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Technical Specification

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Evolved Universal Terrestrial Radio Access (E-UTRA);
User Equipment (UE) conformance specification;
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(3GPP TS 36.521-1 version 8.0.1 Release 8)

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Contents

Foreword

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Introduction

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.
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[<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
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
$N_{Offs-DL}$ Offset used for calculating downlink EARFCN
$N_{Offs-UL}$ Offset used for calculating uplink EARFCN
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

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
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 [x]:

- 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 repeated for each operating band supported by the UE with the applicable test frequencies, channel bandwidths, environmental conditions combinations indicated in the 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.

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 frequency bands and channel bandwidths may be considered in future releases.

5.2 Frequency bands

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

Table 5.2-1 E-UTRA frequency bands

E-UTRA Band	Uplink (UL) eNode B receive UE transmit F_{UL_low} – F_{UL_high}	Downlink (DL) eNode B transmit UE receive F_{DL_low} – F_{DL_high}		Duplex Mode
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz		FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz		FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz		FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz		FDD
5	824 MHz – 849 MHz	869 MHz – 894MHz		FDD
6	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
...				
17	704 MHz – 716 MHz	734 MHz – 746 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

5.3 TX–RX frequency separation

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.

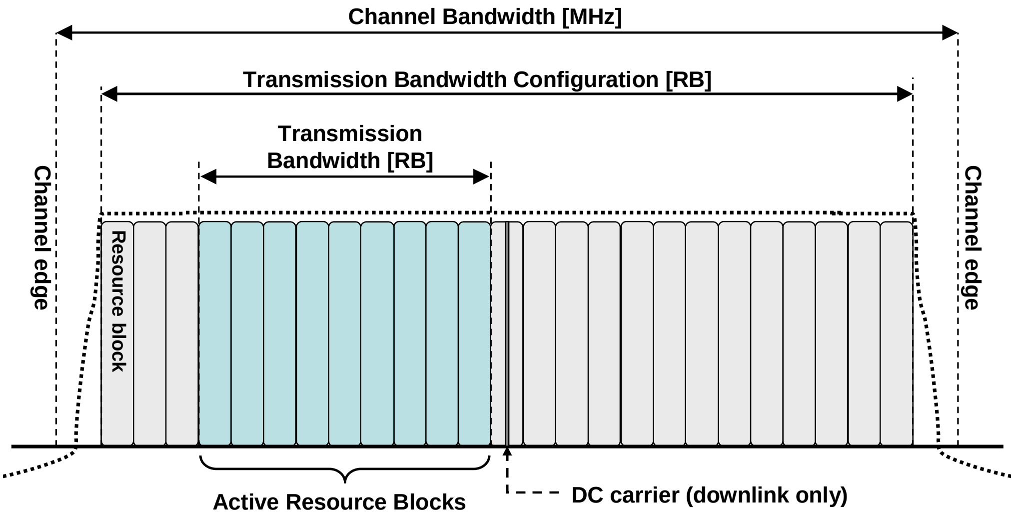

Figure 5.4.2-1 Definition of Channel Bandwidth and Transmission Bandwidth Configuration for one E-UTRA carrier.

5.4.2.1 Channel bandwidths per operating band

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.

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]		
...						
35			Yes	Yes	Yes	Yes
36			Yes	Yes	Yes	
37	Yes	Yes	Yes	Yes	Yes	Yes
38	Yes	Yes	Yes	Yes	Yes	Yes
39			Yes	Yes	Yes	Yes
40			Yes	Yes		
NOTE 1: bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (Clause 7.3) is allowed.						

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). 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	13000	13000 – 13599
2	1930	600	600 – 1199	1850	13600	13600 – 14199
3	1805	1200	1200 – 1949	1710	14200	14200 – 14949
4	2110	1950	1950 – 2399	1710	14950	14950 – 15399
5	869	2400	2400 – 2649	824	15400	15400 – 15649
6	875	2650	2650 – 2749	830	15650	15650 – 15749
7	2620	2750	2750 – 3449	2500	15750	15750 – 16449
8	925	3450	3450 – 3799	880	16450	16450 – 16799
9	1844.9	3800	3800 – 4149	1749.9	16800	16800 – 17149
10	2110	4150	4150 – 4749	1710	17150	17150 – 17749
11	1475.9	4750	4750 – 4999	1427.9	17750	17750 – 17999
12	728	5000	5000 – 5179	698	18000	18000 – 18179
13	746	5180	5180 – 5279	777	18180	18180 – 18279
14	758	5280	5280 – 5379	788	18280	18280 – 18379
…						
17	734	5730	5730 – 5849	704	18730	18730 – 18849
…						
33	1900	26000	26000 – 26199	1900	26000	26000 – 26199
34	2010	26200	26200 – 26349	2010	26200	26200 – 26349
35	1850	26350	26350 – 26949	1850	26350	26350 – 26949
36	1930	26950	26950 – 27549	1930	26950	26950 – 27549
37	1910	27550	27550 – 27749	1910	27550	27550 – 27749
38	2570	27750	27750 – 28249	2570	27750	27750 – 28249
39	1880	28250	28250 – 28649	1880	28250	28250 – 28649
40	2300	28650	28650 – 29649	2300	28650	28650 – 29649

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.

Unless otherwise stated, the transmitter characteristics test cases always exclude all the transient periods due to power steps, ON/OFF, or OFF/ON transitions. Power transients could occur only at the subframe boundary with transient duration affecting one or both sides of the subframe boundary.

The measurement period of all TX tests are integer multiples of 1 time slot and 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 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:

- *The fixed power allocation for the RB(s) is undefined*
- *Reference Measurement Channel is undefined*
- *The UE call setup details are undefined (parameter, procedure, message contents)*
- *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 Power Classes defines the Nominal Maximum Output power. The nominal Maximum Output Power defined is the broadband transmit power of the UE, i.e. the power in a bandwidth of at least (1+x) times the channel bandwidth of the radio access mode. The period of measurement shall be at least one [timeslot/ frame/TTI].

The UE maximum output power shall be within the nominal value and tolerance specified in Table 6.2.2.3-1

Table 6.2.2.3-1: UE Power Class

E-UTRA Band	Class 1 (dBm)	Tol. (dB)	Class 2 (dBm)	Tol. (dB)	Class 3 (dBm)	Tol. (dB)	Class 4 (dBm)	Tol. (dB)
1					23	± 2		
2					23	± 2		
3					23	± 2		
4					23	± 2		
5					23	± 2		
6					23	± 2		
7					23	± 2		
8					23	± 2		
9					23	± 2		
10					23	± 2		
11					23	± 2		
12					23	± 2		
13					23	± 2		
14					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		

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

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in TS 36.508 [7] subclause 4.1

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508[7] subclause 4.3.1

Channel bandwidths to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 [7] subclause 4.3.1

1. Connect the SS and interfering sources to the UE antenna connectors as shown in TS 36.508[7] Annex A Figure A1.

2. 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.

6.2.2.4.2 Test procedure

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

2. Measure the mean power of the UE in a bandwidth of at least (1+x) times the channel bandwidth of the radio access mode. The period of measurement shall be at least one [timeslot/ frame/TTI].

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

E-UTRA Band	Class 1 (dBm)	Tol. (dB)	Class 2 (dBm)	Tol. (dB)	Class 3 (dBm)	Tol. (dB)	Class 4 (dBm)	Tol. (dB)
1					23	±2.7		
2					23	±2.7		
3					23	±2.7		
4					23	±2.7		
5					23	±2.7		
6					23	±2.7		
7					23	±2.7		
8					23	±2.7		
9					23	±2.7		
10					23	±2.7		
11					23	±2.7		
12					23	±2.7		
13					23	±2.7		
14					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		

6.2.3 Maximum Power Reduction (MPR)

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

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	TBD	TBD	> 8	> 12	> 16	> 18	≤ 1
16 QAM	TBD	TBD	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	TBD	TBD	> 8	> 12	> 16	> 18	≤ 2

6.2.3.4 Test description

6.2.2.5 Test requirements

6.3 Output Power Dynamics

6.3.1 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).

6.3.1.1 Power Control Absolute 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:

- *The Message contents are undefined*
- *Reference Measurement Channel is undefined*
- *P0 Nominal PUSCH power levels are not confirmed for the two test points*
- *Need to figure out the expected UE power level based on downlink cell configuration*
- *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*

6.3.1.1.1 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 [x] ms.

6.3.1.1.2 Minimum conformance requirement

The minimum requirement on absolute power tolerance is given in Table 6.3.1.1.2-1.

Table 6.3.1.1.2-1: Absolute power tolerance

Conditions	Tolerance
Normal conditions	± 10.5 dB
Extreme conditions	± 13.5 dB

The normative reference for this requirement is TS 36.101 [2] clause 6.3.1.1.1.

