stage we have an array of Measured data-Symbols and reference-Symbols (MS(f,t))

versus an array of Nominal data-Symbols and reference Symbols (NS(f,t))

(complex, the arrays comprise 6 DFT coded data symbols and 1 demodulation reference symbol in the time axis and the number of allocated subcarriers in the frequency axis.)

MS(f,t) and NS(f,t) are processed with a least square (LS) estimator, to derive one equalizer coefficient per time slot and per allocated subcarrier. EC(f)

$$EC(f) = \frac{\sum_{t=0}^{7} NS(f,t)^{*} NS(f,t)}{\sum_{t=0}^{7} MS(f,t)^{*} NS(f,t)}$$

With * denoting complex conjugation.

EC(f) are used to equalize the DFT-coded data symbols. The measured DFT-coded data and the references symbols are equalized by:

$$Z'(f,t) = MS(f,t) * EC(f)$$

Z'(f,t), restricted to the data symbol (excluding t=3) is used to calculate EVM, as described in E.4.1.

EC(f) is used in E.4.4 to calculate spectral flatness.

The samples of the non allocated resource blocks within the transmission bandwidth configuration in the post FFT domain are called Y(f,t) (f covering the non allocated subcarriers within the transmission bandwidth configuration, t covering the OFDM symbols during 1 slot).

E.4 Derivation of the results

E.4.1 EVM

For EVM create two sets of Z'(f,t)., according to the timing " $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2" using the equalizer coefficients from E.3.3.

Perform the iDFTs on Z'(f,t). The IDFT-decoding preserves the meaning of t but transforms the variable f (representing the allocated sub carriers) into an another variable g, covering the same count and representing the demodulated symbols. The samples in the post IDFT domain are called iZ'(g, t). The equivalent ideal samples are called iI(g,t). Those samples of Z'(f,t), carrying the reference symbols (=symbol 3) are not iDFT processed.

The EVM is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM = \sqrt{\frac{\sum_{t \in T} \sum_{g \in G} \left| iZ'(g,t) - iI(g,t) \right|^2}{|T| \cdot P_0}},$$

where

t covers the count of demodulated symbols with the considered modulation scheme being active within the measurement period, (i.e. symbol 0,1,2,4,5and 6 in each slot, →|T|=6)

g covers the count of demodulated symbols with the considered modulation scheme being active within the allocated bandwidth. (|G|=12* L_{CRBs} (with L_{CRBs} : number of allocated resource blocks)).

$iZ'(g,t)$ are the samples of the signal evaluated for the EVM.

$iI(g,t)$ 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.

From the acquired samples 40 EVM value can be derived, 20 values for the timing $\Delta\tilde{c}$ –W/2 and 20 values for the timing $\Delta\tilde{c}$ +W/2

E.4.2 Averaged EVM

EVM is averaged over all basic EVM measurements.

The averaging comprises 20 consecutive UL slots (for frame structure 2: excluding special fields(UpPTS))

$$\overline{EVM} = \sqrt{\frac{1}{20}\sum_{i=1}^{20} EVM_i^2}$$

The averaging is done separately for timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{\mathrm{EVM}}_l$ and $\overline{\mathrm{EVM}}_h$

$EVM_{\mathrm{final}} = \max(\overline{\mathrm{EVM}}_l, \overline{\mathrm{EVM}}_h)$ is compared against the test requirements.

E.4.3 In-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks.

Explanatory Note:

The inband emission measurement is only meaningful with allocated RBs next to non allocated RB. The allocated RBs are necessary but not under test. The non allocated RBs are under test. The RB allocation for this test is as follows: The allocated RBs are at one end of the channel BW, leaving the other end unallocated. The number of allocated RBs is smaller than half of the number of RBs, available in the channel BW. This means that the vicinity of the DC carrier in the centre is unallocated.

There are 3 types of inband emissions:

1. General
2. IQ image
3. DC

DC are inband emissions next to the DC carrier.

IQ image are inband emissions symmetrically (with respect to the DC carrier) on the other side of the allocated RBs.

General are the remaining unallocated RBs.

1 and 2 is expressed in terms of power in one non allocated RB under test, normalized to the average power of an allocated RB (unit dB).

3 is expressed in terms of power in one non allocated RB, normalized to the power of all allocated RBs. (unit dBc).

This is the reason for two formulas $Emissions_{relative}$

Create one set of Y(t,f) per slot according to the timing "$\Delta\tilde{c}$"

For the non-allocated RBs below the in-band emissions are calculated as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \dfrac{1}{|T_s|}\sum_{t\in T_s} \sum_{\max(f_{\min},(c_l+12\cdot\Delta_{RB})*\Delta f)}^{c_l+(12\cdot\Delta_{RB}+11)*\Delta f} |Y(t,f)|^2, \Delta_{RB}<0 \\ \dfrac{1}{|T_s|}\sum_{t\in T_s} \sum_{c_h+(12\cdot\Delta_{RB}-11)*\Delta f}^{\min(f_{\max},(c_h+12\cdot\Delta_{RB})*\Delta f)} |Y(t,f)|^2, \Delta_{RB}>0 \end{cases},$$

where

the upper formula represents the in band emissions below the allocated frequency block and the lower one the in band emissions above the allocated frequency block.

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. $\Delta_{RB} = 1$ for the first upper or $\Delta_{RB} = -1$ for the first lower adjacent RB),

$f_{\min}$ and $f_{\max}$ are the lower and upper edge of the UL transmission BW configuration,

c_l and c_h are the lower and upper edge of the allocated BW,

Δf is 15kHz,and

$Y(t, f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection E.3.3

The allocated RB power per RB and the total allocated RB power are given by:

$$P_{RB} = \frac{1}{|T_s| \cdot N_{RB}} \sum_{t\in T_S} \sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f} |\mathrm{MS}(t,f)|^2 \ [\mathrm{dBm}/180\,\mathrm{kHz}]$$

$$P_{All-RBs} = \frac{1}{|T_s|} \sum_{t\in T_S} \sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f} |\mathrm{MS}(t,f)|^2 \ [\mathrm{dBm}]$$

The relative in-band emissions, applicable for General and IQ image, are given by:

$$Emissions_{relative}(\Delta_{RB}) = 10\cdot\log_{10}\left(\frac{Emissions_{absolute}(\Delta_{RB})}{\dfrac{1}{|T_s|\cdot N_{RB}}\sum_{t\in T_s}\sum_{c_l}^{c_l+(12\cdot L_{CRBs}-1)*\Delta f}|\mathrm{MS}(t,f)|^2}\right)[\mathrm{dB}]$$
$$= Emissions_{absolute}(\Delta_{RB})\,[\mathrm{dBm}/180\,\mathrm{kHz}] - P_{RB}\,[\mathrm{dBm}/180\,\mathrm{kHz}]$$

where

L_{CRBs} is the number of allocated resource blocks,

N_{RB} is the Transmission Bandwidth Configuration.

and $\mathrm{MS}(t, f)$ is the frequency domain samples for the allocated bandwidth, as defined in the subsection E.3.3.

The relative in-band emissions, applicable for DC, is given by:

$$Emissions_{relative} = 10 \cdot \log_{10}\left(\frac{Emissions_{absolute}(RBnextDC)}{\frac{1}{|T_s|}\sum_{t \in T_s}\sum_{c_1}^{c_1+(12 \cdot L_{CRBs}-1)*\Delta f}|\mathrm{MS}(t,f)|^2}\right)[\mathrm{dBc}]$$
$$= Emissions_{absolute}(RBnextDC)[\mathrm{dBm}/180\,\mathrm{kHz}] - P_{All-RBs}[\mathrm{dBm}]$$

where RBnextDC means: Ressouce Block next to the DCcarrier.

This is one RB, namely the central one in case of an odd number of RBs in the channel BW.

This is one pair of RBs, namely the immediately adjacent RBs to the DC carrier in case of an even number of RBs in the channel BW.

The basic in-band emissions measurement interval is defined over one slot in the time domain.

From the acquired samples 20 functions for general in band emissions and IQ image inband emissions can be derived. 20 values or 20 pairs of DC inband emissions can be derived. They are compared against different limits.

E.4.4 Spectral flatness

For spectral flatness use EC(f) as defined in E.3.3. Note, EC(f) represents the inverse complex channel coefficients.

$$\Delta P(f) = 10 * \log \frac{\frac{1}{12 * L_{CRBs}} \sum_{12*L_{CRBs}} EC(f) * EC(f)}{EC(f) * EC(f)}$$

With * denoting complex conjugation.

12* L_{CRBs} : Number of allocated subcarriers

This function represents the relative frequency response of the TX chain in dB (after equalization) and is compared against limits.

From the acquired samples 20 functions ΔP(f) can be derived.

E.4.5 Frequency error and IQ offset

See E.3.1.

E.4.6 EVM of Demodulation reference symbols (EVM_{DMRS})

For the purpose of EVM $_{DMRS}$, the steps E.2.2 to E.4.2 are repeated 6 times, constituting 6 EVM $_{DMRS}$ sub-periods. The only purpose of the repetition is to cover the longer gross measurement period of EVM $_{DMRS}$ (120 time slots) and to derive the FFT window timing per sub-period.

The bigger of the EVM results in one 20 TS period corresponding to the timing $\Delta\tilde{c}$ –W/2 or $\Delta\tilde{c}$ +W/2 is compared against the limit. (Clause E.4.2) This timing is re-used for EVM $_{DMRS}$ in the equivalent EVM $_{DMRS}$ sub-period.

For EVM the demodulation reference symbols are exlcuded, while the data symbols are used. For EVM_{DMRS} the data symbols are excluded, while the demodulation references symbols are used.

Re-use the folowing formula from E.3.3:

Z'(f,t) = MS(f,t) * EC(f)

To calculate EVM_{DMRS} , the data symbol (t=0,1,2,4,5,6) in Z'(f,t) are excluded and only the reference symbol (t=3) is used.

The EVM $_{DMRS}$ is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM_{DMRS} = \sqrt{\frac{\sum_{t \in T} \sum_{f \in F} \left| Z'(f,t) - I(f,t) \right|^2}{|T| \cdot P_0}},$$

where

t covers the count of demodulation reference symbols (i.e. only symbol 3 in each slot, so count =1)

f covers the count of demodulation reference symbols within the allocated bandwidth. (|F|=12* L_{CRBs} (with L_{CRBs} : number of allocated resource blocks)).

$Z'(f,t)$ are the samples of the signal evaluated for the EVM $_{DMRS}$

$I(f,t)$ 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.

20 such results are generated per measurement sub-period.

E.4.6.1 1st average for EVM $_{DMRS}$

EVM $_{DMRS}$ is averaged over all basic EVM $_{DMRS}$ measurements in one sub-period

The averaging comprises 20 consecutive UL slots (for frame structure 2: excluding special fields(UpPTS))

$$1stEVM_{DMRS} = \sqrt{\frac{1}{20} \sum_{i=1}^{20} EVM_{DMRS\,i}^{\,2}}$$

The timing is taken from the EVM for the data. 6 of those results are achieved from the samples. In general the timing is not the same for each result.

E.4.6.2 Final average for EVM $_{DMRS}$

$$finalEVM_{DMRS} = \sqrt{\frac{1}{6} \sum_{i=1}^{6} 1stEVM_{DMRS\,i}^{\,2}}$$

E.5 EVM and inband emissions for PUCCH

For the purpose of worst case testing, the PUCCH shall be located on the edges of the Transmission Bandwidth Configuration (6,15,25,50,75,100 RBs).

The EVM for PUCCH (EVM_{PUCCH}) is averaged over 20 slots. At least 20 consecutive TSs shall be transmitted by the UE without power change. SRS multiplexing shall be avoided during this period. Although discontinuous in the frequency domain due to band edge alternation, the signal in the time domain is continuous in power. So EVM_{PUCCH} is measured without power change. Transition periods are not applicable.

Editors note:

36.101, clause 6.5.2.1, 3rd paragraph defines the applicability of transition periods only in case of power change.

36.101. Clause 6.3.4.2: it is not clear, if this clause defines the applicability of transition periods for this test.

The applicability of transition periods for TDD is FFS.

The description below is generic in the sense that all 6 PUCCH formats are covered. Although the number of OFDM symbols in one slot is 6 or 7 (depending on the preamble length), the text below uses 7 without excluding 6.

E.5.1 Basic principle

The basis principle is the same as described in E.2.1

E.5.2 Output signal of the TX under test

The output signal of the TX under test is processed same as described in E.2.2

NOTE: TDD is FFS.

E.5.3 Reference signal

The reference signal is defined same as in E.2.3. Same as in E.2.3, $i_1(v)$ is the ideal reference for EVM_{PUCCH} and $i_2(v)$ is used to estimate the FFT window timing.

Note PUSCH is off during the PUCCH measurement period.

E.5.4 Measurement results

The measurement results are:

- EVM_{PUCCH}
- Inband emissions with the sub-results: General in-band emission, IQ image (according to: 36.101. Annex F.4, Clause starting with: “At this stage the ….”)

E.5.5 Measurement points

The measurement points are illustrated in the figure below:

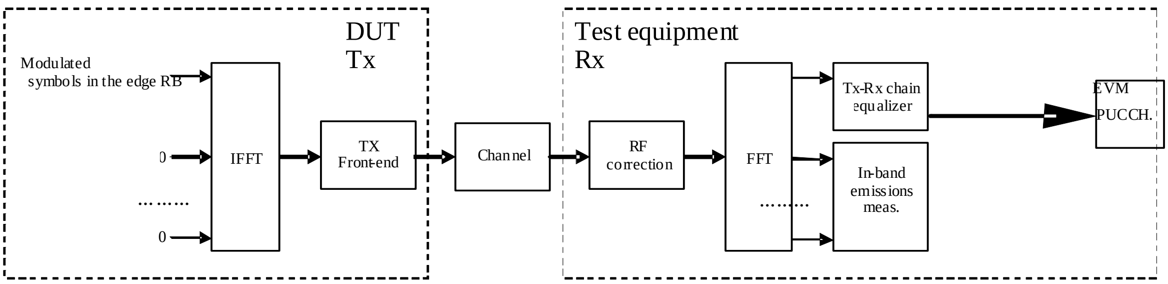

Figure E.5.5-1

E.5.6 Pre FFT minimization process

The pre FFT minimisation process is the same as describes in clause E.3.1.

RF error, and origin offset are necessary for best fit of the measured signal towards the ideal signal in the pre FFT domain. However they are not used to compare them against the limits.

E.5.7 Timing of the FFT window

Timing of the FFT window is estimated with the same method as described in E.3.2.