6.3.1.1.3 Test applicability

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

6.3.1.1.4 Test description

6.3.1.1.4.1 Initial conditions

Test Environment: Normal, [TL/VL, TL/VH, TH/VL, TH/VH], as specified in TS 36.508[7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508 subclause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz, and highest channel bandwidth, as specified in TS 36.508 subclause 4.3.1.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A1.
2. The parameter settings for the cell are set up according to TS 36.508 [7] subclause [FFS].
3. 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 6.3.1.1.4.3.

6.3.1.1.4.2 Test procedure

1. Start sending payload data from the SS to the UE.
2. Measure the initial output power of the first subframe of UE PUSCH first transmission.
3. Repeat for applicable test frequencies, channel bandwidths, operating band combinations, environmental conditions, and the for the two test points as indicated in section 6.3.1.1.4.3.

6.3.1.1.4.3 Message contents

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

Table 6.3.1.1.4.3-1: UplinkPowerControlCommon: Test point 1

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 SystemInformationBlockType2			
Information Element	**Value/remark**	**Comment**	**Condition**
uplinkPowerControl SEQUENCE		Test point 1 to verify a UE relative low initial power transmission	
p0-NominalPUSCH SEQUENCE {			
persistantScheduling	[-100] dBm		
nonPersistantScheduling	[-100] dBm		

Table 6.3.1.1.4.3-1: UplinkPowerControlCommon: Test point 2

Derivation Path: TS 36.508 [7] clause 4.4.3.3, Table 4.4.3.3-1 SystemInformationBlockType2			
Information Element	**Value/remark**	**Comment**	**Condition**
uplinkPowerControl SEQUENCE		Test point 2 to verify a UE relative high initial power transmission	
p0-NominalPUSCH SEQUENCE {			
persistantScheduling	[0] dBm		
nonPersistantScheduling	[0] dBm		

6.3.1.1.5 Test requirement

The requirement for the power measured in step (2) of the test procedure is not to exceed the values specified in Table 6.3.1.1.5-1.

Table 6.3.1.1.5-1: Absolute power tolerance

Conditions	Tolerance
Normal conditions	± [11.5] dB
Extreme conditions	± [14.5] dB

6.3.2 Minimum 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:

- *The fixed power allocation for the RB(s) is undefined*
- *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*

6.3.2.1 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

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508 subclause 4.3.1

Channel bandwidths to be tested: lowest, 5 MHz, and highest channel bandwidth, as specified in TS 36.508 subclause 4.3.1.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, in Figure A1.
2. Ensure the UE is in State 4 according to TS 36.508 [7] clause FFS 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. Send TPC commands to the UE to ensure that the UE transmits at its minimum power.

2. 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.

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 Transmission ON/OFF Power

6.3.3.1 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*

6.3.3.1.1 Test purpose

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

6.3.3.1.2 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 6.3.3.1.2-1.

Table 6.3.3.1.2-1: 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 6.3.3.1.

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

6.3.3.1.3 Test applicability

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

6.3.3.1.4 Test description

6.3.3.1.4.1 Initial conditions

Test Environment: Normal as specified in TS 36.508[7] subclause 4.1.

Frequencies to be tested: mid range as specified in TS 36.508 subclause 4.3.1.

Channel bandwidths to be tested: 5 MHz, and highest channel bandwidth, as specified in TS 36.508 subclause 4.3.1.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A1.
2. 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 as defined in clause 6.3.3.1.4.3.

6.3.3.1.4.2 Test procedure

1. Measure the UE transmission OFF power. The UE transmitter is OFF as the SS is not transmitting data to the UE therefore no data is looped back on the PUSCH.

6.3.3.1.4.3 Message contents

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

6.3.3.1.5 Test requirement

The requirement for the transmit OFF power shall not exceed the values specified in Table 6.3.3.1.5-1.

Table 6.3.3.1.5-1: 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

6.4 Control and monitoring functions

6.4.1 Out-of synchronization handling of output power

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 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*

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

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in TS 36.508 [7] subclause 4.1

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz, and highest channel bandwidth, as specified in TS 36.508 [7] subclause 4.3.1.

1. Connect the SS to the UE to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A1.
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.3.0.
4. 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 7.3.3-1 according to the appropriate operating band and channel bandwidth with no boosting being applied as specified in Table C.3.1-1
2. Send continuous uplink power control “up” commands to the UE to ensure that the UE transmits at its maximum output power
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 is one slot.

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 consecutive uplink sub-frames for 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.

Table 6.5.2.1.3-1: Minimum requirements for Error Vector Magnitude

Parameter	Unit	Level
QPSK	%	17.5
16QAM	%	12.5
64QAM	%	[tbd]

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

Same as section 6.5.1.4.1

6.5.2.1.4.2 Test procedure

1. Send continuous uplink power control “up” commands to the UE to ensure that the UE transmits at its maximum output power.

2. Measure the EVM using Global In-Channel Tx-Test (Annex E).

3. 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.

4. Measure the EVM 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.

6.5.2.1.5 Test requirement

The EVM derived in E.4.2 shall not exceed 17,5 % +TT for QPSK, 12,5% +TT for 16 QAM and [tbd] % for 64 QAM.

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 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

Same as section 6.5.1.4.1

6.5.2.2.4.2 Test procedure

1. Make the UE transmits at the power in table 6.5.2.2.5-1.

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

3. Repeat step 1 and 2 setting UE transmit power at different level of the table 6.5.2.2.5-1.

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)
	0 dBm +[tbd]	-25+[tbd]
	-30dBm +[tbd]	-20+[tbd]
	-40dBm +[tbd]	-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

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

In band emission	Relative emissions (dB)
	$\max\left[-25,(20\cdot\log_{10} EVM)-3-10\cdot(\Delta_{RB}-1)/N_{RB})\right]$

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 [relative UE output power] of any non –allocated RB(s) and the [total UE output power] of all the allocated RB(s). 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

Same as section 6.5.1.4.1

6.5.2.3.4.2 Test procedure

1. Send continuous uplink power control “up” commands to the UE to ensure that the UE transmits at its maximum output power.

2. Measure In-band emission using Global In-Channel Tx-Test (Annex E)

3. 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.

4. 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 values in Table 6.5.2.3.5-1

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

In band emission	Relative emissions (dB)
	$\max\left[-25, (20 \cdot \log_{10} EVM) - 3 - 10 \cdot (\Delta_{RB} - 1) / N_{RB})\right]$+[TBD]

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.

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} ≥ [3MHz] and If F_{UL_high} - $F_{UL\_measurement}$ ≥ [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. FUL_low and FUL_high refers to each E-UTRA frequency band specified in Table 5.2-1 2. FUL_measurement refers to frequency tone 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} ≥ [5 MHz] and If F_{UL_high} - $F_{UL\_measurement}$ ≥ [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 2. $F_{UL\_measurement}$ refers to frequency tone 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

Same as section 6.5.1.4.1

6.5.2.4.4.2 Test procedure

1. Send continuous uplink power control “up” commands to the UE to ensure that the UE transmits at its maximum output power.

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: 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 2. $F_{UL\_measurement}$ refers to frequency tone being evaluated	

Table 6.5.2.4.5-2: Minimum 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/-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 2. $F_{UL\_measurement}$ refers to frequency tone 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.

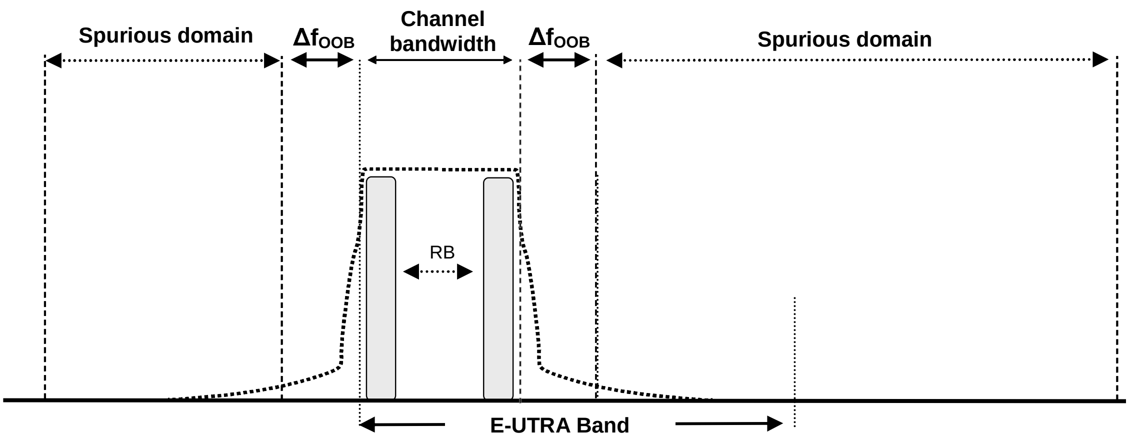

Figure 6.6-1: Transmitter RF spectrum

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*
- *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*
- *Test description section needs to be verified or modified (if necessary) for TDD applicability*

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

Test Environment: Normal as specified in TS 36.508 [7] subclause 4.1

Frequencies to be tested: mid range as specified in TS 36.508 subclause 4.3.1.