E.5.8 Post FFT equalisation

The post FFT equalisation is described separately without reference to E.3.3:

Perform 7 FFTs on z'(v), one for each OFDM symbol in a slot using the timing $\Delta\tilde{c}$, including the demodulation reference symbol. The result is an array of samples, 7 in the time axis t times 2048 in the frequency axis f. The samples represent the OFDM symbols (data and reference symbols) in the allocated RBs and inband emissions in the non allocated RBs within the transmission BW.

Only the allocated resource blocks in the frequency domain are used for equalisation.

The nominal reference symbols and **nominal** OFDM data symbols are used to equalize the measured data symbols.

Note: (The nomenclature inside this note is local and not valid outside)

The nominal OFDM data symbols are created by a demodulation process. A demodulation process as follows is recommended:

1. Equalize the measured OFDM data symbols using the reference symbols for equalisation. Result: Equalized OFDM data symbols
2. Decide for the nearest constellation point, however not independent for each subcarrier in the RB. 12 constellation points are decided dependent, using the applicable CAZAC sequence. Result: Nominal OFDM data symbols

At this stage we have an array of Measured data-Symbols and reference-Symbols (MS(f,t))

versus an array of Nominal data-Symbols and reference Symbols (NS(f,t))

The arrays comprise in sum 7 data and reference symols, depending on the PUCCH format, in the time axis and the number of allocated sub-carriers in the frequency axis.

MS(f,t) and NS(f,t) are processed with a least square (LS) estimator, to derive one equalizer coefficient per time slot and per allocated subcarrier. EC(f)

$$EC(f) = \frac{\sum_{t=0}^{7} NS(f,t)^* NS(f,t)}{\sum_{t=0}^{7} MS(f,t)^* NS(f,t)}$$

With * denoting complex conjugation.

EC(f) are used to equalize the OFDM data together with the demodulation reference symbols by:

Z'(f,t) = MS(f,t) * EC(f)

Z'(f,t) is used to calculate EVM_{PUCCH}, as described in E.5.9 1

The samples of the non allocated resource blocks within the transmission bandwidth configuration in the post FFT domain are called Y(f,t) (f covering the non allocated subcarriers within the transmission bandwidth configuration, t covering the OFDM symbols during 1 slot).

E.5.9 Derivation of the results

E.5.9.1 EVM_{PUCCH}

For EVM_{PUCCH} create two sets of Z'(f,t)., according to the timing " $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2" using the equalizer coefficients from E.5.8

The EVM_{PUCCH} is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM_{PUCCH} = \sqrt{\frac{\sum_{t \in T} \sum_{f \in F} \left| Z'(f,t) - I(f,t) \right|^2}{|T| \cdot P_0}},$$

where

t covers the count of demodulated symbols in the slot (|T|= 7)

f covers the count of demodulated symbols within the allocated bandwidth. (|F|=12)

$Z'(f,t)$ are the samples of the signal evaluated for the EVM_{PUCCH}

$I(g,t)$ 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.

From the acquired samples 40 EVM_{PUCCH} value can be derived, 20 values for the timing $\Delta\tilde{c}$ –W/2 and 20 values for the timing $\Delta\tilde{c}$ +W/2

E.5.9.2 Averaged EVM_{PUCCH}

EVM_{PUCCH} is averaged over all basic EVM_{PUCCH} measurements

The averaging comprises 20 consecutive UL slots (for frame structure 2: excluding special fields(UpPTS))

$$\overline{EVM}_{PUCCH} = \sqrt{\frac{1}{20} \sum_{i=1}^{20} EVM_{PUCCH\,i}^{\,2}}$$

The averaging is done separately for timing¦ $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{EVM}_{PUCCH,low}$ and $\overline{EVM}_{PUCCH,high}$

$EVM_{PUCCH,final} = \max(\overline{EVM}_{PUCCH,low}, \overline{EVM}_{PUCCH,high})$ is compared against the test requirements.

E.5.9.3 In-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks

Create one set of Y(t,f) per slot according to the timing "$\Delta\tilde{c}$"

For the non-allocated RBs the in-band emissions are calculated as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \dfrac{1}{|T_s|} \sum_{t \in T_s} \sum_{\max(f_{\min}, (c_l + 12 \cdot \Delta_{RB}) * \Delta f)}^{c_l + (12 \cdot \Delta_{RB} + 11) * \Delta f} |Y(t,f)|^2, \Delta_{RB} < 0 \\ \dfrac{1}{|T_s|} \sum_{t \in T_s} \sum_{c_h + (12 \cdot \Delta_{RB} - 11) * \Delta f}^{\min(f_{\max}, (c_h + 12 \cdot \Delta_{RB}) * \Delta f)} |Y(t,f)|^2, \Delta_{RB} > 0 \end{cases},$$

where

the upper formula represents the inband emissions below the allocated frequency block and the lower one the inband emissions above the allocated frequency block.

T_s is a set of $|T_s|$ OFDM symbols in the measurement period,

Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ for the first upper or $\Delta_{RB} = -1$ for the first lower adjacent RB),

$f_{\min}$ and $f_{\max}$ are the lower and upper edge of the UL system BW,

c_l and c_h are the lower and upper edge of the allocated BW,

Δf is 15kHz,and

$Y(t, f)$ is the frequency domain signal evaluated for in-band emissions as defined in the subsection E.5.8

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = \frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s| \cdot L_{CRBs}} \sum_{t \in T_s} \sum_{c_l}^{c_l + (12 \cdot L_{CRBs} - 1)*\Delta f} |\mathrm{MS}(t, f)|^2}$$

where

L_{CRBs} is the number of allocated RBs, which is always 1 in case of PUCCH

and $\mathrm{MS}(t, f)$ is the frequency domain samples for the allocated bandwidth, as defined in the subsection E.5.8

The basic in-band emissions measurement interval is defined over one slot in the time domain.

From the acquired samples 20 functions for inband emissions can be derived.

Since the PUCCH allocation is always on the upper or lower band-edge, the opposite to the allocated one represents the IQ image, and the remaining inner RBs represent the general inband emissions. They are compared against different limits.

E.6 EVM for PRACH

The description below is generic in the sense that all 5 PRACH formats are covered. The numbers, used in the text below are taken from PRACH format#0 without excluding the other formats.

E.6.1 Basic principle

The basis principle is the same as described in E.2.1

E.6.2 Output signal of the TX under test

The output signal of the TX under test is processed same as described in E.2.2

The measurement period is different:

- 2 PRACH preambles are recorded for format 0and 1,
- 1 PRACH preamble is recorded for format 2 and 3, each containing 1 CP and 2 preamble sequences
- 10 RPRACH preambles are recorded for format 4.

E.6.3 Reference signal

The test description in 6.5.2.1.4.1A is based on non contention based access:

- PRACH configuration index (responsible for Preamble format, System frame number and subframe number)
- Preamble ID
- Preamble power
- signalled to the UE, defines the reference signal unambiguously, such that no demodulation process is necessary to gain the reference signal.

The reference signal i(v) is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: the applicable Zadoff Chu sequence, nominal carrier frequency, nominal amplitude and phase for each subcarrier, nominal timing, no IQ offset. It is represented as a sequence of samples at a sampling rate of 30.72 Msps in the time domain.

E.6.4 Measurement results

The measurement result is:

- EVM_{PRACH}

E.6.5 Measurement points

The measurement points are illustrated in the figure below:

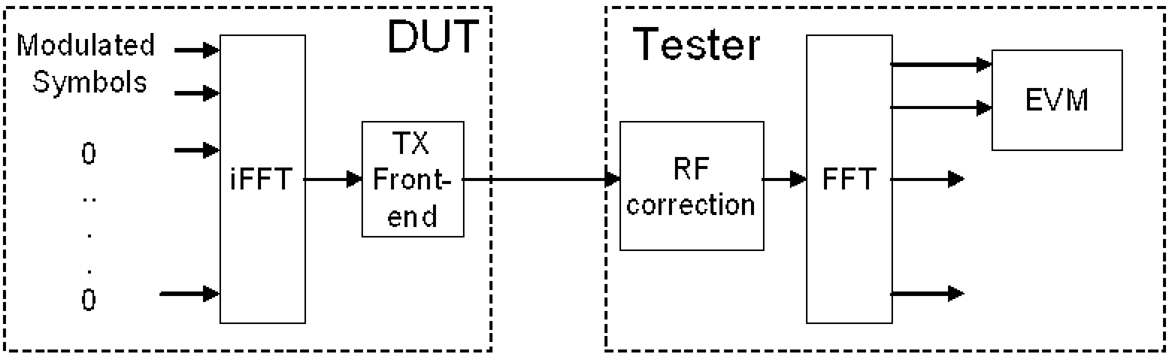

Figure E.6.5-1

E.6.6 Pre FFT minimization process

The pre-FFT minimization process is applied to each PRACH preamble separately. The time period for the pre- FFT minimisation process includes the complete CP and Zadoff-Chu sequence (in other words, the power transition period is per definition outside of this time period) Sample timing, Carrier frequency and I/Q offset in z(v) are jointly varied in order to minimise the difference between z(v) and i(v). Best fit (minimum difference) is achieved when the RMS difference value between z(v) and i(v) is an absolute minimum.

After this process the samples z(v) are called $z^0(v)$.

RF error, and origin offset are necessary for best fit of the measured signal towards the ideal signal in the pre FFT domain. However they are not used to compare them against the limits.

E.6.7 Timing of the FFT window

The FFT window length is 24576 samples for preamble format 0, however in the measurement period is at least 27744 samples are taken. The position in time for FFT must be determined.

In an ideal signal, the FFT may start at any instant within the cyclic prefix without causing an error. The TX filter, however, reduces the window. The EVM requirements shall be met within a window W<CP.

The reference instant for the FFT start is the centre of the reduced window, called $\Delta\tilde{c}$,

EVM is measured at the following two instants: $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

The timing of the measured signal $z^0(v)$ with respect to the ideal signal i(v) is determined in the pre FFT domain as follows:

Correlation between $z^0(v)$ and i(v) will result in a correlation peak. The meaning of the correlation peak is approx. the "impulse response" of the TX filter. The correlation peak, (the highest, or in case of more than one, the earliest) indicates the timing in the measured signal with respect to the ideal signal.

W is different for different preamble formats and shown in Table E.7.1-1.

Table E.7.1-1 EVM window length for PRACH

Preamble format	Cyclic prefix length[1] N_{cp}	Nominal FFT size[2]	EVM window length *W* in FFT samples	Ratio of *W* to CP*
0	3168	24576	[TBD]	[TBD]
1	21024	24576	[TBD]	[TBD]
2	6240	49152	[TBD]	[TBD]
3	21024	49152	[TBD]	[TBD]
4	448	4096	[TBD]	[TBD]
Note 1: The unit is number of samples, sampling rate of 30.72MHz is assumed Note 2: Decimation of time samples by 12 is assumed Note 3: These percentages are informative				

The number of samples, used for FFT is reduced compared to $z^0(v)$. This subset of samples is called z''(v).

The sample frequency 30.72 MHz is oversampled with respect to the PRACH-subcarrier spacing of 1.25MHz. EVM is based on 2048 samples per PRACH preamble and requires decimation of the time samples by the factor of 12. The final number of samples per PRACH preamble, used for FFT is reduced compared to $z''(v)$ by the factor of 12. This subset of samples is called z'(v).

E.6.8 Post FFT equalisation

Equalisation is not applicable for the PRACH.

E.6.9 Derivation of the results

E.6.9.1 EVM_{PRACH}

Perform FFT on z'(v) and i(v) using the FFT timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2.

For format 2 and 3 the first and the repeated preamble sequence are FFT-converted separately.

The EVM_{PRACH} is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s).

$$EVM_{PRACH} = \sqrt{\frac{\sum_{f \in F} \left| Z'(f) - I(f) \right|^2}{\cdot P_0}},$$

where

f covers the count of demodulated symbols within the allocated bandwidth.

$Z'(f)$ are the samples of the signal evaluated for the EVM_{PRACH}

$I(f)$ 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.

From the acquired samples 4 EVM_{PRACH} value can be derived, 2 values for the timing $\Delta\tilde{c}$ –W/2 and 2 values for the timing $\Delta\tilde{c}$ +W/2 (4 and 2 applies for format 0,1,2,3. 20 and 10 applies for format 4).

E.6.9.2 Averaged EVM_{PRACH}

EVM_{PRACH} is averaged over all basic EVM_{PRACH} measurements

$$\overline{EVM}_{PRACH} = \sqrt{\frac{1}{2}\sum_{i=1}^{2} EVM_{PRACH\,i}^{2}}$$

(i= 2 applies for format 0,1,2,3. i= 10 applies for format 4)

The averaging is done separately for timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{EVM}_{PRACH,low}$ and $\overline{EVM}_{PRACH,high}$

$EVM_{PRACH,final} = \max(\overline{EVM}_{PRACH,low}, \overline{EVM}_{PRACH,high})$ is compared against the test requirements.

Annex F: (normative) Measurement uncertainties and Test Tolerances

Editor's note: Annex is incomplete. The following aspects are either missing or not yet determined:

In Annex F.1 the Acceptable uncertainty of Test System has not yet been defined for all tests

In Annex F.3 the Derivation of Test Requirements has not yet been defined for all test

The references to other specifications need to be formalised

The requirements of this clause apply to all applicable tests in the present document.

F.1 Acceptable uncertainty of Test System (normative)

The maximum acceptable uncertainty of the Test System is specified below for each test, where appropriate. The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified range, and the equipment under test to be measured with an uncertainty not exceeding the specified values. All ranges and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

For RF tests it should be noted that the uncertainties in clause F.1 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

F.1.1 Measurement of test environments

The measurement accuracy of the UE test environments defined in TS 36.508 subclause 4.1, Test environments shall be.

- Pressure ±5 kPa.
- Temperature ±2 degrees.
- Relative Humidity ±5 %.
- DC Voltage ±1,0 %.
- AC Voltage ±1,5 %.
- Vibration 10 %.
- Vibration frequency 0,1 Hz.

The above values shall apply unless the test environment is otherwise controlled and the specification for the control of the test environment specifies the uncertainty for the parameter.