Channel bandwidths to be tested:all channel bandwidths as specified in TS 36.508 subclause 4.3.1.

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A1
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.3.0
4. 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 output power shall be maximum level.
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 procedure is not defined yet*
- *Reference Measurement Channel is undefined*
- *The UE call setup details are undefined (parameter, procedure, message contents)*
- *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*

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

Δf_{OOB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
± 0-1	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
± 1-2.5	[-10]	[-10]	-10	-10	-10	-10	1 MHz
± 2.5-5	[-25]	[-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

Test Environment: Normal; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508 [7] subclause 4.3.1..

Channel bandwidths to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A1..
2. Ensure the UE is in State 4 according to TS 36.508 [7] clause FFS 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

FFS

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	[TBD]	[TBD]	-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	[-25]	[-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: 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 is not defined yet*
- *Reference Measurement Channel is undefined*
- *The UE call setup details are undefined (parameter, procedure, message contents)*
- *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*

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	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
± 1-2.5	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
± 2.5-5	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
± 5-6	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
± 6-10	[TBD]	[TBD]	-25	-13	-13	-13	1 MHz
± 10-15	[TBD]	[TBD]		-25	-13	-13	1 MHz
± 15-20	[TBD]	[TBD]			-25	-13	1 MHz
± 10-25	[TBD]	[TBD]				-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	[TBD]	[TBD]	-15	-18	-20	-21	30 kHz
± 1-2.5	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
± 2.5-5	[TBD]	[TBD]	-13	-13	-13	-13	1 MHz
± 5-6	[TBD]	[TBD]	-25	-25	-25	-25	1 MHz
± 6-10	[TBD]	[TBD]	-25	-25	-25	-25	1 MHz
± 10-15	[TBD]	[TBD]		-25	-25	-25	1 MHz
± 15-20	[TBD]	[TBD]			-25	-25	1 MHz
± 10-25	[TBD]	[TBD]				-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")

When "NS_06" 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")

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

Test Environment: Normal; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidths to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1

1. Connect the SS to the UE antenna connectors as shown in TS 36.508 [7] Annex A, Figure A1.

2. 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

[FFS]

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	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	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	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	[TBD]	[TBD]	-13.5	-16.5	-18.5	-19.5	30 kHz
1-2.5	[TBD]	[TBD]	-11.5	-11.5	-11.5	-11.5	1 MHz
2.5-5	[TBD]	[TBD]	-11.5	-11.5	-11.5	-11.5	1 MHz
5-6	[TBD]	[TBD]	-11.5	-11.5	-11.5	-11.5	1 MHz
6-10	[TBD]	[TBD]	-23.5	-11.5	-11.5	-11.5	1 MHz
10-15	[TBD]	[TBD]		-23.5	-11.5	-11.5	1 MHz
15-20	[TBD]	[TBD]			-23.5	-11.5	1 MHz
10-25	[TBD]	[TBD]				-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	[TBD]	[TBD]	-13.5	-16.5	-18.5	-19.5	30 kHz
1-2.5	[TBD]	[TBD]	-11.5	-11.5	-11.5	-11.5	1 MHz
2.5-5	[TBD]	[TBD]	-11.5	-11.5	-11.5	-11.5	1 MHz
5-6	[TBD]	[TBD]	-23.5	-23.5	-23.5	-23.5	1 MHz
6-10	[TBD]	[TBD]	-23.5	-23.5	-23.5	-23.5	1 MHz
10-15	[TBD]	[TBD]		-23.5	-23.5	-23.5	1 MHz
15-20	[TBD]	[TBD]			-23.5	-23.5	1 MHz
10-25	[TBD]	[TBD]				-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_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")

When "NS_06" 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")

	Spectrum emission limit (dBm)/ Channel bandwidth				
Δf_{OOB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	Measurement bandwidth
0-0.1	[TBD]	[TBD]	-13.5	-16.5	30 kHz
0.1-1	-11.5	-11.5	-11.5	-11.5	100 kHz
1-2.5	[TBD]	[TBD]	-11.5	-11.5	1 MHz
2.5-5	[TBD]	[TBD]	-11.5	-11.5	1 MHz
5-6		[TBD]	-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 0.985 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_06 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: The test cases for ACLR and additional ACLR are incomplete. The following aspects specified to ACLR are either missing or not yet determined:

FDD aspects missing or not yet determined:

- *The Core requirements for ACLR are undefined for channel bandwidth 1.4MHz, 3.0MHz*
- *It is not yet clear how the "Rectangular Filter" is to be implemented in detail.*
- *The absolute ACLR power limit is not confirmed yet.*
- *Test points to apply MPR for ACLR case needed to be investigated*
- *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 following aspects are either missing or not yet determined same as other test cases:

- *Reference Measurement Channels are undefined*
- *The fixed power allocation for the RB(s) is undefined*
- *The UE call setup details are undefined (parameter, procedure, message contents)*

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.

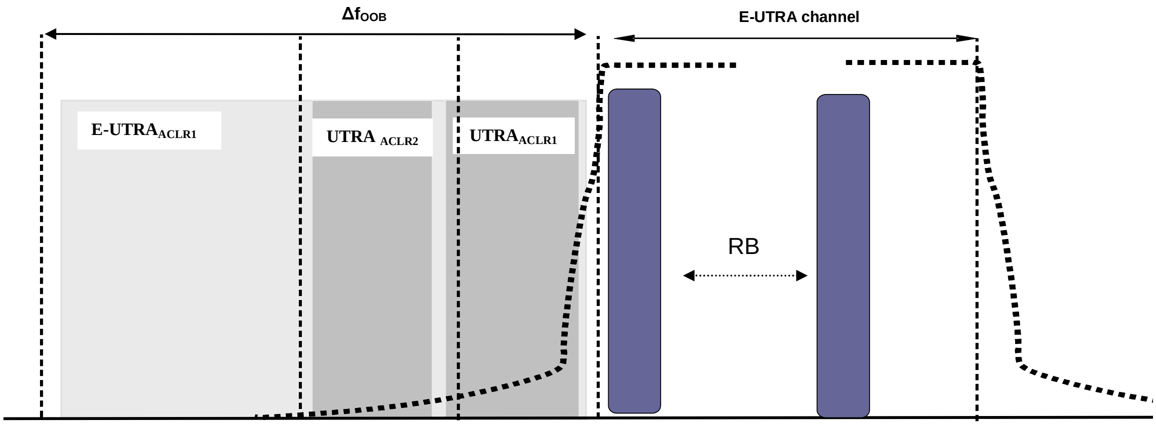

Figure 6.6.2.3.3-1: Adjacent Channel Leakage Power Ratio requirements

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. 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			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 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz

$UTRA_{ACLR1}$	33 dB	33 dB	33 dB	33 dB	33 dB	33 dB
Adjacent channel centre frequency offset (in MHz)	-	-	$2.5+BW_{UTRA}/2$	$5+BW_{UTRA}/2$	$7.5+BW_{UTRA}/2$	$10+BW_{UTRA}/2$
$UTRA_{ACLR2}$	-	-	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

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: [lowest, 5MHz, and highest] channel bandwidth as defined in TS 36.508 subclause 4.3.1

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A1.
2. 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 continuous uplink power control "up" commands to the UE to ensure that the UE transmits at its maximum power.
2. Masure the filtered mean power for E-UTRA.
3. Measure the filtered mean power of the first E-UTRA adjacent channel.
4. Measure the RRC filtered mean power of the first and the second UTRA adjacent channel.
5. Calculate the ratio of the power between the values measured in step 3 over step 2 for $E\text{-}UTRA_{ACLR}$.
6. Calculated the ratio of the power between the values measured in step 4 over step 2 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			4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
UE channel			+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)	-	-	$2.5+BW_{UTRA}/2$	$5+BW_{UTRA}/2$	$7.5+BW_{UTRA}/2$	$10+BW_{UTRA}/2$
$UTRA_{ACLR2}$	-	-	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.						

6.6.2.4 Additional ACLR requirements

6.6.2.4.1 Test purpose

To verify that UE transmitter does not cause unacceptable interference to the 2nd UTRA 5MHz adjacent channel in terms of ACLR under the deployment scenarios where additional requirements for the 2nd UTRA 5MHz channel are specified.