F.1.2 Measurement of transmitter

Table F.1.2-1: Maximum Test System Uncertainty for transmitter tests

Subclause	Maximum Test System Uncertainty	Derivation of Test System Uncertainty
6.2.2. UE Maximum Output Power	±0.7 dB	
6.2.3 Maximum Power Reduction	±0.7 dB	
6.2.4 UE Maximum Output Power with additional requirements	±0.7 dB	
6.2.5 Configured UE transmitted Output Power	±0.7 dB	
6.3.1 Power Control	[TBD]	
6.3.2 Minimum Output Power	±1.0 dB	
6.3.3 Transmission ON/OFF Power	Transmission OFF Power: ±1.5 dB	
6.3.4 ON/OFF time mask		
6.3.5.1 Power Control Absolute power tolerance	±1.0 dB	
6.3.5.2 Power Control Relative power tolerance	[TBD]	
6.3.5.3 Aggregate power control tolerance	±0.7 dB	
6.5.1 Frequency Error	±15 Hz DL Signal level: ±0.7 dB	
6.5.2.1 Error Vector Magnitude	[TBD]	
6.5.2.2 IQ-component	[TBD]	
6.5.2.3 In-band emissions for non allocated RB	[TBD]	
6.5.2.4 Spectrum flatness	[TBD]	
6.6.1 Occupied bandwidth	1.4MHz, 3MHz: 30kHz 5MHz, 10MHz: 100kHz 15MHz, 20MHz: 300kHz	
6.6.2.1 Spectrum Emission Mask	±1.5 dB	
6.6.2.2 Additional Spectrum Emission Mask	±1.5 dB	
6.6.2.3 Adjacent Channel Leakage power Ratio	±0.8 dB	
6.6.2.4 Additional ACLR requirements	±0.8 dB	
6.6.3.1 Transmitter Spurious emissions	9kHz < f ≤ 4 GHz: ± 2.0 dB 4 GHz < f ≤ 12.75 GHz: ± 4.0 dB	
6.6.3.2 Spurious emission band UE co-existence	± 2.0 dB for results > -60 dBm ± 3.0 dB for results ≤ -60 dBm	
6.6.3.3 Additional spurious emissions	9kHz < f ≤ 4 GHz: ± 2.0 dB	
6.7 Transmit intermodulation	[TBD]	

F.1.3 Measurement of receiver

Table F.1.3-1: Maximum Test System Uncertainty for receiver tests

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
7.3.1 Reference sensitivity power level; Minimum requirements (QPSK)	±0.7 dB	
7.4 Maximum input level	±0.7 dB	
7.5 Adjacent Channel Selectivity (ACS)	±1.1 dB	Overall system uncertainty comprises three quantities: 1. Wanted signal level error 2. Interferer signal level error 3. Additional impact of interferer ACLR Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added aritmetically. Test System uncertainty = [SQRT (wanted_level_error^2 + interferer_level_error^2)] + ACLR effect. Wanted signal level ± 0.7dB Interferer signal level ± 0.7dB Impact of interferer ACLR 0.1dB
7.6.1 In-band blocking	±1.4 dB	Overall system uncertainty can have these contributions: 1. Wanted signal level error 2. Interferer signal level error 3. Interferer ACLR 4. Interferer broadband noise Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added aritmetically. Test System uncertainty = [SQRT (wanted_level_error^2 + interferer_level_error^2)] + ACLR effect + Broadband noise effect. In-band blocking, using modulated interferer: Wanted signal level ± 0.7dB Interferer signal level: ± 0.7dB Interferer ACLR 0.4dB Broadband noise not applicable

7.6.2 Out of-band blocking	1MHz < $f_{interferer}$ ≦ 3 GHz: ±1.3 dB 3 GHz < $f_{interferer}$ ≦ 12.75 GHz: ±3.2 dB	Out of band blocking, using CW interferer: Wanted signal level ± 0.7dB Interferer signal level: ± 1.0dB up to 3GHz ± 3.0dB up to 12.75GHz Interferer ACLR not applicable Impact of interferer Broadband noise 0.1dB Figures are combined to give Test System uncertainty, using formula given for 7.6.1
7.6.3 Narrow band blocking	±1.3 dB	Narrow band blocking, using CW interferer: Wanted signal level ± 0.7dB Interferer signal level: ± 1.0dB Interferer ACLR not applicable Impact of interferer Broadband noise 0.1dB Figures are combined to give Test System uncertainty, using formula given for 7.6.1
7.7 Spurious response	1MHz < $f_{interferer}$ ≦ 3 GHz: ±1.3 dB 3 GHz < $f_{interferer}$ ≦ 12.75 GHz: ±3.2 dB	Spurious response, using CW interferer: Wanted signal level ± 0.7dB Interferer signal level: ± 1.0dB up to 3GHz ± 3.0dB up to 12.75GHz Interferer ACLR not applicable Impact of interferer Broadband noise 0.1dB Figures are combined to give Test System uncertainty, using formula given for 7.6.1

7.8.1 Wide band intermodulation	±1.4 dB	Overall system uncertainty comprises three quantities: 1. Wanted signal level error 2. CW Interferer level error 3. Modulated Interferer level error Effect of interferer ACLR has not been included as modulated interferer has larger frequency offset The effect of the closer CW signal has twice the effect. Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals. Test System uncertainty = SQRT [(2 x CW_level_error)^2 +(mod interferer_level_error)^2 +(wanted signal_level_error)^2] Wanted signal level ± 0.7dB CW Interferer level ± 0.5dB Mod Interferer level ± 0.7dB
7.9 Spurious emissions	30MHz ≤ f ≤ 4.0GHz: ± 2.0 dB 4 GHz < f ≤ 12.75 GHz: ± 4.0 dB	
NOTE 1: Unless otherwise noted, only the Test System stimulus error is considered here. The effect of errors in the throughput measurements due to finite test duration is not considered.		

F.1.4 Measurement of performance requirements

Table F.1.4-1: Maximum Test System Uncertainty for Performance Requirements

Subclause	Maximum Test System Uncertainty[1]	Derivation of Test System Uncertainty
[TBD]	[TBD]	[TBD]
NOTE 1: Only the overall stimulus error is considered here. The effect of errors in the throughput measurements due to finite test duration is not considered.		

F.2 Interpretation of measurement results (normative)

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 ETR 273-1-2 clause 6.5.

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in clause F.1 of the present document.

If the Test System for a test is known to have a measurement uncertainty greater than that specified in clause F.1, it is still permitted to use this apparatus provided that an adjustment is made value as follows:

Any additional uncertainty in the Test System over and above that specified in clause F.1 shall be used to tighten the Test Requirement, making the test harder to pass. For some tests, for example receiver tests, this may require modification of stimulus signals. This procedure will ensure that a Test System not compliant with clause F.1does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with clause F.1 had been used.

F.3 Test Tolerance and Derivation of Test Requirements (informative)

The Test Requirements in the present document have been calculated by relaxing the Minimum Requirements of the core specification using the Test Tolerances defined in this clause. When the Test Tolerance is zero, the Test Requirement will be the same as the Minimum Requirement. When the Test Tolerance is non-zero, the Test Requirements will differ from the Minimum Requirements, and the formula used for the relaxation is given in this clause.

The Test Tolerances are derived from Test System uncertainties, regulatory requirements and criticality to system performance. As a result, the Test Tolerances may sometimes be set to zero.

The test tolerances should not be modified for any reason e.g. to take account of commonly known test system errors (such as mismatch, cable loss, etc.).

F.3.1 Measurement of test environments

The UE test environments are set to the values defined in TS 36.508 subclause 4.1, without any relaxation. The applied Test Tolerance is therfore zero.

F.3.2 Measurement of transmitter

Table F.3.2-1: Derivation of Test Requirements (Transmitter tests)

Test	Minimum Requirement in TS 36.101	Test Tolerance (TT)	Test Requirement in TS 36.521-1
6.2.2. UE Maximum Output Power	Power class 1: [FFS] Power class 2: [FFS] Power class 3: 23dBm ±2 dB Power class 4: [FFS]	0.7 dB 0.7 dB 0.7 dB 0.7 dB	Formula: Upper limit + TT, Lower limit - TT Power class 1: [FFS] Power class 2: [FFS] Power class 3: 23dBm ±2.7 dB Power class 4: [FFS]
6.2.3 Maximum Power Reduction	Power class 3: QPSK: MPR ≤ 1dB 16QAM: Depending on the number RB allocated: 16QAM: MPR ≤ 1dB 16QAM: MPR ≤ 2dB	0.7 dB	Formula: Upper limit + TT, Lower limit – MPR – TT Power class 3: QPSK: 23dBm +2.7 / - 3.7dB 16QAM: 23dBm +2.7 / - 3.7dB 23dBm +2.7 / - 4.7dB

6.2.4 UE Maximum Output Power with additional requirements	Power class 3: QPSK: MPR ≤ 1dB For network signalled value NS_03 to NS_06: A-MPR ≤ 1dB For network signalled value NS_07; Depending on the RB_start and RB allocation: Region A with RB_start = 0-12 & RB allocation 1 to 5 and 9-50: A-MPR = 12dB Region A with RB_start = 0-12 & RB allocation 6-8: A-MPR = 8dB Region B with RB_start = 13-18 & RB allocation < 8: A-MPR ≤ 0dB Region B with RB_start = 13-18 & RB allocation ≥ 8: A-MPR ≤ 12dB Region B with RB_start = 19-42 & RB allocation < 18: A-MPR = 0dB Region B with RB_start = 19-42 & RB allocation ≥ 18: A-MPR = 6dB Region C with RB_start = 43-49 & RB allocation ≤ 2: A-MPR = 0dB Region C with RB_start = 43-49 & RB allocation > 2: A-MPR = 3dB Region A with RB_start = 0-12 & RB allocation 1 to 5 and 9-50: A-MPR = 12dB	0.7 dB	Formula: Upper limit + TT, A: Lower limit – TT, B: Lower limit – MPR – TT, C: Lower limit – A-MPR – TT, D: Lower limit – A-MPR – MPR – TT Power class 3: Network signalled value NS_03 to NS_06: 23dBm +2.7 / -2.7dB – [A] 23dBm +2.7 / -3.7dB – [B] 23dBm +2.7 / -4.7dB – [D] Network signalled value NS_07: 23dBm +2.7 / - 14.7dB – [C] 23dBm +2.7 / - 10.7dB – [C] 23dBm +2.7 / - 2.7dB – [A] 23dBm +2.7 / - 15.7dB – [D] 23dBm +2.7 / - 3.7dB – [B] 23dBm +2.7 / - 9.7dB – [D] 23dBm +2.7 / - 2.7dB – [A] 23dBm +2.7 / - 5.7dB – [C] 23dBm +2.7 / - 15.7dB – [D]

6.2.5 Configured UE transmitted Output Power	TS 36.101 [2] clause 6.2.5 PCMAX normal conditions: 23 ± 2.0 22 ± 2.5 21 ± 3.0 20 ± 3.5 19 ± 4.0 18 ± 4.5 13 ≤PCMAX < 18 ± 5.0 8 ≤ PCMAX < 13 ± 6.0 -40 ≤ PCMAX < 8 ± 7.0	0.7 dB	Formula: Upper limit + TT, Lower limit – TT PCMAX normal conditions: 23 ± 2.7 22 ± 3.2 21 ± 3.7 20 ± 4.2 19 ± 4.7 18 ± 5.2 13 ≤PCMAX < 18 ± 5.7 8 ≤ PCMAX < 13 ± 6.7 -40 ≤ PCMAX < 8 ± 7.7
6.3.1 Power Control	[TBD]	[TBD]	[TBD]
6.3.2 Minimum Output Power	-40 dBm	1 dB	Formula: Minimum Requirement + TT UE minimum ouput power =–39 dBm
6.3.3 Transmission ON/OFF Power	Transmission OFF Power ≤ -50 dBm	1.5 dB	Transmission OFF power formula: Transmission OFF power Minimum Requirement + TT Transmission OFF Power = –48.5 dBm
6.3.4 ON/OFF time mask			
6.3.5.1 Power Control Absolute power tolerance	Normal conditions ± 9.0 dB Extremed conditions ± 12.0 dB	1.0 dB	Formula: Upper limit + TT, Lower limit - TT Normal conditions ± 10.0 dB Extremed conditions ± 13.0 dB
6.3.5.1 Power Control Relative power tolerance	[TBD]		
6.3.5.1 Aggregate power control tolerance	Aggregate power control tolerance within 21 ms: PUCCH = ±2.5 dB PUSCH = ±3.5 dB	0.7 dB	Formula: Upper limit + TT, Lower limit - TT PUCCH = ±3.2 dB PUSCH = ±4.2 dB
6.5.1 Frequency Error	The UE modulated carrier frequency shall be accurate to within ±0.1 ppm compared to the carrier frequency received from the E-UTRA Node B.	15 Hz	Formula: modulated carrier frequency error + TT modulated carrier frequency error = ±(0.1 ppm + 15 Hz).
6.5.2.1 Error Vector Magnitude	[TBD]	[TBD]	[TBD]
6.5.2.2 IQ-component	[TBD]	[TBD]	[TBD]

6.5.2.4 Spectrum flatness	Normal conditions :
	
	If (F-FUL_low ≥ [3MHz])&(FUL_high-F≥ [3MHz])
	[+2/-2]
	else
	[+3/-5]
	
	Extreme conditions:
	
	If (F-FUL_low ≥ [3MHz])&(FUL_high-F≥ [3MHz])
	[+2/-2]
	else
	[+4/-8]
		[TBD]	Formula:
			Minimum Requirement + TT

6.5.2.3 In-band emissions for non allocated RB	[TBD]	[TBD]	[TBD]
6.6.1 Occupied bandwidth	For 1.4 MHz channel bandwidth: Occupied channel bandwidth = 1.4 MHz For 3.0 MHz channel bandwidth: Occupied channel bandwidth = 3.0 MHz For 5 MHz channel bandwidth: Occupied channel bandwidth = 5 MHz For 10 MHz channel bandwidth: Occupied channel bandwidth = 10 MHz For 15 MHz channel bandwidth: Occupied channel bandwidth = 15 MHz For 20 MHz channel bandwidth: Occupied channel bandwidth = 20 MHz	0kHz	Formula: Minimum Requirement + TT

6.6.2.1 Spectrum Emission Mask	For 1.4 MHz BW: -10 dBm / 30kHz -25dBm to -10dBm / 1MHz	1.5dB (Δf_{OOB} < 2 x Channel Bandwidth) 0dB (Δf_{OOB} ≥ 2 x Channel Bandwidth)	Formula: Minimum Requirement + TT
	For 3 MHz BW: -10 dBm / 30kHz -25dBm to -10dBm / 1MHz	1.5dB	
	For 5 MHz BW: -15dBm / 30kHz -25dBm to -10dBm / 1MHz	1.5dB	
	For 10 MHz BW: -18dBm / 30kHz -25dBm to -10dBm / 1MHz	1.5dB	
	For 15 MHz BW: -20dBm / 30kHz -25dBm to -10dBm / 1MHz	1.5dB	
	For 20 MHz BW: -21dBm / 30kHz -25dBm to -10dBm / 1MHz	1.5dB	