6.6.2.4.2 Test applicability

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

6.6.2.4.3 Minimum conformance requirements (network signalled value "NS_02")

The Additional ACLR requirement is specified for the 2nd UTRA 5MHz adjacent channel ($UTRA_{ACLR2bis}$). The UTRA channel power is measured with a 3.84 MHz 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 6.6.2.4.3-1.

If the UTRA 2nd adjacent channel power is greater than –50dBm then the $UTRA_{ACLR2bis}$ shall be higher than the valued specified in Table 6.6.2.4.3-1.

Table 6.6.2.4.3-1: Additional requirements for $UTRA_{ACLR2bis}$

	Channel bandwidth / $UTRA_{ACLR2bis}$ / measurement bandwidth					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
$UTRA_{ACLR2bis}$	-	-	43 dB	43 dB	-	-
E-UTRA channel Measurement bandwidth	-	-	4.5 MHz	9.0 MHz	-	-
UTRA channel Measurement bandwidth	-	-	3.84 MHz	3.84 MHz	-	-

The normative reference for this requirement is TS 36.101 [2] subclause 6.6.2.4.1.

6.6.2.4.4 Test description

6.6.2.4.4.1 Initial conditions

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508 [7] subclause 4.3.1

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1

1. Connect the SS to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A1.
2. 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 6.6.2.4.4.3.

6.6.2.4.4.2 Test procedure

1. Send continuous uplink power control “up” commands to the UE to ensure that the UE transmits at its maximum power.
2. Masure the filtered mean power for E-UTRA.
3. Measure the filtered mean power of the second UTRA adjacent channel..
4. Calculate the ratio of the power between the values measured in step 2 over step 3 for $UTRA_{ACLR2bis}$.

6.6.2.4.4.3 Message contents

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

1. Information element additionalSpectrumEmission is set to NS_02. This can be set in the *SystemInformationblockType2* as part of the cell broadcast message. This exception indicates that the UE shall meet the additional ACLR requirement for a specific deployment scenario.

Table 6.6.2.4.4.3-1: *SystemInformationBlockType2* :Additional ACLR 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	NS_02		

6.6.2.4.5 Test requirements

If the UTRA 2nd adjacent channel power is greater than –50dBm then the measured $UTRA_{ACLR2bis}$, derived in step 4), shall be higher than the limit in table 6.6.2.4.5-1.

Table 6.6.2.4.5-1: Additional requirements ($UTRA_{ACLR2bis}$)

	Channel bandwidth / $UTRA_{ACLR2bis}$ / measurement bandwidth					
	1.4 MHz	**3.0 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
$UTRA_{ACLR2bis}$	-	-	42.2 dB	42.2 dB	-	-
E-UTRA channel Measurement bandwidth	-	-	4.5 MHz	9.0 MHz	-	-
UTRA channel Measurement bandwidth	-	-	3.84 MHz	3.84 MHz	-	-
UE channel for $UTRA_{ACLR2bis}$	+7.5MHz from upper band edge or -7.5MHz from lower band edge					

6.6.3 Spurious emissions

Editor's note: The test cases for spurious emissions are *incomplete. The following aspects specified to spurious emissions 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.*
- *It is not yet clear how the average power of spurious emission should be calculated in detail.*
- *For additional spurious emission either NS_02 or NS_05 can be signalled to the UE and for both values the requirements apply. The test procedure needs to be clarified with respect of the values to use.*
- *The edge of the assigned E-UTRA UL channel and low range frequency for Additional Spurious Emissions needs to be verified.*
- *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*

The following aspects are either missing or not yet determined same as other test cases:

- *Reference Measurement Channels are undefined*
- *The fixed power allocation for the RB(s) is undefined*
- *The UE call setup details are undefined (parameter, procedure, message contents)*

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)	[tbd]	[tbd]	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

Test Environment: Normal; see as specified in TS 36.508 [7] subclause 4.1

Frequencies to be tested: low range, mid range, high range as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1.

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A1.
2. 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 continuous uplink power control “up” commands to the UE to ensure that the UE transmits at its maximum power.

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 [in one active slot], 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	
	Frequency range	1884.5	-	1919.6	-41	0.3	Note [6]
	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, 13, 14	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, 13, 14	FDL_low	-	FDL_high	-50	1	
5	E-UTRA Band 2, 4, 5, 10, 13, 14	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	
	Frequency range	1884.5	-	1919.6	-41	0.3	
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	
	Frequency range	1884.5	-	1919.6	-41	0.3	
10	E-UTRA Band 2, 4, 5, 10, 13, 14	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	
	Frequency range	1884.5	-	1919.6	-41	0.3	
13	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
14	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
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	
	Frequency range	1884.5	-	1919.6	-41	0.3	
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

[2] A number of exceptions are permitted and is FFS. These exceptions include both spurious due to LO mixing and I/Q imbalance for specific values of N_{RB}. For these exceptions the requirements of Table 6.6.3.1.3-2 are applicable.

[3] To meet these requirements some restriction will be needed for either the operating band or protected band

[4] Requirements are specified in terms of E-UTRA sub-bands

[5] For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

[6] Applicable when NS_02 or NS_05 in section 6.6.3.3.3 is signalled by the network.

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

Test Environment: Normal; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range as specified in TS 36.508 [7] subclause 4.3.1

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A1..
2. 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 continuous uplink power control “up” commands to the UE to ensure that the UE transmits at its maximum power.
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	
	Frequency range	1884.5	-	1919.6	-41	0.3	Note 6
	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, 13, 14	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, 13, 14	FDL_low	-	FDL_high	-50	1	
5	E-UTRA Band 2, 4, 5, 10, 13, 14	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	
	Frequency range	1884.5	-	1919.6	-41	0.3	
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	
	Frequency range	1884.5	-	1919.6	-41	0.3	
10	E-UTRA Band 2, 4, 5, 10, 13, 14	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	
	Frequency range	1884.5	-	1919.6	-41	0.3	
13	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
14	E-UTRA Band 2, 4, 5, 10, 13, 14	FDL_low	-	FDL_high	-50	1	
	Frequency range	763	-	775	-35	0.00625	
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	
	Frequency range	1884.5	-	1919.6	-41	0.3	
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
2 A number of exceptions are permitted and is FFS. These exceptions include both spurious due to LO mixing and I/Q imbalance for specific values of N_{RB}. For these exceptions the requirements of Table 6.6.3.1.5-1 are applicable.
3 To meet these requirements some restriction will be needed for either the operating band or protected band
4 Requirements are specified in terms of E-UTRA sub-bands
5 For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band
6 Applicable when NS_02 or NS_05 in section 6.6.3.3.3 is signalled by the network.

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 (network signalled value "NS_02" or "NS_05")

When "NS_02" or "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.

Table 6.6.3.3.3-1: 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
NOTE: The requirements are 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.							

The normative reference for this requirement is TS 36.101[2] subclause 6.6.3.3.

6.6.3.3.4 Test description

6.6.3.3.4.1 Initial conditions

Test Environment: Normal; as specified in TS 36.508 [7] subclause 4.1

Frequencies to be tested: [low range,] mid range, high range; as specified in TS 36.508 [7] subclause 4.3.1

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1

1. Connect the SS to the UE to the UE antenna connectors as shown in Figure TS 36.508 [7] Annex A, Figure A1.

2. 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 continuous uplink power control "up" commands to the UE to ensure that the UE transmits at its maximum power.
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

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

1. Information element additionalSpectrumEmission is set to NS_02 or 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: *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	NS_02/NS_05		

6.6.3.3.5 Test requirement

The measured average power of spurious emission, derived in step 2, shall not exceed the described value in tables 6.6.3.3.5-1.

Table 6.6.3.3.5-1: 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
NOTE: The requirements are 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.							

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:

- *The Core requirements for Tx intermodulation are in bracket for channel bandwidth 5MHz and undefined for channel bandwidth 10, 15 and 20MHz*
- *The test environment and frequencies to be tested are TBD.*
- *The fixed power allocation for the RB(s) is undefined*
- *Reference Measurement Channel is undefined*
- *The UE call setup details are undefined (parameter, procedure, message contents)*
- *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*

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.

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	[-31dBc]	[-41dBc]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]
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

Test Environment: [Normal, TL/VL, TL/VH, TH/VL, TH/VH] as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: [low range, mid range, high range] as specified in TS 36.508 [7] subclause 4.3.1

Channel bandwidths to be tested: 5MHz and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1.

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.3.0.
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 according to the Reference Measurement channel in Annex A.[FFS]. Message contents are defined in clause 6.7.4.3.

6.7.4.3 Test procedure

1. Send continuous uplink power control "up" commands to the UE to ensure that the UE transmits at its maximum power.
2. Measure the RRC 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	[-31dBc]	[-41dBc]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]	[t.b.d.]
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).