6.6.2.2 Additional Spectrum Emission Mask	For 1.4 MHz BW: NS_03, NS_04 -10 dBm / 30 kHz -25 dBm to -13 dBm / 1MHz NS_06 or NS_07 -13 dBm / 30 kHz -13 dBm / 100 kHz -25 dBm to -13 dBm / 1MHz For 3 MHz BW: NS_03, NS_04 -13 dBm / 30 kHz -25 dBm to -13 dBm / 1 MHz NS_06 or NS_07 -13 dBm / 30 kHz -13 dBm / 100kHz -25 dBm to -13 dBm / 1 MHz For 5 MHz BW: NS_03, NS_04 -15 dBm / 30 kHz -25 dBm to -13 dBm / 1 MHz NS_06 or NS_07 -15 dBm / 30 kHz -13 dBm / 100 kHz -25 dBm to -13 dBm / 1 MHz For 10 MHz BW: NS_03, NS_04, -18 dBm / 30 kHz -25 dBm to - 13dBm / 1 MHz NS_06 or NS_07 -18 dBm / 30 kHz -13 dBm / 100 kHz -25 dBm to - 13dBm / 1 MHz For 15 MHz BW: NS_03, NS_04 -20 dBm / 30kHz -25 dBm to -13 dBm / 1 MHz For 20 MHz BW: NS_03, NS_04 -21 dBm / 30 kHz -25 dBm to -13 dBm / 1 MHz	1.5dB (Δf_{OOB} < 2 x Channel Bandwidth) 0dB (Δf_{OOB} ≥ 2 x Channel Bandwidth) 1.5dB 1.5dB 1.5dB 1.5dB 1.5dB	Formula: Minimum Requirement + TT
6.6.2.3 Adjacent Channel Leakage power Ratio	If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below. E-UTRA ACLR: 30 dB UTRA ACLR: 33 dB for UTRA ACLR 1 36 dB for UTRA ACLR 2	0 dB 0.8 dB 0.8 dB 0.8 dB	Formula: ACLR Minimum Requirement + TT Formula: ACLR Minimum Requirement - TT E-UTRA ACLR: 29.2 dB UTRA ACLR: 32.2 dB for UTRA ACLR 1 35.2 dB for UTRA ACLR 2

6.6.2.4 Additional ACLR requirements	If the adjacent channel power is greater than –50 dBm then the ACLR shall be higher than the values specified below. E-UTRA ACLR: 43 dB for UTRA ACLR 2	0 dB 0.8 dB	Formula: ACLR Minimum Requirement + TT Formula: ACLR Minimum Requirement – TT E-UTRA ACLR: 42.2 dB for UTRA ACLR 2
6.6.3.1 Transmitter Spurious emissions	9 kHz ≤ f < 150 kHz: -36dBm / 1kHz 150 kHz ≤ f < 30 MHz: -36dBm / 10kHz 30 MHz ≤ f < 1 GHz: -36dBm / 100kHz 1 GHz ≤ f < 12.75 GHz: -30dBm / 1MHz	0 dB	Formula: Minimum Requirement + TT
6.6.3.2 Spurious emission band UE co-existence	-35 dBm / 6.25kHz -36 dBm / 100kHz -41 dBm / 300kHz -37 dBm / 1MHz -40 dBm / 1MHz -50 dBm / 1MHz Frequencies as detailed in core requirement	0 dB	Formula: Minimum Requirement + TT
6.6.3.3 Additional spurious emissions	1884.5MHz ≤ f ≤ 1919.6MHz: -41dBm / 300kHz 1884.5MHz ≤ f ≤ 1915.7MHz: -41dBm / 300kHz 860 ≤ f ≤ 895 -40dBm / 1MHz	0 dB	Formula: Minimum Requirement + TT
6.7 Transmit intermodulation	[TBD]	[TBD]	[TBD]

NOTE: Section 6.6.3.3 in the table shall be reviewed after June 2012 because of PHS band operation change

F.3.3 Measurement of receiver

Table F.3.3-1: Derivation of Test Requirements (Receiver tests)

Test	Minimum Requirement in TS 36.101	Test Tolerance (TT)	Test Requirement in TS 36.521-1
7.3.1 Reference sensitivity power level; Minimum requirements (QPSK)	Reference sensitivity power level: For 1.4MHz -102.2dBm -103.2dBm -105.2dBm -106.2dBm For 3MHz -99.2dBm -100.2dBm -102.2dBm For 5MHz -97dBm -98dBm -99dBm -100dBm -96.5dBm Band 9 with Multi band For 10MHz -94dBm -95dBm -96dBm -97dBm -93.5dBm Band 9 with Multi band For 15MHz -92.2dBm -93.2dBm -94.2dBm -95.2dBm -91.7dBm Band 9 with Multi band For 20MHz -91dBm -92dBm -93dBm -94dBm -90.5dBm Band 9 with Multi band T-put limit = 95% of maximum for the Ref Meas channel	0.7dB	Formula: Reference sensitivity power level + TT T-put limit unchanged
7.4 Maximum input level	Signal level -25dBm T-put limit = 95% of maximum for the Ref Meas channel	0.7 dB	Formula: Maximum input level - TT Signal level -25.7 dBm T-put limit unchanged
7.5 Adjacent Channel Selectivity (ACS)	Case 1: Wanted signal power, all BWs: (REFSENS + 14 dB)	0 dB	Formula: Wanted signal power + TT

	Interferer signal power For 1.4 MHz, 3 MHz, 5 MHz, 10 MHz BW: (REFSENS + [45] dB) For 15 MHz BW: (REFSENS + [42] dB) For 20 MHz BW: (REFSENS + [39] dB) Case 2: Wanted signal power For 1.4 MHz, 3 MHz, 5 MHz, 10 MHz BW: [-56] dBm For 15 MHz BW: [-53] dBm For 20 MHz BW: [-50] dBm Interferer signal power, all BWs: -25 dBm T-put limit = 95% of maximum for the Ref Meas channel		Interferer signal power unchanged T-put limit unchanged
7.6.1 In-band blocking	Wanted signal power: (REFSENS + BW dependent value) Interferer signal power: -56dBm or -44dBm T-put limit = 95% of maximum for the Ref Meas channel	0 dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged
7.6.2 Out of-band blocking	Wanted signal power: (REFSENS + BW dependent value) Interferer signal power: -44dBm, -30dBm or -15dBm T-put limit = 95% of maximum for the Ref Meas channel	0 dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged
7.6.3 Narrow band blocking	Wanted signal power,: (REFSENS + BW dependent value) Interferer signal power: -55dBm T-put limit = 95% of maximum for the Ref Meas channel	0 dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged
7.7 Spurious response	Wanted signal power: (REFSENS + BW dependent value) Interferer signal power: -44dBm T-put limit = 95% of maximum for the Ref Meas channel	0 dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged
7.8.1 Wide band intermodulation	Wanted signal power: For 1.4 MHz BW: (REFSENS + [12] dB) For 3 MHz BW:	0 dB	Formula: Wanted signal power +TT CW Interferer signal power

	(REFSENS + [8] dB) For 5 MHz and 10MHz BW: (REFSENS + 6 dB) For 15 MHz BW: (REFSENS + 7 dB) For 20 MHz BW: (REFSENS + 9 dB) CW Interferer power, aall BWs: -46 dBm Modulated Interferer power:, aall BWs: -46 dBm T-put limit = 95% of maximum for the Ref Meas channel		unchanged Modulated Interferer signal power unchanged T-put limit unchanged
7.9 Spurious emissions	30MHz ≤ f < 1GHz: -57dBm / 100kHz 1GHz ≤ f ≤ 12.75 GHz: -47dBm / 1MHz	0 dB	Formula: Minimum Requirement + TT

F.3.4 Measurement of performance requirements

Table F.3.4-1: Derivation of Test Requirements (performance tests)

Test	Minimum Requirement in TS 36.133	Test Tolerance (TT)	Test Requirement in TS 36.521-1
[TBD]	[TBD]	[TBD]	[TBD]

Annex G (normative): Statistical Testing

G.1 General

FFS.

G.2 Statistical testing of receiver characteristics

G.2.1 General

The test of receiver characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.
2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for all receiver tests is >95% of the maximum throughput.

All receiver tests are performed in static propagation conditions. No fading conditions are applied.

G.2.2 Mapping throughput to error ratio

a) The measured information bit throughput R is defined as the sum (in kilobits) of the information bit payloads successfully received during the test interval, divided by the duration of the test interval (in seconds).

b) In measurement practice the UE indicates successfully received information bit payload by signalling an ACK to the SS.
If payload is received, but damaged and cannot be decoded, the UE signals a NACK.

c) Only the ACK and NACK signals, not the data bits received, are accessible to the SS.
The number of bits is known in the SS from knowledge of what payload was sent.

d) For the reference measurement channel, applied for testing, the number of bits is different in different subframes, however in a radio frame it is fixed during one test.

e) The time in the measurement interval is composed of successfully received subframes (ACK), unsuccessfully received subframes (NACK) and no reception at all (DTX-subframes).

f) DTX-subframes may occur regularly according the appliccable reference measurment channel (regDTX).
In real live networks this is the time when other UEs are served. In TDD these are the UL and special subframes.
regDTX vary from test to test but are fixed within the test.

g) Additional DTX-subframes occur statistically when the UE is not responding ACK or NACK where it should. (statDTX)
This may happen when the UE was not expecting data or decided that the data were not intended for it.

The pass / fail decision is done by observing the:

- number of NACKs
- number of ACKs and
- number of statDTXs (regDTX is implicitly known to the SS)

The ratio `(NACK + statDTX)/(NACK+ statDTX + ACK)` is the Error Ratio (ER). Taking into account the time consumed by the ACK, NACK, and DTX-TTIs (regular and statistical), ER can be mapped unambiguously to throughput for any single reference measurement channel test.

G.2.3 Design of the test

The test is defined by the following design principles (see clause G.x, Theory….):

1. The early decision concept is applied.
2. A second limit is introduced: Bad DUT factor M>1
3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail

   Cusomer Risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1. Limit ER = 0.05 (Throughput limit = 95%)
2. Bad DUT factor M=1.5 (selectivity)
3. Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

G.2.4 Numerical definition of the pass fail limits

Table G.2.4-1: pass fail limits

ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f
0	67	NA	39	763	500	78	1366	1148	117	1951	1828
1	95	NA	40	778	516	79	1381	1166	118	1965	1845
2	119	2	41	794	532	80	1396	1183	119	1980	1863
3	141	7	42	810	548	81	1412	1200	120	1995	1881
4	162	14	43	826	564	82	1427	1217	121	2010	1899
5	183	22	44	842	580	83	1442	1234	122	2025	1916
6	202	32	45	858	596	84	1457	1252	123	2039	1934
7	222	42	46	873	612	85	1472	1269	124	2054	1952
8	241	53	47	889	629	86	1487	1286	125	2069	1969
9	259	64	48	905	645	87	1502	1303	126	2084	1987
10	278	76	49	920	661	88	1517	1321	127	2099	2005
11	296	88	50	936	678	89	1532	1338	128	2113	2023
12	314	100	51	952	694	90	1547	1355	129	2128	2040
13	332	113	52	967	711	91	1562	1373	130	2143	2058
14	349	126	53	983	727	92	1577	1390	131	2158	2076
15	367	140	54	998	744	93	1592	1407	132	2172	2094
16	384	153	55	1014	760	94	1607	1425	133	2187	2111
17	401	167	56	1029	777	95	1623	1442	134	2202	2129
18	418	181	57	1045	793	96	1637	1459	135	2217	2147
19	435	195	58	1060	810	97	1652	1477	136	2231	2165
20	452	209	59	1076	827	98	1667	1494	137	2246	2183
21	469	224	60	1091	844	99	1682	1512	138	2261	2201
22	486	238	61	1106	860	100	1697	1529	139	2275	2218
23	503	253	62	1122	877	101	1712	1547	140	2290	2236

24	519	268	63	1137	894	102	1727	1564	141	2305	2254
25	536	283	64	1153	911	103	1742	1582	142	2320	2272
26	552	298	65	1168	928	104	1757	1599	143	2334	2290
27	569	313	66	1183	944	105	1772	1617	144	2349	2308
28	585	328	67	1199	961	106	1787	1634	145	2364	2326
29	602	343	68	1214	978	107	1802	1652	146	2378	2344
30	618	359	69	1229	995	108	1817	1669	147	2393	2361
31	634	374	70	1244	1012	109	1832	1687	148	2408	2379
32	650	389	71	1260	1029	110	1847	1704	149	2422	2397
33	667	405	72	1275	1046	111	1861	1722	150	2437	2415
34	683	421	73	1290	1063	112	1876	1740	151	2452	2433
35	699	436	74	1305	1080	113	1891	1757	152	2466	2451
36	715	452	75	1321	1097	114	1906	1775			
37	731	468	76	1336	1114	115	1921	1793			
38	747	484	77	1351	1131	116	1936	1810			

NOTE 1: The first column is the number of errors (ne = number of NACK + statDTX)

NOTE 2: The second column is the number of samples for the pass limit (ns_p , ns=Number of Samples= number of NACK + statDTX + ACK)

NOTE 3: The third column is the number of samples for the fail limit (ns_f)

G.2.5 Pass fail decision rules

The pass fail decision rules apply for a single test, comprising one component in the test vector. The over all Pass /Fail conditions are defined in clause G.2.1.5.

Having observed 0 errors, pass the test at 67+ samples, otherwise continue

Having observed 1 error, pass the test at 95+ otherwise continue

Having observed 2 errors, pass the test at 119+ samples, fail the test at 2- samples, otherwise continue

Etc. etc.

Having observed 151 errors, pass the test at 2452+ samples, fail the test at 2433- samples, otherwise continue

Having observed 152 errors, pass the test at 2466+ samples, fail the test at 2451 samples.

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 67 samples. The maximum test time is 2466 samples.

NOTE 2: since subframe 0 contain less bits than the remaining subframes and subframe 5 contains no data, it is allowed to postpone the decision until the radio frame limit i.e. decide or continue every 10^{th} sample.

G.2.6 Test conditions for receiver tests

Table G.2.6-1: Test conditions for receiver tests

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test	Over all Pass/Fail condition
7.3 Reference sensitivity level	Yes: the inherent receiver noise is assumed to be AWGN	tbd	To pass 7.3 each component in the test vector must pass
7.4 Maximum input level	Unclear: in case, clipping causes errors, errors are data dependent. Statistical independence is assumed.	tbd	To pass 7.4 each component in the test vector must pass
7.5 Adjacent Channel Selectivity (ACS)	Unclear: errors are data dependent on the interferers data. Statistical independence is assumed.	tbd	To pass 7.5 each component in the test vector must pass
7.6.1 In-band blocking	Unclear: errors are data dependent on the interferers data. Statistical independence is assumed.	tbd	To pass 7.6.1 each component in the test vector must pass
7.6.2 Out of-band blocking	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.6.2, all except [tbd] components in the test vector must pass
7.6.3 Narrow band blocking	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.6.3 each component in the test vector must pass
7.7 Spurious response	yes: it is assumed that the CW interferer causes errors, which are independent and time invariant.	tbd	To pass 7.7 each component in the test vector must pass
7.8.1 Wide band Intermodulation	Unclear: errors are dependent on the data content of the interferer. Statistical independence is assumed.	tbd	To pass 7.8.1 each component in the test vector must pass

G.3 Statistical testing of Performance Requirements with throughput

G.3.1 General

The test of receiver performance characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.
2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for all receiver performance tests is either 70% or 30% of the maximum throughput.

All receiver performance tests are performed in fading conditions. In addition to the statistical considerations, this requires the definition of a minimum test time.

G.3.2 Mapping throughput to error ratio

G.2.2 applies

G.3.3 Design of the test

The test is defined by the following design principles (see clause G.x, Theory….):

1. The standard concept is applied. (not the early decision concept)
2. A second limit is introduced: The second limit is different, whether 30% or 70% throughput is tested.
3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail:

   Cusomer Risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1a) Limit Error Ratio = 0.3 (in case 70% Throughput is tested) or

1b) Limit Througput = 0.3 (in case 30% Throughput is tested)

2a) Bad DUT factor M=1.387 (selectivity)

2b) Bad DUT factor m=0.692 (selectivity)

justification see: TS 34.121 Clause F.6.3.3

3) Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

G.3.4 Pass Fail limit

Testing Throughput = 30%, then the test limit is

Number of successes (ACK) / number of samples ≥ 59 / 233

Testing Throughput = 70% then the test limit is

Number of fails (NACK and statDTX) / number of samples ≤ 66 / 184

We have to distinguish 3 cases:

a) The duration for the number of samples (233 or 184) is greater than the minimum test time:

   Then the number of samples (233 or 184) is predefined and the decision is done according to the number of events (59 successes or 66 fails)

b) Since subframe 0 and 5 contain less bits than the remaining subframes, it is allowed to predefine a number of samples contained in an integer number of frames In this case test-limit-ratio applies.

c) The minimum test time is greater than the duration for the number of samples:

   The minimum testtime is predefined and the decision is done comparing the measured ratio at that instant against the test-limit-ratio.

NOTE 1: since subframe 0 contain less bits than the remaining subframes and subframe 5 contains no data, it is allowed to postpone the decision until the radio frame limit.

NOTE 2: The test time for most of the tests is governed by the Minimum Test Time

G.3.5 Minimum Test time

If a pass fail decision in G.3.4 can be achieved earlier than the minimum test time, then the test shall not be decided, but continued until the minimum test time is elapsed.

NOTE 1: The following delay profiles are applied: EPA, EVA and ETU. It is TBD, if different delay profiles need different minimum test time.

NOTE 2: The following doppler frequency shifts 5, 70 and 300 Hz are applied for the fading profiles. They influence the minimum test time. For 5 MHz bandwidth and a contiuous DL-signal the minimum test time can be derived from the following rule: No stop of the test until 990 wavelengths are crossed with the speed given in the fading profile. (see TS34.121 clause F.6.1) In TS36.521-1 Annex B Doppler frequency shift is defined instead of speed. This transformes to: No stop until 990 doppler periods are elapsed.

NOTE 3: The follwing bandwidths are applied: 1.4, 3, 5, 10, 15 and 20 MHz. It is TBD, if the different bandwidths need different minimum test times and which ones. Even single physical resource block (1 PRB) are tested under fading conditions. This corresponsnds to a BW 0.18MHz.

NOTE 4: Inter TTI distance and TDD create discontinuous transmission. It is TBD, if the prolongation factor for the minimum test time is "time slots per frame" / "time slots containing DL payload"

Table G.3.5-1: Minimum Test time

Δf doppler max	Minimum test time in sec (NOTE1)						
BW	**1 PRB**	**1.4 MHz**	**3MHz**	**5MHz**	**10MHz**	**15 MHz**	**20 MHz**
5 Hz	tbd	tbd	tbd	[198]	tbd	tbd	tbd
70 Hz	tbd	tbd	tbd	[14.1]	tbd	tbd	tbd
300 Hz	tbd	tbd	tbd	[3.3]	tbd	tbd	tbd
NOTE 1: in case the DL signal is discontinuous during the testtime, the minimum test time must be multiplied by a factor p>1. p = "time slots per frame" / "time slots containing DL payload" The precise value of p is tbd.							

G.3.6 Test conditions for receiver performance tests

Table G.3.6: Test conditions for receiver performance tests

Table G.3.6-1: Single Antenna Port Performance (Cell-specific Reference Symbols) for test case 8.2.1.1 and 8.2.2.1 demodulation of PDSCH

<table>
<tr><th>Test</th><th>Statistical independence</th><th colspan="4">Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test</th><th>Over all Pass/Fail condition</th></tr>
<tr><td rowspan="3">8.2.1.1 FDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols)</td><td rowspan="3">subframes are independent</td><td>CAT</td><td>1</td><td>2</td><td>3-5</td><td rowspan="6">To pass 8.2.1.1 and 8.2.2.1each component in the test vector must pass

For UEs, supporting multiple E_UTRA-bands (number of bands =B), the number of repetitions must be multiplied by B.

If a test is defined over a BW>(BW of the E_UTRA band), the test is not applicable and reduces the number of repetitions.

If a test is defined over a BW, which is not supported in the E_UTRAN band, the test is not applicable and reduces the number of repetitions.</td></tr>
<tr><td>QPSK</td><td>5</td><td>5</td><td>5</td></tr>
<tr><td>16QAM</td><td>0</td><td>3</td><td>3</td></tr>
<tr><td rowspan="3">8.2.1.2 TDD PDSCH Single Antenna Port Performance (Cell-Specific Reference Symbols)</td><td rowspan="3">subframes are independent</td><td>64 QAM</td><td>1</td><td>6</td><td>7</td></tr>
<tr><td>1PRB</td><td>4</td><td>4</td><td>4</td></tr>
<tr><td>Σ</td><td>10</td><td>18</td><td>19</td></tr>
</table>

Table G.3.6-2: Transmit Diversity Performance (Cell-specific Reference Symbols) for test case 8.2.1.2 and 8.2.2.2 demodulation of PDSCH

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.2.1.2 FDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols)	subframes are independent	CAT	1	2	3-5	To pass 8.2.1.2 and 8.2.2.2 each component in the test vector must pass For UEs, supporting multiple E_UTRA-bands (number of bands =B), the number of repetitions must be multiplied by B. If a test is defined over a BW, which is not supported in the E_UTRAN band, the test is not applicable and reduces the number of repetitions.
		QPSK	2	2	2	
8.2.2.2 TDD PDSCH Transmit Diversity Performance (Cell-Specific Reference Symbols)	subframes are independent	16QAM	0	1	1	
		Σ	2	3	3	

Table G.3.6-3: Open Loop Spatial Multiplexing Performance (Cell-specific Reference Symbols) for test case 8.2.1.3 and 8.2.2.3 demodulation of PDSCH

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.2.1.3 FDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)	subframes are independent	CAT	1	2	3-5	To pass 8.2.1.3 and 8.2.2.3 each component in the test vector must pass
		16QAM	0	2	2	
8.2.2.3 TDD PDSCH Open Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)	subframes are independent	Σ	0	2	2	

Table G.3.6-4: Closed Loop Spatial Multiplexing Performance (Cell-specific Reference Symbols) for test case 8.2.1.4 and 8.2.2.4 demodulation of PDSCH

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.2.1.4 FDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)	subframes are independent	CAT	1	2	3-5	To pass 8.2.1.4 and 8.2.2.4 each component in the test vector must pass
		Single layer QPSK	3	3	3	
8.2.2.4 TDD PDSCH Closed Loop Spatial Multiplexing Performance (Cell-Specific Reference Symbols)	subframes are independent	Multi layer 16QAM	0	3	3	
		Σ	3	6	6	

Table G.3.6-5: Performance (UE-specific Reference Symbols) for test case 8.3.2.1 demodulation of PDSCH

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test				Over all Pass/Fail condition
8.3.2.1 TDD Demodulation of PDSCH (UE-Specific Reference Symbols)	subframes are independent	Cat	1	2	3-5	To pass 8.3.2.1 each component in the test vector must pass
		QPSK	1	1	1	
		16QAM	1	2	2	
		64 QAM	0	1	1	
		Σ	2	4	4	

G.4 Statistical testing of Performance Requirements with probabilitiy of misdetection

G.4.1 General

The test of receiver performance characteristics is two fold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.

2. The ability of the receiver to demodulate /decode this signal is verified by analyzing the reaction of the UE to this signal.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for those receiver performance tests is 1% misdetection probability

All receiver performance tests are performed in fading conditions. In addition to the statistical considerations, this requires the definition of a minimum test time.

G.4.2 Mapping the UE reaction to error ratio

The UE can not indicate the detection or misdetection of the physical channel under test directly. Indirect methods are described in the procedure of the applicable test.

G.4.3 Design of the test

G.2.3 applies, exception:

Limit ER = 0.01

G.4.4 Numerical definition of the pass fail limits

Table G.2.3-1 pass fail limits

ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f	ne	ns_p	ns_f
0	344	NA	40	3929	2553	80	7033	5874	120	10036	9354
1	485	NA	41	4009	2632	81	7109	5960	121	10110	9442
2	607	10	42	4089	2712	82	7185	6046	122	10184	9530
3	719	33	43	4168	2792	83	7261	6131	123	10259	9619
4	826	66	44	4247	2873	84	7336	6217	124	10333	9707
5	929	107	45	4327	2953	85	7412	6303	125	10407	9796
6	1029	152	46	4406	3034	86	7488	6389	126	10481	9884
7	1127	202	47	4484	3115	87	7564	6475	127	10555	9972
8	1223	255	48	4563	3196	88	7639	6561	128	10629	10061
9	1317	311	49	4642	3278	89	7715	6648	129	10703	10150
10	1409	370	50	4720	3359	90	7790	6734	130	10777	10238
11	1501	430	51	4799	3441	91	7866	6820	131	10851	10327
12	1592	492	52	4877	3523	92	7941	6907	132	10925	10416
13	1681	555	53	4955	3605	93	8017	6993	133	10999	10504
14	1770	620	54	5033	3688	94	8092	7080	134	11073	10593
15	1858	686	55	5111	3770	95	8167	7167	135	11147	10682
16	1946	754	56	5189	3853	96	8242	7253	136	11221	10771
17	2032	822	57	5267	3935	97	8317	7340	137	11295	10860
18	2119	891	58	5344	4018	98	8393	7427	138	11369	10949
19	2204	961	59	5422	4101	99	8468	7514	139	11442	11038
20	2290	1032	60	5499	4185	100	8543	7601	140	11516	11127
21	2374	1103	61	5577	4268	101	8618	7688	141	11590	11216
22	2459	1175	62	5654	4352	102	8693	7775	142	11664	11305
23	2543	1248	63	5731	4435	103	8768	7863	143	11737	11394
24	2627	1321	64	5809	4519	104	8843	7950	144	11811	11483
25	2710	1395	65	5886	4603	105	8917	8037	145	11885	11573
26	2793	1470	66	5963	4687	106	8992	8125	146	11958	11662
27	2876	1544	67	6039	4771	107	9067	8212	147	12032	11751
28	2958	1620	68	6116	4855	108	9142	8300	148	12105	11840
29	3040	1696	69	6193	4940	109	9216	8387	149	12179	11930
30	3122	1772	70	6270	5024	110	9291	8475	150	12252	12019
31	3204	1848	71	6346	5109	111	9366	8562	151	12326	12109
32	3285	1925	72	6423	5193	112	9440	8650	152	12399	12198
33	3366	2003	73	6499	5278	113	9515	8738	153	12473	12288
34	3447	2080	74	6576	5363	114	9589	8826	154	12546	12377
35	3528	2158	75	6652	5448	115	9664	8914	155	12620	12467
36	3609	2237	76	6728	5533	116	9738	9002	156	12693	12556
37	3689	2315	77	6805	5618	117	9813	9090	157	12767	12646
38	3769	2394	78	6881	5704	118	9887	9178	158	12840	12736
39	3850	2473	79	6957	5789	119	9962	9266	159	12913	12826

NOTE 1: The first column is the number of errors (ne = number of misdetections)

NOTE 2: The second column is the number of samples for the pass limit (ns_p , ns=Number of Samples= number misdetections + number of detections)

NOTE 3: The third column is the number of samples for the fail limit (ns_f)

G.4.5 Pass fail decision rules

G.2.5 applies

NOTE 1: an ideal DUT passes after 344 samples. The maximum test time is 12913 samples.

G.4.6 Minimum Test time

G.3.5 applies

G.4.7 Test conditions for receiver performance tests

Table G.4.7: Test conditions for receiver performance tests

Test	Statistical independence	Number of components in the test vector, as specified in the test requirements and initial conditions of the applicable test	Over all Pass/Fail condition
8.4.1.1 FDD PCFICH/PDCCH Single-antenna Port Performance	A misdetection is an independent event	1	NA
8.4.1.2 FDD PCFICH/PDCCH Transmit Diversity Performance	A misdetection is an independent event	2	To pass 8.4.1.2 each component in the test vector must pass
8.4.2.1 TDD PCFICH/PDCCH Single-antenna Port Performance	A misdetection is an independent event	1	NA
8.4.2.2 TDD PCFICH/PDCCH Transmit Diversity Performance	A misdetection is an independent event	2	To pass 8.4.2.2 each component in the test vector must pass
8.5.1.1 FDD PHICH Single-antenna Port Performance	A misdetection is an independent event		
8.5.1.2 FDD PHICH Transmit Diversity Performance	A misdetection is an independent event		
8.5.2.1 TDD PHICH Single-antenna Port Performance	A misdetection is an independent event		
8.5.2.2 TDD PHICH Transmit Diversity Performance	A misdetection is an independent event		

G.X Theory to derive the numbers in Table G.2.1.3-1 (Informative)

Editor's note: this section of the Annex G is for information only and it described the background theory and information to derive the entries in the table G.2.1.3-1.

G.X.1 Error Ratio (ER)

The Error Ratio (ER) is defined as the ratio of number of errors (ne) to all results, number of samples (ns).

(1-ER is the success ratio).

G.X.2 Test Design

A statistical test is characterised by:

Test-time, Selectivity and Confidence level.

G.X.3 Confidence level

The outcome of a statistical test is a decision. This decision may be correct or in-correct. The Confidence Level CL describes the probability that the decision is a correct one. The complepement is the wrong decision probability (risk) D = 1-CL

G.X.4 Introduction: Supplier Risk versus Customer Risk

There are two targets of decision:

1. A measurement on the pass-limit shows, that the DUT has the specified quality or is better with probability CL (CL e.g.95%) This shall lead to a "pass decision"

   The pass-limit is on the good side of the specified DUT-quality. A more stringent CL (CL e.g.99%) shifts the pass-limit farer into the the good direction. Given the quality of the DUTs is distributed, a greater CL passes less and better DUTs.