The levels of the test signal applied to each of the antenna connectors shall be as defined 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
- Regarding tables 7.3.3-2 and 7.3.3-3, the max power for UL configuration parameters are not finalised in the core specification, and the less than Maximum transmission power for Max RB configuration 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

7.3.1 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	-104.2	-100.2	-98	-95	-93.2	-92	FDD
3	-103.2	-99.2	-97	-94	-92.2	-91	FDD
4	-106.2	-102.2	-100	-97	-95.2	-94	FDD
5	-104.2	-100.2	-98	-95			FDD
6	-	-	-100	-97			FDD
7	-	-	-98	-95	-93.2	-92	FDD
8	-103.2	-99.2	-97	-94			FDD
9	-	-	-99	-96	-94	-93	FDD
10	-	-	-100	-97	-95.2	-94	FDD
11	-	-	-98	-95	-93.2	-92	FDD
12							FDD
13	-103.2	-99.2	-97	-94			FDD
14							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: Reference measurement channel is 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. For larger transmission configurations a certain relaxation of the UE performance is allowed. Table 7.3.3-3 specifies the maximum output power level for which the reference receive sensitivity requirement must be met when UL resource blocks is the total resource blocks (Table 5.4.2-1) supported by the channel bandwidth.

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							FDD
13	6	15	[15-25]	[15-25]			FDD
14							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	-	-	TDD
39			25	50	75	100	TDD
40				50	75	100	TDD
NOTE: Maximum number of UL resources blocks allocated is less than the total resources blocks supported by the channel bandwidth							

Table 7.3.3-3: Maximum transmission power for reference sensitivity

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							FDD
2							FDD
3							FDD
4							FDD
5							FDD
6							FDD
7							FDD
8							FDD
9							FDD
10							FDD
11							FDD
12							FDD
13							FDD
14							FDD
NOTE 1: UE output power is less than the maximum output power							

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

Test Environment: Normal, TL/VL, TL/VH, TH/VL, TH/VH, as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range, as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: lowest, 5 MHz, and highest channel bandwidth as defined in TS 36.508 [7] subclause 4.3.1.

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 C.3.1.
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 according to the Reference Measurement channel in Annex A.3.2. Message contents are defined in clause 7.3.4.3.

7.3.4.2 Test procedure

1. Send continuous Uplink power control "up" commands to the UE to ensure that the UE transmits at its maximum power.
2. Set the Downlink signal level to the appropriate REFSENS value defined in Table 7.3.5-1.
3. 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	-103.5	-99.5	-97.3	-94.3	-92.5	-91.3	FDD
3	-102.5	-98.5	-96.3	-93.3	-91.5	-90.3	FDD
4	-105.5	-101.5	-99.3	-96.3	-94.5	-93.3	FDD
5	-103.5	-99.5	-97.3	-94.3			FDD
6	-	-	-99.3	-96.3			FDD
7	-	-	-97.3	-94.3	-92.5	-91.3	FDD
8	-102.5	-98.5	-96.3	-93.3			FDD
9	-	-	-98.3	-95.3	-93.7	-92.3	FDD
10	-	-	-99.3	-96.3	-94.5	-93.3	FDD
11	-	-	-97.3	-94.3	-92.5	-91.3	FDD
12							FDD
13	-102.5	-98.5	-96.3	-93.3			FDD
14							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: Reference measurement channel is 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. For larger transmission configurations a certain relaxation of the UE performance is allowed. Table 7.3.5-3 specifies the maximum output power level for which the reference receive sensitivity requirement must be met when UL resource blocks is the total resource blocks (Table 5.4.2-1) supported by the channel bandwidth.

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							FDD
13	6	15	[15-25]	[15-25]			FDD
14							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	-	-	TDD
39			25	50	75	100	TDD
40				50	75	100	TDD
NOTE: Maximum number of UL resources blocks allocated is less than the total resources blocks supported by the channel bandwidth							

Table 7.3.5-3: Maximum transmission power for reference sensitivity

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							FDD
2							FDD
3							FDD
4							FDD
5							FDD
6							FDD
7							FDD
8							FDD
9							FDD
10							FDD
11							FDD
12							FDD
13							FDD
14							FDD
NOTE 1: UE output power is less than the maximum output power							

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:

- It is not yet clear whether setting the UE Tx to 4dB below max power is a realistic scenario, when the UE Rx is at maximum level
- The acceptable window for the UE Tx power is undefined
- The power control method and message IEs for setting the UE output power to a constant level are undefined
- The throughput requirements are undefined
- The 64QAM, R=3/4 Reference Measurement Channel is undefined (note that the core spec incorrectly refers to Annex A.3.2 which has only a QPSK Reference Measurement Channel in 36.101 v8.2.0)
- 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

7.4.1 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 [FFS] 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 [FSS] 64QAM R=3/4]							

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

Test Environment: Normal, as specified TS 36.508 [7] subclause 4.1.

Frequencies to be tested: Mid range, as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1

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 C.3.1.
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 according to the Reference Measurement channel in [FFS]. 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 [FFS dB] 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 [clause FFS in reference FFS].

With the exception: Power Control Algorithm for the Uplink allows the UE output power to be at a constant level.

7.4.5 Test requirement

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channels as specified in Annex [FFS] 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 [FFS] 64QAM R=3/4]							

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 undefined

- The power control method and message IEs for setting the UE output power to a constant level are undefined
- For Case 1 the power of the Interfering signal is not finally determined
- For Case 2 the power of the wanted signal is not finally determined
- 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

7.5.1 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

Rx Parameter	Units	Channel bandwidth					
		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]dB	REFSENS +[45]dB	REFSENS +[45]dB*	REFSENS +[45]dB	REFSENS +[42]dB	REFSENS +[39]dB
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Interferer}$ (offset)	MHz	1.4	3	5	7.5	10	12.5
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	[-56.0]	[-56.0]	[-56.0]	[-56.0]	[-53.0]	[-50.0]
$P_{Interferer}$	dBm	-25					
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Interferer}$ (offset)	MHz	1.4	3	5	7.5	10	12.5
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

Test Environment: Normal, as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: Mid range, as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 subclause 4.3.1

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 C.3.1.
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 according to the Reference Measurement channel in Annex A.3.2. 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 [FFS dB] 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 [FFS dB] 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 [clause FFS in reference FFS],

With the exception: Power Control Algorithm for the Uplink allows the UE output power to be at a constant level.

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]dB	REFSENS +[45]dB	REFSENS +[45]dB*	REFSENS +[45]dB	REFSENS +[42]dB	REFSENS +[39]dB
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Interferer}$ (offset)	MHz	1.4	3	5	7.5	10	12.5
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	[-56.0]	[-56.0]	[-56.0]	[-56.0]	[-53.0]	[-50.0]
$P_{Interferer}$	dBm	-25					
$BW_{Interferer}$	MHz	1.4	3	5	5	5	5
$F_{Interferer}$ (offset)	MHz	1.4	3	5	7.5	10	12.5
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 out-of-band blocking, the number of allowed exceptions is undefined and interferer power level hasn't been finalized
- For narrow-band blocking, the frequency offset for 7.5kHz hasn't been defined..
- Output power level tolerance 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
- Test description section needs to be verified or modified (if necessary) for TDD applicability

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	4.5	7.5	7.5	7.5	7.5
$F_{Ioffset, case 2}$	MHz	3.5	7.5	12.5	12.5	12.5	12.5
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
	$P_{Interferer}$	dBm	-56	-44
	$F_{Interferer}$ (Offset)	MHz	=-BW/2 - $F_{Ioffset, case 1}$ & =+BW/2 + $F_{Ioffset, case 1}$	≤ -BW/2- $F_{Ioffset, case 2}$ & ≥ +BW/2 + $F_{Ioffset, case 2}$
1, 2, 3, 4, 5 7, 8, 9, 10, 11 33,34,35,36,37, 38,39,40	$F_{Interferer}$	MHz	F_{DL_low} -7.5 to F_{DL_high} +7.5 (NOTE 1)	F_{DL_low} -15 to F_{DL_high} +15
6, 13	$F_{Interferer}$	MHz	F_{DL_low} - 7.5 to F_{DL_high} +7.5 (NOTE 1 & 2)	F_{DL_low} -15 to F_{DL_high} +15 (NOTE 2)
NOTE 1: 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 2: For Band 6 and 13, the unwanted modulated interfering signal does not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band				

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

Test Environment: normal; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: mid range; as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 [7] subclause 4.3.1.

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 C.3.1
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 according to the Reference Measurement channel in Annex A.3.2. 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 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 [FFS dB] 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 in Case 2 at step 1.

7.6.1.4.3 Message Contents

Message contents are according to [clause FFS in reference FFS]. With this exception, the Power Control Algorithm for the Uplink allows the UE output power to be at a constant level.

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	4.5	7.5	7.5	7.5	7.5
$F_{Ioffset, case 2}$	MHz	3.5	7.5	12.5	12.5	12.5	12.5

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
	$P_{Interferer}$	dBm	-56	-44
	$F_{Interferer}$ (Offset)	MHz	$=-BW/2 - F_{Ioffset, case 1}$ & $=+BW/2 + F_{Ioffset, case 1}$	$\le -BW/2- F_{Ioffset, case 2}$ & $\ge +BW/2 + F_{Ioffset, case 2}$
1, 2, 3, 4, 5 7, 8, 9, 10, 11 33,34,35,36,37, 38,39,40	$F_{Interferer}$	MHz	F_{DL_low} -7.5 to F_{DL_high} +7.5 (NOTE 1)	F_{DL_low} -15 to F_{DL_high} +15
6, 13	$F_{Interferer}$	MHz	F_{DL_low} - 7.5 to F_{DL_high} +7.5 (NOTE 1 & 2)	F_{DL_low} -15 to F_{DL_high} +15 (NOTE 2)

NOTE 1: 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 2: For Band 6 and 13 , the unwanted modulated interfering signal does not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band

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 [TBD] exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

For Table 7.6.2.3-2 in frequency range 4, up to [TBD] exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1MHz step size. For these exceptions the requirements of 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: Reference measurement channel is 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, 11,13 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	$F_{Interferer}$	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

Test Environment: normal; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: one frequency chosen arbitrarily from low or high range;, as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508[7] subclause 4.3.1.

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 C.3.1.
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 according to the Reference Measurement channel in Annex A.3.2. 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 [FFS dB] 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 [clause FFS in reference FFS]. With this exception, the Power Control Algorithm for the Uplink allows the UE output power to be at a constant level.

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 [TBD] in each assigned frequency channel, 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 [TBD] in each assigned frequency channel. For these exceptions the requirements of clause 7.7 Spurious Response are applicable.

Table 7.6.2.5-1: Out-of-band blocking parameters

<table>
<tr><th rowspan="2">Rx Parameter</th><th rowspan="2">Units</th><th colspan="6">Channel bandwidth</th></tr>
<tr><th>1.4 MHz</th><th>3 MHz</th><th>5 MHz</th><th>10 MHz</th><th>15 MHz</th><th>20 MHz</th></tr>
<tr><td rowspan="2">Wanted signal mean power</td><td rowspan="2">dBm</td><td colspan="6">REFSENS + channel bandwidth specific value below</td></tr>
<tr><td>6</td><td>6</td><td>6</td><td>6</td><td>7</td><td>9</td></tr>
<tr><td colspan="8">NOTE 1: The transmitter shall be set to 4dB below the supported maximum output power.
NOTE 2: Reference measurement channel is Annex A.3.2</td></tr>
</table>

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, 13 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	$F_{Interferer}$	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: Reference measurement channel is 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

Test Environment: normal; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: mid range; as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 [7] subclause 4.3.1.

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 C.3.1.

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 according to the Reference Measurement channel in Annex A.3.2. 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 [FFS dB] 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 [clause FFS in reference FFS]. With this exception, the Power Control Algorithm for the Uplink allows the UE output power to be at a constant level.

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: Reference measurement channel is 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 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 description section needs to be verified or modified (if necessary) for TDD applicability

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: Reference measurement channel is 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

Test Environment: normal; as specified in TS 36.508 [7] subclause 4.1.

Frequencies to be tested: the same frequency as chosen in clause 7.6.2.4.1 for Blocking Characteristics Out-of-band.

Channel bandwidth to be tested: the same channel bandwidths as chosen in clause 7.6.2.4.1 for Blocking Characteristics' Out-of-band.

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 C.3.1.
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 according to the Reference Measurement channel in Annex A.3.2. Message contents are defined in clause 7.7.4.3.

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 [FFS dB] 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 [clause FFS in reference FFS]. With this exception, the Power Control Algorithm for the Uplink allows the UE output power to be at a constant level.

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: Reference measurement channel is 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 undefined*
- *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: Reference measurement channel is 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

Test Environment: Normal [as specified in clauses FFS of this document]

Frequencies to be tested: Mid range, as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: lowest, 5MHz, and highest channel bandwidth as defined in TS 36.508 [7] subclause 4.3.1.

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 C.3.1.
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 according to the Reference Measurement channel in Annex A.3.2. 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 [FFS dB] 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 [clause FFS in reference FFS]

With this exception, the Power Control Algorithm for the Uplink allows the UE output power to be at a constant level.

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: Reference measurement channel is 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 Narrow band Intermodulation

7.8.2.1 Test purpose

7.8.2.2 Test applicability

7.8.2.3 Minimum conformance requirements

7.8.2.4 Test description

7.8.2.4.1 Initial condition

7.8.2.4.2 Test procedure

7.8.2.4.3 Message contents

7.8.2.5 Test requirements

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:

- *It's FFS how to make sure the UE stay in a certain state for not to interfere the measurement*
- *The fixed power allocation for the RB(s) is undefined*
- *The Initial Conditions including UE setup are incomplete*
- *The Message contents are undefined*
- *Annexes related to the test case are incomplete.*
- *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 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

Test Environment: normal; as specified in clauses TS 36.508 [7] subclause 4.1.

Frequencies to be tested: low range, mid range, high range; as specified in TS 36.508 [7] subclause 4.3.1.

Channel bandwidth to be tested: highest channel bandwidth as defined in TS 36.508 [7] subclause 4.3.1.

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. Ensure the UE is in State [FSS] according to TS 36.508 [7] clause FFS. 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

Editor's note: The following aspects are either missing or not yet determined:

- The demodulation requirements for all physical channels are undefined
- AWGN noise source undefined
- Test tolerances undefined

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 [FFS].

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].

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 UL, as specified in TS 36.213 [10] clause 8
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	2 [for bandwidths ≥ 10 MHz]	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)

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

- *SNR to be presented for throughput undefined*
- *A diagram showing connections between the SS, multi-path fading simulator and AWGN noise source and the UE antenna port (s) is missing*
- *Physical channels used are undefined*
- *Measurement channel used is 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*

8.2.1.1.1 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.

8.2.1.1.2 Test applicability

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

8.2.1.1.3 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, 8.2.1.1.3-1, 8.2.1.1.3-3, 8.2.1.1.3-5 and 8.2.1.1.3-7 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 8.2.1.1.3-2, 8.2.1.1.3-4, 8.2.1.1.3-6 and 8.2.1.1.3-8 for the specified SNR. For QPSK and 64QAM performance the bandwidths specified in Table 5.4.2.1-1 are verified.

Table 8.2.1.1.3-1: Test Parameters for Testing QPSK

Parameter	Unit	Test [1.1-1.4,2.1]
Reference signal power E_{RS}/I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD [-74]
NOTE: TBD		

Table 8.2.1.1.3-2: Minimum performance QPSK (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[1.1]	10 MHz	[R.2 FDD]	EVA5	Low	70	-1.0	
[1.2]	10 MHz	[R.2 FDD]	ETU70	Low	70	-0.4	
[1.3]	10 MHz	[R.2 FDD]	ETU300	Low	70	0.0	
[1.4]	10 MHz	[R.2 FDD]	HST	Low	70	TBD	
[2.1]	1.4 MHz	[R.4 FDD]	EVA5	Low	70	TBD	

Table 8.2.1.1.3-3: Test Parameters for Testing 16QAM

Parameter	Unit	Test [1.5-1.7]
Reference signal power E_{RS}/I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD
NOTE: TBD		

Table 8.2.1.1.3-4: Minimum performance 16QAM (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[1.5]	10 MHz	[R.3 FDD]	EVA5	Low	70	6.7	
[1.6]	10 MHz	[R.3 FDD]	ETU70	Low	30	1.4	
[1.7]	10 MHz	[R.3 FDD]	ETU300	High	70	9.4	

Table 8.2.1.1.3-5: Test Parameters for Testing 64QAM

Parameter	Unit	Test [1.8-1.10, 2.2-2.5]
Reference signal power E_{RS} / I_{or}	dB	0
N_{oc} at antenna port	dBm/15kHz	TBD
NOTE: TBD		

Table 8.2.1.1.3-6: Minimum performance 64QAM (FRC)

Test number	Bandwidth	Reference Channel	Propagation Condition	Correlation Matrix	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[2.2]	3 MHz	[R.5 FDD]	EVA5	Low	70	TBD	
[2.3]	5 MHz	[R.6 FDD]	EVA5	Low	70	TBD	
[1.8]	10 MHz	[R.7 FDD]	EVA5	Low	70	17.7	
[1.9]	10 MHz	[R.7 FDD]	ETU70	Low	70	19.0	
[1.10]	10 MHz	[R.7 FDD]	EVA5	High	70	19.1	
[2.4]	15 MHz	[R.8 FDD]	EVA5	Low	70	17.7	
[2.5]	20 MHz	[R.9 FDD]	EVA5	Low	70	17.6	

Table 8.2.1.1.3-7: Test Parameters for Testing 1 PRB allocation

Parameter	Unit	Test [3.1-3.3]
Reference signal power E_{RS} / I_{or}	dB	TBD
N_{oc} at antenna port	dBm/15kHz	TBD
PRB allocation		[Lower channel edge]
NOTE: TBD		

Table 8.2.1.1.3-8: Minimum performance 1 PRB allocation (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[3.1]	1.4 MHz 16QAM 1/2	[R.0 FDD]	ETU70	Low	30	TBD	
[3.2]	10 MHz 16QAM 1/2	[R.1 FDD]	ETU70	Low	30	TBD	
[3.3]	20 MHz 16QAM 1/2	[R.1 FDD]	ETU70	Low	30	TBD	

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.1.