   A measurement on the bad side of the pass-limit is simply "not pass" (undecided or artificial fail).

   Complementary:

   A measurement on the fail-limit shows, that the DUT is worse than the specified quality with probability CL.

   The fail-limit is on the bad side of the specified DUT-quality. A more stringent CL shifts the fail-limit farer into the the bad direction. Given the quality of the DUTs is distributed, a greater CL fails less and worse DUTs.

   A measurement on the good side of the fail-limit is simply "not fail".

2. A DUT, known to have the specified quality, shall be measured and decided pass with probability CL. This leads to the test limit.

   For CL e.g. 95%, the test limit is on the bad side of the specified DUT-quality. CL e.g.99% shifts the pass-limit farer into the the bad direction. Given the DUT-quality is distributed, a greater CL passes more and worse DUTs.

   A DUT, known to be an ($\varepsilon \rightarrow 0$) beyond the specified quality, shall be measured and decided fail with probability CL.

   For CL e.g.95%, the test limit is on the good side of the specified DUT-quality.

NOTE 1: the different sense for CL in (a), (aa) versus (b), (bb)

NOTE 2: for constant CL in all 4 bullets (a) is equivalent to (bb) and (aa) is equivalent to (b)

G.X.5 Supplier Risk versus Customer Risk

The table below summarizes the different targets of decision.

Table G.X.5-1 Equivalent statements

	Equivalent statements, using different cause-to-effect-directions, and assuming CL = constant >1/2	
cause-to-effect-directions	Known measurement result → estimation of the DUT's quality	Known DUT's quality → estimation of the measurement's outcome
Supplier Risk	A measurement on the pass-limit shows, that the DUT has the specified quality or is better (a)	A DUT, known to have an (ε→0) beyond the specified DUT-quality, shall be measured and decided fail (bb)
Customer Risk	A measurement on the fail-limit shall shows, that the DUT is worse than the specified quality (aa)	A DUT, known to have the specified quality, shall be measured and decided pass (b)

The shaded area shown the direct interpretation of Supplier Risk and Customer Risk.

The same statements can be based on other DUT-quality-definitions.

G.X.6 Introduction: Standard test versus early decision concept

In standard statistical tests, a certain number of results (ns) is predefined in advance to the test. After ns results the number of bad results (ne) is counted and the error ratio (ER) is calculated by ne/ns.

Applying statistical theory, a decision limit can be designed, against which the calculated ER is compared to derive the decision. Such a limit is one decision point and is characterised by:

- D: the wrong decision probability (a predefined parameter)
- ns: the number of results (a fixed predefined parameter)
- ne: the number of bad results (the limit based on just ns)

In the formula for the limit, D and ns can be understood as variable parameter and variable. However the standard test execution requires fixed ns and D. The property of such a test is: It discriminate between two states only, depending on the test design:

- pass (with CL) / undecided (undecided in the sense: finally undecided)
- fail (with CL) / undecided (undecided in the sense: finally undecided)
- pass(with CL) / fail (with CL) (however against two limits).

In contrast to the standard statistical tests, the early decision concept predefines a set of (ne,ns) co-ordinates, representing the limit-curve for decision. After each result a preliminary ER is calculated and compared against the limit-curve. After each result one may make the decision or not (undecided for later decision) The parameters and variables in the limit-curve for the early decision concept have a similar but not equal meaning:

- D: the wrong decision probability (a predefined parameter)
- ns: the number of results (a variable parameter)
- ne: the number of bad results (the limit. It varies together with ns)

To avoid a “final undecided” in the standard test, a second limit must be introduced and the single decision co-ordinate (ne,ns) needs a high ne, leading to a fixed (high) test time. In the early decision concept, having the same selectivity and the same confidence level an “undecided” need not to be avoided, as it can be decided later. A perfect DUT will hit the decision coordinate (ne,ns) with ne=0. This test time is short.

G.X.7 Standard test versus early decision concept

For Supplier Risk:

The wrong decision probability D in the standard test is the probability, to decide a DUT in-correct in the single decision point. In the early decision concept there is a probability of in-correct decisions d at each point of the limit-curve. The sum of all those wrong decision probabilities accumulate to D. Hence d<D

For Customer Risk:

The correct decision probability CL in the standard test is the probability, to decide a DUT correct in the single decision point. In the early decision concept there is a probability of correct decisions cl at each point of the limit-curve. The sum of all those correct decision probabilities accumulate to CL. Hence cl<CL or d>D

G.X.8 Selectivity

There is no statistical test which can discriminate between a limit DUT and a DUT which is an ($\varepsilon \rightarrow 0$) apart from the limit in finite time and high confidence level CL. Either the test discriminates against one limit with the results pass (with CL)/undecided or fail (with CL)/undecided, or the test ends in a result pass (with CL)/fail (with CL) but this requires a second limit.

For CL>1/2, a (measurement-result = specified-DUT-quality), generates undecided in test “supplier risk against pass limit” (a, from above) and also in the test “customer risk against the fail limit “ (aa)

For CL>1/2, a DUT, known to be on the limit, will be decided pass for the test “customer risk against pass limit” (b) and also “supplier risk against fail limit” (bb).

This overlap or undecided area is not a fault or a contradiction, however it can be avoided by introducing a Bad or a Good DUT quality according to:

- Bad DUT quality: specified DUT-quality * M (M>1)
- Good DUT quality: specified DUT-qualityt * m (m<1)

Using e.g M>1 and CL=95% the test for different DUT qualities yield different pass probabilities:

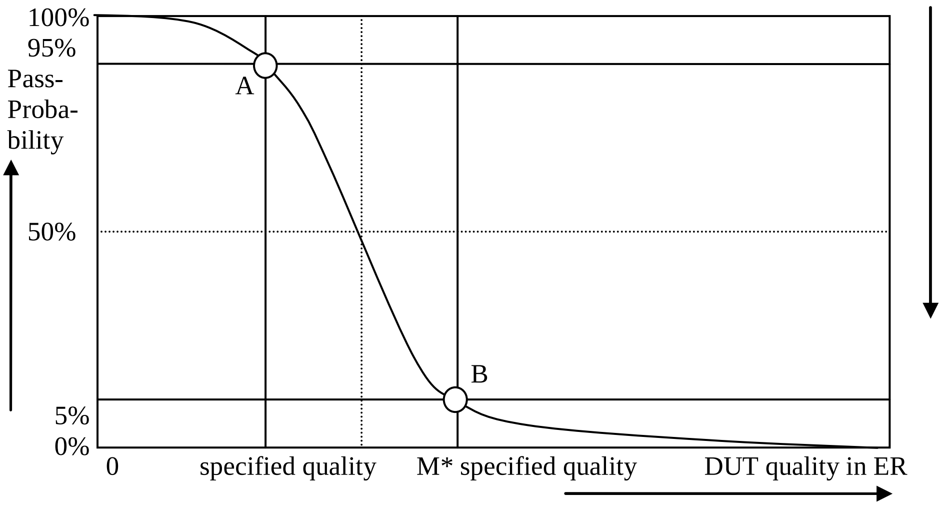

Figure G.X.8-1: Pass probability versus DUT quality

G.X.9 Design of the test

The receiver characteristic test are defined by the following design principles:

1. The early decision concept is applied.

2. A second limit is introduced: Bad DUT factor M>1

3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail

   Cusomer Risk is applied based on the specified DUT quality

Fail-
Proba
bility

The receiver characteristic test are defined by the following parameters:

1. Limit ER = 0.05

2. Bad DUT factor M=1.5 (selectivity)

3. Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

This has the following consequences:

1. A measurement on the fail limit is connected with 2 equivalent statements:

A measurement on the fail-limit shows, that the DUT is worse than the specified DUT-quality	A DUT, known have the specified quality, shall be measured and decided pass

2. A measurement on the pass limit is connected with the complementary statements:

A measurement on the pass limit shows, that the DUT is better than the Bad DUT-quality.	A DUT, known to have the Bad DUT quality, shall be measured and decided fail

The left comumn is used to decide the measurement.

The right column is used to verify the design of the test by simulation.

The simulation is based on the two fulcrums A and B only in Figure G.x.8-1

3. Test time

   The minimum and maximum test time is fixed.

   The average test time is a function of the DUT's quality.

   The individual test time is not predictable.

4. The number of decision co-ordinates (ne,ns) in the early decision concept is responsible for the selectivity of the test and the maximum test time. Having fixed the number of decision co-ordinates there is still freedom to select the individual decision co-ordinates in many combinations, all leading to the same confidence level.

G.X.10 Simulation to derive the pass fail limits in Table G.2.1.3-1

There is freedom to design the decision co-ordinates (ne,ns).

The binomial distribution and its inverse is used to design the pass and fail limits. Note that this method is not unique and that other methods exist.

$$\mathrm{fail}(ne, d_f) := \frac{ne}{(ne + \mathrm{qnbinom}(d_f, ne, ER))}$$

$$\mathrm{pass}(ne, cl_p, M) := \frac{ne}{(ne + \mathrm{qnbinom}(cl_p, ne, ER \cdot M))}$$

Where

- fail(..) is the error ratio for the fail limit
- pass(..) is the error ratio for the pass limit
- ER is the specified error ratio 0.05
- ne is the number of bad results. This is the variable in both equations
- M is the Bad DUT factor M=1.5
- d_f is the wrong decision probability of a single (ne,ns) co-ordinate for the fail limit. It is found by simulation to be $d_f = 0.004$
- cl_p is the confidence level of a single (ne,ns) co-ordinate for the pass limit. It is found by simulation to be $cl_p = 0.9975$
- qnbinom(..): The inverse cumulative function of the negative binomial distribution

The simulation works as follows:

- A large population of limit DUTs with true ER = 0.05 is decided against the pass and fail limits.
- cl_p and d_f are tuned such that CL (95%) of the population passes and D (5%) of the population fails.
- A population of Bad DUTs with true ER = M*0.05 is decided against the same pass and fail limits.
- cl_p and d_f are tuned such that CL (95%) of the population fails and D (5%) of the population passes.
- This procedure and the relationship to the measurement is justified in clause G.x.9. The number of DUTs decrease during the simulation, as the decided DUTs leave the population. That number decreases with an approximately exponential characteristics. After 169 bad results all DUTs of the population are decided.

NOTE: The exponential decrease of the population is an optimal design goal for the decision co-ordinates (ne,ns), which can be achieved with other formulas or methods as well.

Annex H (normative): Uplink Physical Channels

H.0 Uplink Signal Levels

Editor's note: The configuration of SRS is FFS

The uplink power levels are specified within the test cases.

H.1 General

This annex specifies the uplink physical channels that are needed for setting a connection and channels that are needed during a connection. Table H.1-1 describes the mapping of uplink physical channels and signals to physical resources for FDD. Table H.1-2 describes the mapping of uplink physical channels and signals to physical resources for TDD.

Table H.1-1: Mapping of uplink physical channels and signals to physical resources for FDD

Physical channel	Time Domain Location	Frequency Domain Location	Note
PRACH	Allowed for the parameter *prach-Configuration Index* provided by higher layers	[Allowed for the parameter *prach-FrequencyOffset* provided by higher layers]	Mapping rule is specified in TS36.211 Section 5.7.1
DMRS	For PUCCH: Symbols 2 to 4 of each slot (PUCCH format: 1, 1a, 1b) Symbol 1 and 5 of each slot (PUCCH format: 2, 2a, 2b) For PUSCH: Symbol 3 of each slot	Uplink system bandwidth dependent.	Mapping rule of DMRS for PUCCH is specified in TS36.211 5.5.2.2.2 Mapping rule of DMRS for PUSCH is specified in TS36.211 5.5.2.1.2
PUCCH	Slot 0 and 1 of each subframe	[Each 12 subcarriers of both ends of the bandwidth]	Mapping rule is specified in TS36.211 Section 5.4.3
PUSCH	All remaining SC-FDMA symbols of each subframe not allocated to DMRS	RBs allocated according to Reference Measurement channel in Annex A.2	Mapping rule is specified in TS36.211 Section 5.4.2

Table H.1-2: Mapping of uplink physical channels and signals to physical resources for TDD

Physical channel	Time Domain Location	Frequency Domain Location	Note
PRACH	Allowed for the parameters $(t_{RA}^0, t_{RA}^1, t_{RA}^2)$ in *prach-Configration Index* provided by higher layers	For format 0-3, the frequency location allowed is by *prach-FrequencyOffset* and (f_{RA}) in *prach-Configration Index* provided by higher layers. Preamble format 4 is mapped only on UpPTS, where the frequency location allowed is only by (f_{RA}) in *prach-Configration Index* provided by higher layers.	Mapping rule is specified in TS36.211 Section 5.7.1
DMRS	For PUCCH: Symbols 2 to 4 of each slot (PUCCH format: 1, 1a, 1b) Symbol 1 and 5 of each slot (PUCCH format: 2, 2a, 2b) For PUSCH: Symbol 3 of each slot	Uplink system bandwidth dependent.	Mapping rule of DMRS for PUCCH is specified in TS36.211 5.5.2.2.2 Mapping rule of DMRS for PUSCH is specified in TS36.211 5.5.2.1.2
PUCCH	Slot 0 and 1 of each subframe	[Each 12 subcarriers of both ends of the bandwidth]	Mapping rule is specified in TS36.211 Section 5.4.3
PUSCH	All remaining SC-FDMA symbols of each subframe not allocated to DMRS	RBs allocated according to Reference Measurement channel in Annex A.2	Mapping rule is specified in TS36.211 Section 5.4.2

NOTE: PUSCH, PUCCH, DMRS are not present in UpPTS for TDD.

H.2 Set-up

Table H.2-1 describes the uplink physical channels that are required for connection set up.

Table H.2-1: Uplink Physical Channels required for connection set-up

Physical Channel
PRACH
DMRS
PUCCH
PUSCH

H.3 Connection

The following clauses describes the uplink physical channels that are transmitted during a connection i.e., when measurements are done.