8.2.1.1.4 Test description

8.2.1.1.4.1 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 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number as defined in TS 36.508 [7] clause 4.3.1.1

1. Connect the SS, the multi-path fading simulator and AWGN noise source 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 Tables 8.2.1-1, 8.2.1.1.5-1, 8.2.1.1.5-3, 8.2.1.1.5-5, 8.2.1.1.5-7 and 8.2.1.1.5-9 as appropriate.

3. Downlink signals are initially set up according to Annex C.3.2.

4. Propagation conditions are set according to Annex B clauses B.1.1, B.2.1 and B.2.2.

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 8.2.1.1.4.3.

8.2.1.1.4.2 Test procedure

1. Set the parameters of the bandwidth, MCS, reference channel, the propagation condition, the correlation matrix and the SNR according to Tables 8.2.1.1.5-2, 8.2.1.1.5-4, 8.2.1.1.5-6 and 8.2.1.1.5-8 as appropriate.

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

3. Repeat steps from 1 to 2 for each test interval in Tables 8.2.1.1.5-2, 8.2.1.1.5-4, 8.2.1.1.5-6 and 8.2.1.1.5-8 as appropriate. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH 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.

8.2.1.1.4.3 Message contents

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

8.2.1.1.5 Test requirement

Tables 8.2.1.1.5-1 to 8.2.1.1.5-9 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 clause A.3.3.1for each throughput test shall meet or exceed the specified value in Tables 8.2.1.1.5-2, 8.2.1.1.5-4, 8.2.1.1.5-6 and 8.2.1.1.5-8 for the specified SNR.

Table 8.2.1.1.5-1: Test Parameters for Testing QPSK

Parameter	Unit	Test [1.1-1.4,2.1]
Reference signal power E_{RS} / I_{or}	dB	0 + TT
N_{oc} at antenna port	dBm/15kHz	TBD [-74]
NOTE: TBD		

Table 8.2.1.1.5-2: Test requirement QPSK (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[1.1]	10 MHz QPSK 1/3	[R.2 FDD]	EVA5	Low	70	-1.0 + TT	
[1.2]	10 MHz QPSK 1/3	[R.2 FDD]	ETU70	Low	70	-0.4 + TT	
[1.3]	10 MHz QPSK 1/3	[R.2 FDD]	ETU300	Low	70	0.0 + TT	
[1.4]	10 MHz QPSK 1/3	[R.2 FDD]	HST	Low	70	TBD + TT	
[2.1]	1.4 MHz QPSK 1/3	[R.4 FDD]	EVA5	Low	70	TBD + TT	

Table 8.2.1.1.5-3: Test Parameters for Testing 16QAM

Parameter	Unit	Test [1.5-1.7]
Reference signal power E_{RS}/I_{or}	dB	0 + TT
N_{oc} at antenna port	dBm/15kHz	TBD
NOTE: TBD		

Table 8.2.1.1.5-4: Test requirement 16QAM (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[1.5]	10 MHz 16QAM 1/2	[R.3 FDD]	EVA5	Low	70	6.7 + TT	
[1.6]	10 MHz 16QAM 1/2	[R.3 FDD]	ETU70	Low	30	1.4 + TT	
[1.7]	10 MHz 16QAM 1/2	[R.3 FDD]	ETU300	High	70	9.4 + TT	

Table 8.2.1.1.5-5: Test Parameters for Testing 64QAM

Parameter	Unit	Test [1.8-1.10, 2.2-2.5]
Reference signal power E_{RS}/I_{or}	dB	0 + TT
N_{oc} at antenna port	dBm/15kHz	TBD
NOTE: TBD		

Table 8.2.1.1.5-6: Test requirement 64QAM (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[2.2]	3 MHz 64QAM 3/4	[R.5 FDD]	EVA5	Low	70	TBD + TT	
[2.3]	5 MHz 64QAM 3/4	[R.6 FDD]	EVA5	Low	70	TBD + TT	
[1.8]	10 MHz 64QAM 3/4	[R.7 FDD]	EVA5	Low	70	17.7 + TT	
[1.9]	10 MHz 64QAM 3/4	[R.7 FDD]	ETU70	Low	70	19.0 + TT	
[1.10]	10 MHz 64QAM 3/4	[R.7 FDD]	EVA5	High	70	19.1 + TT	
[2.4]	15 MHz 64QAM 3/4	[R.8 FDD]	EVA5	Low	70	17.7 + TT	
[2.5]	20 MHz 64QAM 3/4	[R.9 FDD]	EVA5	Low	70	17.6 + TT	

Table 8.2.1.1.5-7: Test Parameters for Testing 1 PRB allocation

Parameter	Unit	Test [3.1-3.3]
Reference signal power E_{RS} / I_{or}	dB	TBD + TT
N_{oc} at antenna port	dBm/15kHz	TBD
PRB allocation		[Lower channel edge]
NOTE: TBD		

Table 8.2.1.1.5-8: Test requirement 1 PRB allocation (FRC)

Test number	Bandwidth and MCS	Reference Channel	Propagation Condition	Correlation Matrix	Reference value		UE Category
					Fraction of Maximum Throughput (%)	SNR (dB)	
[3.1]	1.4 MHz 16QAM 1/2	[R.0 FDD]	ETU70	Low	30	TBD + TT	
[3.2]	10 MHz 16QAM 1/2	[R.1 FDD]	ETU70	Low	30	TBD + TT	
[3.3]	20 MHz 16QAM 1/2	[R.1 FDD]	ETU70	Low	30	TBD + TT	

Table 8.2.1.1.5-9: Additional Common Single Antenna Port Test Parameters (FDD)

Parameter	Unit	Value	Comments
TX antenna port number	p	0	As specified in TS 36.211 [8] clause 6.2.1
DCI Format		1	Used for the scheduling of one PDSCH codeword, as specified in TS 36.212 [9] clause 5.3.3.1
Resource allocation header		0	Type 0 is indicated, as specified in TS 36.213 [10] clause 7.1.6
Resource Allocation		Type 0	A resource allocation consist of two parts: a type field and information consisting of the actual resource allocation, as specified in TS 36.213 [10] clause 7.1.6
Transmission Mode		1	Single antenna; port 0, as specified in TS 36.213 [10] clause 7.1
P_A	dB	0	P_A is signalled by higher layers, where it provides information about the exact power setting of the PDSCH transmission, as specified in TS 36.213 [10] clause 5.2
P_B		0	P_B is signalled by higher layers, offset between Type A and Type B PDSCH REs, where the actual value depends on the number of antennas used, as specified in TS 36.213 [10] clause 5.2
ρ_B / ρ_A	cell-specific ratio	1	As specified in TS 36.213 [10] clause 5.2

8.2.1.2 FDD 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 throughput requirements are undefined

The DL Reference Measurement Channel (RMC) for QPSK R=1/3 cod rate,16QAM R=1/2 code rate and 64QAM R=5/6 code rate undefined

The bandwidth (BW) selection undefined

The propagations(Doppler) and channel model selections undefined

The transmission scheme (1Tx or 2Tx) undefined

SNR to be presented for throughput undefined

The core requirements themselves contain no formal reference to the interfering signal as defined in 36.101 Annex D

The Initial Conditions including UE setup are undefined

A diagram showing connections between the SS and AWGN noise source and the UE antenna port (s) is missing

Physical channels used are undefined

Measurement channel used is 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

8.2.1.2.1 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 two antenna ports using transmit diversity (SFBC).

8.2.1.2.2 Test applicability

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

8.2.1.2.3 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.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1 and 8.2.1.2.3-1 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 8.2.1.2.3-2 for the specified SNR. For transmit diversity (SFBC) performance with 2 and 4 transmitter antennas as specified.