Table H.3-1: Uplink Physical Channels required during a connection

[Table contents FFS]

H.3.0 Measurement of Transmitter Characteristics

[FFS]

H.3.1 Measurement of Receiver Characteristics

[FFS]

H.3.2 Measurement of Performance Requirements

[FFS]

Annex I (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2007-08	RAN5 #36	R5-072185			Skeleton proposed for RAN5#36Athens		0.0.1
2007-08	RAN5 #36	R5-072419			Update the skeleton base on R4-071234_TR36.803.0.4.0.doc	0.0.1	0.0.2
2007-08	RAN5 #36	R5-072424			Update with editorial changes	0.0.2	0.0.3
2007-11	RAN5 #37	R5-073043			Update document with some info as following: Section 5: Frequency band information Section 6.2: Maximum output power Section 6.5: Output RF spectrum emissions Section 6.5.1: Occupied bandwidth Section 6.5.2: Out of band emission Section 6.5.3: Spurious emissions	0.0.3	0.0.4
2007-11	RAN5 #37	R5-073360			Editorial change to split MOP and UE Power classes	0.0.4	0.0.5
2008-03	RAN5 #38	R5-080069			Editorial changes to sync up with 36.101 v1.0.0 as much as feasible for the moment: Update definitions, symbols and abbreviations Update frequency bands, channel bandwidth, channel numbers information. Restructure document to move “frequency error” sub-section inside Transmit signal quality. Add “additional spectrum Emission Mask” sub-test (mask A,B,C) section to address the regulatory requirements that are not met with the general mask (OOB and spurious emission). Add “Additional ACLR requirements” to address additional requirements that the network might indicate to the UE via signalling for a specific deployment scenario (in terms of additional requirements for UTRA/ACLR2 Restructure “Spurious Emission” to indicate we need to have 3 test cases to address: “E-UTRA Spurious Emission” requirements , “Spurious Emission band UE co-existence” requirements, and “Additional spurious emissions” requirements Separate wide band and narrow band intermodulation in the intermodulation characteristics	0.0.5	0.0.6
2008-03	RAN5 #38	R5-080408			LTE Reference Sensitivity test Text proposal		0.0.7
2008-03	RAN5 #38	R5-080409			LTE Maximum Rx input level test Text proposal		0.0.7
2008-03	RAN5 #38	R5-080410			LTE Adjacent Channel Selectivity test Text proposal		0.0.7
2008-03	RAN5 #38	R5-080064			LTE RF Receiver tests, General section Text proposal		0.0.7
2008-03	RAN5 #38	R5-080412			LTE RF: transmission modulation initial EVM test proposal		0.0.7
2008-03	RAN5 Workshop-UE LTE Test (9-11 April)	R5w0800027			Modify styles and formats of tables and others according to drafting rules. Add some definitions and abbreviations Modified section 6.2 structure to be aligned with 36.101 v8.1.0 Modify tables of requirements to remove 1.6 MHz and 3.2MHz channel bandwidth according to new requirements 36.101 v8.1.0		0.0.9
2008-03	RAN5 Workshop-UE LTE Test (9-11 April)	R5w0800028			Following TPs have been included: R5w080013r1 R5w080014r1 R5w080008r2 R5w080009r2 R5w080040r1 R5w080015r1 R5w080016r1 R5w080017r1	0.0.9	0.1.0

					R5w080018r2		
2008-05	RAN5#39	R5-081046			36-521-1 alignment of measurement state for test cases	0.1.0	0.1.1
2008-05	RAN5#39	R5-081042			Following approved TPs have been included: R5-081040 36.521-1 after April LTE-RF workshop R5-081415 36-521-1 alignment of measurement state for test cases – also the measurement state for each test cases has been updated according to R5-081404 R5-081416 Cover for LTE E-UTRAN RRC_IDLE State Mobility text proposal R5-081417 Cover for LTE E-UTRAN RRC_CONNECTED State Mobility text proposal R5-081404 LTE Rx Intermodulation test case text proposal R5-081409 Annex structure for Measurement uncertainty & Test Tools R5-081405 Text Proposal for TS36.521-1 TC7.6 Blocking Characteristics R5-081406 Text Proposal for TS36.521-1 TC7.7 Spurious Response R5-081403 Text Proposal for TS36.521-1 TC7.9 Spurious Emissions R5-081410 Uncertainties and Test Tools for subset of UE tests R5-081331 Clarification of diversity characteristics section for multiple UE antennas R5-081335 36-521-1 update of nominal and additional channel bandwidths	0.1.1	0.2.0
2008-06	RAN5 #39bis	R5-082029			Following approved TPs have been included: R5-082129: Restructure of TS 36.521-1 and RRM proposal (Split of RRM from 36.521-1 v0.2.0 in its own specification 36.521-3.) R5-082166: Text Proposal for Annex C Downlink Physical Channels R5-082130: Text Proposal for Chan bandwidths in TS 36.521-1 R5-082155: Text Proposal for LTE Tx Minimum Output Power R5-082027: Text Proposal for Occupied bandwidth in TS 36.521-1 R5-082171: Text Proposal for LTE Adjacent Channel Leakage power Ratio R5-082134: Text Proposal for LTE Tx Spurious Emissions R5-082135: Text Proposal for LTE UE Maximum Output Power R5-082136: Text Proposal for LTE Spectrum Emission Mask R5-082138: UE Spurious Emissions Measurement uncertainty & Test Tolerances R5-082169: LTE Spectrum Emission Mask test uncertainties and TTs R5-082151: LTE UE Max Power and ACLR tests uncertainties and TTs R5-082152: Text proposal for LTE Transmit OFF Power R5-082153: LTE UE Max Rx Input and ACS test cases update R5-082082: LTE Rx Intermodulation test case uncertainties and TTs R5-082093: Text Proposal for TS36.521-1 TC7.6 Blocking Characteristics R5-082154: Text Proposal for TS36.521-1 TC7.7 Spurious Response R5-082167: OBW Measurement uncertainty & Test Tolerances R5-082158: Cover for LTE Performance Requirement text proposal R5-082159: Text Proposal for LTE Demodulation of	0.2.0	0.3.0

					PCFICH/PDCCH and PHICH R5-082156: Text proposal for LTE Tx Minimum Output Power Uncertainty R5-082157: Text proposal for LTE Tx Minimum Output Power Tolerance R5-082164: Statistical testing of receiver characteristics R5-082170: Cover for LTE Propagation Conditions Text Proposal Editorial changes to align tables and figures numbering with R5-082025		
2008-08	RAN5 #40	R5-083163			Following approved TPs have been included: R5-083804: LTE Demodulation Performance text proposal R5-083159: LTE-RF Occupied bandwidth test case / measurement uncertainty and TT text proposal R5-083160: Transmission OFF power: TP, measurement uncertainty and test tolerances proposal R5-083805: Frequency Error test case / measurement uncertainty and TT test proposal R5-083162: Propagation conditions correction text proposal R5-083220:Text Proposal for LTE Tx Minimum Output Power R5-083806: TP of section 8 for E-UTRAN TDD in 36.521-1 R5-083344: Test Tolerance and System uncertainty for OBW test R5-083848:Test Tolerance and System uncertainty for Reference sensitivity test R5-083840: Test Tolerances for Spectrum Emission Mask R5-083808: Reference Measurement Channel for LTE UE Receiver tests R5-083350: Test Tolerance and System uncertainty for Blocking and Spurious response R5-083366: Text Proposal for LTE Reporting of CQI/PMI R5-083810: LTE PBCH Demodulation Performance Requirements R5-083482: LTE-RF TP for Test Case 7.6 Blocking Characteristics R5-083809: LTE-RF TP for Test Case 7.7 Spurious Response R5-083484: LTE-RF TP for Test Case 7.9 Spurious Emissions R5-083811: Annex E Global In-Channel TX-Test R5-083163: TS 36.521-1 after RAN5#40	0.3.0	1.0.0
2008-10	RAN5 #40Bis	R5-084072			Following approved TPs have been included: R5-084072 TS 36.521-1 after RAN5#40Bis R5-084300 LTE-RF TP for Definitions Symbols and Abbreviations R5-084304 LTE-RF-TP for general section R5-084036 Test Tolerances for additional SEM R5-084303 LTE-RF TP for Channel bandwidths and frequency range R5-084305 LTE-RF TP for new Absolute Power Tolerance test case R5-084067 LTE-RF TP for Transmission OFF test case R5-084318 LTE-RF TP for Transmission Modulation test cases R5-084069 LTE-RF Investigation of E-UTRA-TDD Frequency Error test case applicability R5-084319 LTE-RF TP for Frequency Error test case R5-084309 Text Proposal for LTE Tx Spurious Emissions R5-084111 Text Proposal for LTE Adjacent Channel Leakage power Ratio R5-084320 Text Proposal for LTE Additional Spectrum	1.0.0	1.1.0

					Emission Mask R5-084310 Test Tolerances for additional spurious emission R5-084311 Text Proposal for Occupied bandwidth R5-084321 Text Proposal for LTE Spectrum Emission Mask R5-084060 Modification to section 7.2 Diversity characteristics R5-084312 References in 36.521-1 tests initial conditions R5-084148 Update of Reference Measurement Channel for LTE UE Rx tests R5-084167 LTE-RF TP for TC7.9 Spurious Emissions R5-084075 LTE DL Reference Measurement Channel for PDSCH (FDD) text proposal R5-084077 LTE Measurement of Performance Requirements text proposal R5-084313 LTE Demodulation of PDSCH Test Requirements text proposal R5-084147 Specification of DL propagation conditions for LTE UE tests R5-084315 Text Proposal for LTE Demodulation of PCFICH/PDCCH R5-084323 Text Proposal for Annex E Global In-Channel		
2008-12	RAN#42	RP-080863			Approval of version 2.0.0 at RAN#42, then put to version 8.0.0.	2.0.0	8.0.0
2008-01					Editorial corrections.	8.0.0	8.0.1
2009-03	RAN#43	R5-086011	0001	-	TP for In-band emissions	8.0.1	8.1.0
2009-03	RAN#43	R5-086012	0002	-	TP for Spectrum flatness	8.0.1	8.1.0
2009-03	RAN#43	R5-086013	0003	-	TP for IQ-component	8.0.1	8.1.0
2009-03	RAN#43	R5-086064	0004	-	LTE-RF: UE max output power	8.0.1	8.1.0
2009-03	RAN#43	R5-086093	0005	-	Clarification of measurement period in minimum output power test procedure	8.0.1	8.1.0
2009-03	RAN#43	R5-086094	0006	-	Clarification of measurement period in transmit OFF power test procedure	8.0.1	8.1.0
2009-03	RAN#43	R5-086120	0007	-	Update of Max.input level test	8.0.1	8.1.0
2009-03	RAN#43	R5-086125	0008	-	Addition of UL Reference Measurement Channels in Annex A2	8.0.1	8.1.0
2009-03	RAN#43	R5-086160	0009	-	correction for Maximum Power Reduction (MPR)	8.0.1	8.1.0
2009-03	RAN#43	R5-086167	0010	-	LTE-RF: TDD applicability and CR for Blocking Characteristics and Spurious Response	8.0.1	8.1.0
2009-03	RAN#43	R5-086168	0011	-	LTE-RF: TDD applicability and CR for Spurious Emissions	8.0.1	8.1.0
2009-03	RAN#43	R5-086239	0012	-	Update of Symbols	8.0.1	8.1.0
2009-03	RAN#43	R5-086401	0013	-	LTE-RF: TX-RX channel freq separation	8.0.1	8.1.0
2009-03	RAN#43	R5-086405	0014	-	Update of 6.7 Transmit intermodulation test	8.0.1	8.1.0
2009-03	RAN#43	R5-086406	0015	-	Update of initial conditions for Tx and Rx test cases	8.0.1	8.1.0
2009-03	RAN#43	R5-086408	0016	-	Update of Adjacent Channel Leakage power Ratio	8.0.1	8.1.0
2009-03	RAN#43	R5-086409	0017	-	Removal of [ ] from Clause 7 Receiver Characteristics	8.0.1	8.1.0
2009-03	RAN#43	R5-086413	0018	-	Updates to Demodulation of PCFICH/PDCCH test case	8.0.1	8.1.0
2009-03	RAN#43	R5-086414	0019	-	Text proposal for Reporting of Channel State Information	8.0.1	8.1.0
2009-03	RAN#43	R5-086415	0020	-	Correction of RS_EPRE powers for default DL signal levels	8.0.1	8.1.0
2009-03	RAN#43	R5-086416	0021	-	Update of DL Reference Measurement Channels in Annex A3	8.0.1	8.1.0
2009-03	RAN#43	R5-086417	0022	-	Update to Annex E	8.0.1	8.1.0
2009-03	RAN#43	R5-086425	0023	-	Update of General text in clause 6	8.0.1	8.1.0
2009-03	RAN#43	R5-086426	0024	-	Clarification of measurement bandwidth in spectrum emission mask test	8.0.1	8.1.0
2009-03	RAN#43	R5-086428	0025	-	Demodulation of TDD PHICH test requirements text proposal	8.0.1	8.1.0
2009-03	RAN#43	R5-086429	0026	-	Demodulation of TDD PCFICH/PDCCH test requirements text proposal	8.0.1	8.1.0
2009-03	RAN#43	R5-090306	0027	-	New Annex H for Uplink Physical Channels	8.0.1	8.1.0

2009-03	RAN#43	R5-090308	0028	-	Text proposal for Reporting of Channel State Information	8.0.1	8.1.0
2009-03	RAN#43	R5-090403	0029	-	CR to 36.521-1: Update of Spurious Emissions test cases	8.0.1	8.1.0
2009-03	RAN#43	R5-090404	0030	-	CR to 36.521-1: Update of ACLR test case	8.0.1	8.1.0
2009-03	RAN#43	R5-090443	0031	-	LTE-RF: Correction to 36.521-1 Frequency error test case	8.0.1	8.1.0
2009-03	RAN#43	R5-090488	0032	-	LTE TDD applicability for Transmit intermodulation test case	8.0.1	8.1.0
2009-03	RAN#43	R5-091002	0033	-	LTE Demodulation of PDSCH Test Requirements text proposal	8.0.1	8.1.0
2009-03	RAN#43	R5-091004	0034	-	LTE-RF: CR for UE max power test case	8.0.1	8.1.0
2009-03	RAN#43	R5-091007	0035	-	LTE-RF: TDD Applicability and CR for Spectrum Emission Mask and Additional Spectrum Emission Mask	8.0.1	8.1.0
2009-03	RAN#43	R5-091008	0036	-	LTE-RF Investigation of E-UTRA-TDD for Occupied bandwidth test case applicability	8.0.1	8.1.0
2009-03	RAN#43	R5-091009	0037	-	LTE-RF: Investigation of E-UTRA-TDD for Adjacent Channel Leakage power Ratio test case applicability	8.0.1	8.1.0
2009-03	RAN#43	R5-091011	0038	-	LTE-RF: TDD applicability and CR for Maximum Input Level	8.0.1	8.1.0
2009-03	RAN#43	R5-091012	0039	-	LTE-RF: TDD applicability and CR for Adjacent Channel Selectivity (ACS)	8.0.1	8.1.0
2009-03	RAN#43	R5-091017	0040	-	Removal of Rx Narrowband Intermod 7.8.2	8.0.1	8.1.0
2009-03	RAN#43	R5-091019	0041	-	Relocation of 36.521-1 Annex C DL mapping	8.0.1	8.1.0
2009-03	RAN#43	R5-091020	0042	-	Removal of "Out-of-synchronization handling of output power" heading	8.0.1	8.1.0
2009-03	RAN#43	R5-091023	0043	-	Test requirements of TDD PDSCH demodulation performance with user-specific reference symbols	8.0.1	8.1.0
2009-03	RAN#43	R5-091024	0044	-	CR to 36.521-1: Update of Annex F.3.2 Measurement of transmitter	8.0.1	8.1.0
2009-03	RAN#43	R5-091025	0045	-	CR to 36.521-1: Update of SEM and Additional SEM test cases	8.0.1	8.1.0
2009-03	RAN#43	R5-091077	0046	-	CR to 36.521-1: Addition of test combinations for test cases with MPR application	8.0.1	8.1.0
2009-03	RAN#43	R5-091082	0047	-	Spurious emission requirements on PHS band including the future plan in Japan	8.0.1	8.1.0
2009-03	RAN#43	R5-091101	0048	-	LTE-RF: CR for MPR test case	8.0.1	8.1.0
2009-03	RAN#43	R5-091106	0049	-	Update of Reference sensitivity test in 7.3	8.0.1	8.1.0
2009-03	RAN#43	R5-091111	0050	1	Update of initial conditions for Rx tests	8.0.1	8.1.0
2009-05	RAN#44	R5-092144	0051	-	LTE-RF: Resubmission of R5-086424 UE output power dynamics 36.521-1 v8.1.0 (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092146	0052	-	LTE-RF: CR for UE configured UE transmitted output power test case (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092147	0053	-	LTE-RF: CR for UE minimum output power test case (re-submit no change)	8.1.0	8.2.0
2009-05	RAN#44	R5-092149	0054	-	LTE-RF: CR for Power Control Absolute power tolerance test case (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092150	0055	-	LTE-RF: CR for Power Control Relative power tolerance test case (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092151	0056	-	LTE-RF: New test case for Aggregate power control tolerance (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092263	0057	-	Text proposal for Reporting of Channel State Information	8.1.0	8.2.0
2009-05	RAN#44	R5-092264	0058	-	Propagation conditions for CQI tests	8.1.0	8.2.0
2009-05	RAN#44	R5-092265	0059	-	Correction to Demodulation of PDCCH/PCFICH test cases	8.1.0	8.2.0
2009-05	RAN#44	R5-092273	0060	-	Mapping of downlink physical channels for TDD	8.1.0	8.2.0
2009-05	RAN#44	R5-092277	0061	-	Annex A RMC updates	8.1.0	8.2.0
2009-05	RAN#44	R5-092369	0062	-	Update of A.3.4.3 for RMC with UE-specific RS	8.1.0	8.2.0
2009-05	RAN#44	R5-092372	0063	-	Maintenance on Initial configurations for Perf TCs	8.1.0	8.2.0
2009-05	RAN#44	R5-092436	0064	-	CR to 36.521-1: Update of ACLR test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092442	0065	-	CR to 36.521-1: Update of Spurious Emissions test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092467	0066	-	LTE-RF: Transmit OFF Power update	8.1.0	8.2.0

2009-05	RAN#44	R5-092473	0067	-	LTE_RF - Update on TC 7.7 Spurious Response (re-submit with no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092474	0068	-	LTE_RF - Update on TC 7.9 Spurious Emissions (re-submit with no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092527	0069	-	Update of TDD PDSCH test cases	8.1.0	8.2.0
2009-05	RAN#44	R5-092602	0070	-	LTE-RF: CR for Maximum Power Reduction test case (re-submit no changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092603	0071	-	TP for Demodulation of TDD PDCCH/PCFICH	8.1.0	8.2.0
2009-05	RAN#44	R5-092605	0072	-	Mapping of uplink physical channels for FDD	8.1.0	8.2.0
2009-05	RAN#44	R5-092606	0073	-	Update of Annex C	8.1.0	8.2.0
2009-05	RAN#44	R5-092607	0074	-	CR to 36.521-1: Update of test parameters for Demodulation of PDSCH (FDD) tests	8.1.0	8.2.0
2009-05	RAN#44	R5-092614	0075	-	Update of SEM test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092642	0076	-	Update of transmit quality test cases	8.1.0	8.2.0
2009-05	RAN#44	R5-092643	0077	-	Text proposal for TDD part of CQI Reporting under Fading conditions	8.1.0	8.2.0
2009-05	RAN#44	R5-092644	0078	-	Text proposal for TDD part of CQI Reporting under AWGN conditions	8.1.0	8.2.0
2009-05	RAN#44	R5-092645	0079	-	LTE-RF: Update of Additional Spectrum Emission mask Test case with TDD Uplink Test configuration	8.1.0	8.2.0
2009-05	RAN#44	R5-092649	0080	-	LTE-RF: CR for TDD DL RMC to be used in TX test cases	8.1.0	8.2.0
2009-05	RAN#44	R5-092653	0081	-	LTE-RF: CR for Additional Maximum Power Reduction test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092661	0082	-	RMC update for PDCCH/PCFICH peformance requirement	8.1.0	8.2.0
2009-05	RAN#44	RP-090444	1161	-	Test frequencies for Additional Spurious Emission test case	8.6.0	8.7.0
2009-05	RAN#44	R5-092366	0084	-	Update of 7.3.1	8.1.0	8.2.0
2009-05	RAN#44	R5-092440	0085	-	LTE-RF: CR for UE max output power test case	8.1.0	8.2.0
2009-05	RAN#44	R5-092472	0086	-	LTE_RF - Update on TC 7.6 Blocking Characteristics (re-submit with changes)	8.1.0	8.2.0
2009-05	RAN#44	R5-092636	0087	-	CR to 36.521-1 Addition of frequencies for band 18 and band 19	8.1.0	8.2.0
2009-05	RAN#44	R5-092652	0088	2	Improved stability of TC 7.8.5 Power Control in the DL fro F-DPCH to HSUPA TC 5.2D and 5.13.2B	8.1.0	8.2.0
-	-	-	-	-	Editorial corrections	8.2.0	8.2.1
2009-09	RAN#45	R5-094032	0089	-	Correction CR to 36.521-1: Update of Requirements for Demodulation of PDSCH (FDD) tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094034	0090	-	Correction CR to 36.521-1: Update of General Requirements for Demodulation tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094214	0091	-	Update of In-band emissions	8.2.1	8.3.0
2009-09	RAN#45	R5-094215	0092	-	TDD Initial downlink channel setting	8.2.1	8.3.0
2009-09	RAN#45	R5-094216	0093	-	Correction to Annex B	8.2.1	8.3.0
2009-09	RAN#45	R5-094248	0094	-	CR to 36.521-1: Update to ACLR test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094250	0095	-	CR to 36.521-1: Update to UE max output power test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094281	0096	-	Mapping of uplink physical channels for TDD	8.2.1	8.3.0
2009-09	RAN#45	R5-094282	0097	-	LTE-RF: CR for notes in TDD DL RMC to be used in TX test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094283	0098	-	LTE-RF: message update to keep Tx power constant for some Rx test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094313	0099	-	LTE-RF: CR to test case for Aggregate power control tolerance	8.2.1	8.3.0
2009-09	RAN#45	R5-094317	0100	-	LTE-RF: CR for UE minimum output power test case for TDD	8.2.1	8.3.0
2009-09	RAN#45	R5-094318	0101	-	LTE-RF: CR for Power Control Relative power tolerance test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094319	0102	-	In band emission for non-allocated RB	8.2.1	8.3.0
2009-09	RAN#45	R5-094320	0103	-	LTE RF: correction for subclause 6.6.2.2.5 (A-SEM) supported band list	8.2.1	8.3.0
2009-09	RAN#45	R5-094362	0104	-	Correction of RMCs (36.521 Annex A)	8.2.1	8.3.0
2009-09	RAN#45	R5-094363	0105	-	Usage of the Global In-Channels TX-Test across different Signal Quality tests.	8.2.1	8.3.0
2009-09	RAN#45	R5-094365	0106	-	LTE TX: 1to2 RX antenna	8.2.1	8.3.0

2009-09	RAN#45	R5-094367	0107	-	Correction to 6.6.2.2 Additional Spectrum Emission Mask	8.2.1	8.3.0
2009-09	RAN#45	R5-094370	0108	-	Correction to 6.6.2.3 ACLR	8.2.1	8.3.0
2009-09	RAN#45	R5-094371	0109	-	Correction to 6.7 TX Intermodulation	8.2.1	8.3.0
2009-09	RAN#45	R5-094374	0110	-	Correction to 7.6.1 In-Band Blocking	8.2.1	8.3.0
2009-09	RAN#45	R5-094375	0111	-	UE category (36.521 clause 8)	8.2.1	8.3.0
2009-09	RAN#45	R5-094378	0112	-	Completion of Global in-Channel TX-Test (36.521 Annex E)	8.2.1	8.3.0
2009-09	RAN#45	R5-094379	0113	-	Completion of Global in-Channel TX-Test with PRACH (36.521 Annex E)	8.2.1	8.3.0
2009-09	RAN#45	R5-094380	0114	-	Completion of Statistical testing (36.521 Annex G)	8.2.1	8.3.0
2009-09	RAN#45	R5-094385	0115	-	Correction to Annex D.2 Interference signals	8.2.1	8.3.0
2009-09	RAN#45	R5-094439	0116	-	Update for ACS	8.2.1	8.3.0
2009-09	RAN#45	R5-094661	0117	-	LTE RF - Core update on TC7.6.2 Out-of-band Blocking	8.2.1	8.3.0
2009-09	RAN#45	R5-094663	0118	-	LTE RF - Symbols Update on UL transmission configurations	8.2.1	8.3.0
2009-09	RAN#45	R5-094665	0119	-	LTE RF - Clarification for Test Configurations in General Section	8.2.1	8.3.0
2009-09	RAN#45	R5-094668	0120	-	LTE RF - Applicability of 6.2.3 MPR	8.2.1	8.3.0
2009-09	RAN#45	R5-094671	0121	-	LTE RF - Verification of UE Output Power in Out of Band Emission tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094684	0122	-	CR to 36.521-1: Update to UE max output power test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094686	0123	-	LTE-RF CR to 36.521-1: Update the E-UTRA channel numbers	8.2.1	8.3.0
2009-09	RAN#45	R5-094687	0124	-	LTE-RF: CR for UE maximum power reduction(MPR) test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094699	0125	-	Update to SEM and spurious emissions TC	8.2.1	8.3.0
2009-09	RAN#45	R5-094706	0126	-	Resubmission-Update to the Requirements for frequency-selective fading test	8.2.1	8.3.0
2009-09	RAN#45	R5-094717	0127	-	Update of SEM	8.2.1	8.3.0
2009-09	RAN#45	R5-094718	0128	-	Update of initial conditions with Annex references	8.2.1	8.3.0
2009-09	RAN#45	R5-094721	0129	-	Update of 6.7 Tx Inter Mod	8.2.1	8.3.0
2009-09	RAN#45	R5-094725	0130	-	Correction to E-UTRA channel numbers for Band 2	8.2.1	8.3.0
2009-09	RAN#45	R5-094726	0131	-	Correction to Tx spurious emissions	8.2.1	8.3.0
2009-09	RAN#45	R5-094757	0132	-	Update of TDD PHICH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094874	0133	-	Correction to Demodulation of PDCCH/PCFICH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094902	0134	-	Addition of 15 MHz and 20 MHz bandwidths and corresponding sensitivity requirements into band 38	8.2.1	8.3.0
2009-09	RAN#45	R5-094903	0135	-	Correction CR to 36.521-1: Update of Transmitter tests network signalled parameter value	8.2.1	8.3.0
2009-09	RAN#45	R5-094905	0136	-	Update of TDD PDSCH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094908	0137	-	LTE-RF: CR for Power Control Absolute power tolerance test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094909	0138	-	Update to Output Power dynamics test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094913	0139	-	Clarification for downlink signal setting in RX tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094914	0140	-	UL RB allocation for receiver tests	8.2.1	8.3.0
2009-09	RAN#45	R5-094915	0141	-	Update of TDD PCFICH/PDCCH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094921	0142	-	Correction to CQI performance test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094922	0143	-	Test description for CQI test cases under AWGN conditions	8.2.1	8.3.0
2009-09	RAN#45	R5-094923	0144	-	Resubmission - Requirements for PMI reporting (Single and Multiple PMI)	8.2.1	8.3.0
2009-09	RAN#45	R5-094966	0145	-	CR to 36.521-1: Addition of A-MPR for band 19	8.2.1	8.3.0
2009-09	RAN#45	R5-094976	0146	-	Without loop back: 6.2.2 UE maximum output power	8.2.1	8.3.0
2009-09	RAN#45	R5-094977	0147	-	Without loop back: 6.3.2 Minimum output power	8.2.1	8.3.0
2009-09	RAN#45	R5-094979	0148	-	LTE-RF: CR for UE configured UE transmitted output power test case	8.2.1	8.3.0
2009-09	RAN#45	R5-094980	0149	-	CR to 36.521-1: Definition of Maximum Power state in TX/RX test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094982	0150	1	Correction of Tx general discription	8.2.1	8.3.0
2009-09	RAN#45	R5-094986	0151	-	Update of 6.6.1OBW	8.2.1	8.3.0
2009-09	RAN#45	R5-094989	0152	-	Correction to 1PRB tests in Demodulation of PDSCH	8.2.1	8.3.0

2009-09	RAN#45	R5-094995	0153	-	Correction CR to 36.521-1: Update of Requirements for Additional Maximum Power Reduction (A-MPR) test	8.2.1	8.3.0
2009-09	RAN#45	R5-094996	0154	-	Correction to Demodulation of PHICH test cases	8.2.1	8.3.0
2009-09	RAN#45	R5-094997	0155	-	EVM TC update	8.2.1	8.3.0
2009-09	RAN#45	R5-095300	0156	-	LTE-RF: test description update	8.2.1	8.3.0
2009-09	RAN#45	R5-095301	0157	-	Correction CR to 36.521-1: Addition of measurement uncertainty and test tolerances for A-MPR	8.2.1	8.3.0
2009-09	RAN#45	R5-095304	0158	-	Sorting out Demodulation of PDSCH for FDD	8.2.1	8.3.0
2009-09	-	-	-	-	TOC update and Annexes' titles formattings	8.3.0	8.3.1

History

Document history		
V8.0.1	January 2009	Publication
V8.1.0	April 2009	Publication
V8.2.1	June 2009	Publication
V8.3.1	November 2009	Publication