Table 8.2.1.2.3-1: Test Parameters for Testing Transmit Diversity Performance

Parameter	Unit	Test [7.1]	Test [7.2]	Test [7.3]
Reference signal power $(E_{RS}/I_{or})^{(p)}$	dB	3	TBD	TBD
N_{oc} at antenna port	dBm/15kHz	TBD	TBD	TBD
NOTE: TBD				

Table 8.2.1.2.3-2: 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 FDD]	EVA5	2x2 Medium	70	6.8	
[7.2]	10 MHz QPSK 1/3	[R.10 FDD]	HST	2x2 Low	70	TBD	
[7.3]	1.4 MHz QPSK 1/3	[R.12 FDD]	EPA5	4x2 Medium	70	TBD	

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.2.

8.2.1.2.4 Test description

8.2.1.2.4.1 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 4.3.1.1.

Channel Bandwidths to be tested: As specified per test number as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the multi-path fading simulator and AWGN noise source 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 Tables 8.2.1-1, 8.2.1.2.5-1 and 8.2.1.2.5-3 as appropriate.

3. Downlink signals are initially set up according to Annex C.3.2.

4. Propagation conditions are set according to Annex B clauses B.1.1, B.2.1 and B.2.2.

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 8.2.1.2.4.3.

8.2.1.2.4.2 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 8.2.1.2.5-2 as appropriate.

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

3. Repeat steps from 1 to 2 for each test interval in Table 8.2.1.2.5-2 as appropriate. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH 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.

8.2.1.2.4.3 Message contents

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

8.2.1.2.5 Test requirement

Tables 8.2.1.2.5-1 to 8.2.1.2.5.3 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 clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Table 8.2.1.2.5-2 for the specified SNR.

Table 8.2.1.2.5-1: Test Parameters for Testing Transmit Diversity Performance

Parameter	Unit	Test [7.1]	Test [7.2]	Test [7.3]
Reference signal power $(E_{RS}/I_{or})^{(p)}$ NOTE 1	dB	3 + TT	TBD + TT	TBD + TT
N_{oc} at antenna port	dBm/15kHz	TBD	TBD	TBD
NOTE 1: The superscript (p) indicates the number of cell-specific TX antenna ports used for transmission of the PDSCH				

Table 8.2.1.5-2: 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 FDD]	EVA5	2x2 Medium	70	6.8 + TT	
[7.2]	10 MHz QPSK 1/3	[R.10 FDD]	HST	2x2 Low	70	TBD + TT	
[7.3]	1.4 MHz QPSK 1/3	[R.12 FDD]	EPA5	4x2 Medium	70	TBD + TT	

Table 8.2.1.2.5-3: Additional Transmit Diversity Test Parameters (FDD)

Parameter	Unit	Value	Comments
TX antenna port number	p	$p \in \{0,1\}$ for 2 antenna ports $p \in \{0,1,2,3\}$ for 4 antenna ports	As specified in TS 36.211 [8] clause 6.2.1
DCI Format		1	Used for the scheduling of one PDSCH codeword, as specified in TS 36.212 [9] clause 5.3.3.1
Resource allocation header		0	Type 0 is indicated, as specified in TS 36.213 [10] clause 7.1.6
Resource Allocation		Type 0	A resource allocation consist of two parts: a type field and information consisting of the actual resource allocation, as specified in TS 36.213 [10] clause 7.1.6
Transmission Mode		2	Transmit diversity, as specified in TS 36.213 [10] clause 7.1
P_A	dB	-3 for 2 TX antenna ports -3 for 4 TX antenna ports	P_A is signalled by higher layers, where it provides information about the exact power setting of the PDSCH transmission, as specified in TS 36.213 [10] clause 5.2
P_B		1 (2 TX antenna ports) 1 (4 TX antenna ports)	P_B is signalled by higher layers, offset between Type A and Type B PDSCH REs, where the actual value depends on the number of antennas used, as specified in TS 36.213 [10] clause 5.2
ρ_B / ρ_A	cell-specific ratio	1 (2 TX antenna ports) 1 (4 TX antenna ports)	As specified in TS 36.213 [10] clause 5.2

8.2.1.3 FDD 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 throughput requirements are undefined*
- *The DL Reference Measurement Channel (RMC) for QPSK R=1/3 cod rate,16QAM R=1/2 code rate and 64QAM R=5/6 code rate undefined*
- *The bandwidth (BW) selection undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- *SNR to be presented for throughput undefined*
- *The core requirements themselves contain no formal reference to the interfering signal as defined in 36.101 Annex D*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS and AWGN noise source and the UE antenna port (s) is missing*
- *Physical channels used are undefined*
- *Measurement channel used is 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*

8.2.1.3.1 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 open-loop spatial multiplexing.

8.2.1.3.2 Test applicability

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

8.2.1.3.3 Minimum conformance requirements

[FFS]

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.3.

8.2.1.3.4 Test description

8.2.1.3.4.1 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 4.3.1.1

1. Connect the SS, the multi-path fading simulator and AWGN noise source 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 [clause FFS in reference FFS].
4. Propagation conditions are set according to Annex B clauses B.1.1, B.2.1 and B.2.2.
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 8.2.1.3.4.3.

8.2.1.3.4.2 Test procedure

1. Set the parameters of the reference channel, the propagation condition, the correlation matrix and the SNR according to Tables [FFS] as appropriate.

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

3. Repeat steps from 1 to 2 for each test interval in Tables [FFS] as appropriate. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH 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.

8.2.1.3.4.3 Message contents

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

8.2.1.3.5 Test requirement

[FFS]

8.2.1.4 FDD PDSCH Closed 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 throughput requirements are undefined*

- *The DL Reference Measurement Channel (RMC) for QPSK R=1/3 cod rate,16QAM R=1/2 code rate and 64QAM R=5/6 code rate undefined*
- *The bandwidth (BW) selection undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- *SNR to be presented for throughput undefined*
- *The core requirements themselves contain no formal reference to the interfering signal as defined in 36.101 Annex D*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS and AWGN noise source and the UE antenna port (s) is missing*
- *Physical channels used are undefined*
- *Measurement channel used is 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*

8.2.1.4.1 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.

8.2.1.4.2 Test applicability

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

8.2.1.4.3 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.3.3.2, with the addition of the relevant parameters in Tables 8.2.1-1, 8.2.1.4.3-1 and 8.2.1.4.3-3 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 8.2.1.4.3-2 and 8.2.1.4.3-4 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 8.2.1.4.3-1: Test Parameters for Testing Single-Layer Spatial Multiplexing

Parameter	Unit	Test [4.1]	Test [4.2]	Test [4.3]
Reference signal power $(E_{RS}/I_{or})^{(p)}$	dB	3	TBD	TBD
N_{oc} at antenna port	dBm/15kHz	TBD	TBD	TBD
Precoding granularity	PRB	6	50	TBD
[PMI delay]	[ms]	[6]	[6]	[6]
NOTE: TBD				

Table 8.2.1.4.3-2: 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	-2.5	
[4.2]	10 MHz QPSK 1/3	[R.10]	EPA5	2x2 High	70	-2.8	
[4.3]	10 MHz QPSK 1/3	[R.13]	EVA5	4x2 Low	70	TBD	

Table 8.2.1.4.3-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing

Parameter	Unit	Test [5.1,5.2]	Test [5.3]
Reference signal power $(E_{RS}/I_{or})^{(p)}$	dB	3	TBD
N_{oc} at antenna port	dBm/15kHz	TBD	TBD
Precoding granularity	PRB	50	6
PMI delay	[ms]	6	6
NOTE: TBD			

Table 8.2.1.4.3-4: 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 FDD]	EVA5	2x2 Low	70	12.9	
[5.2]	10 MHz 16QAM 1/2	[R.11 FDD]	ETU70	2x2 Low	70	14.3	
[5.3]	10 MHz 16QAM 1/2	[R.14 FDD]	EVA5	4x2 Low	70	TBD	

The normative reference for this requirement is TS 36.101 [2] clause 8.2.1.4.

8.2.1.4.4 Test description

8.2.1.4.4.1 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 as defined in TS 36.508 [7] clause 4.3.1.1.

1. Connect the SS, the multi-path fading simulator and AWGN noise source 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 Tables 8.2.1-1, 8.2.1.4.5-1, 8.2.1.4.5-3 and 8.2.1.4.5.-5 as appropriate.

3. Downlink signals are initially set up according to Annex C.3.2.

4. Propagation conditions are set according to Annex B clauses B.1.1, B.2.1 and B.2.2.
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 8.2.1.4.4.3.

8.2.1.4.4.2 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 8.2.1.4.5-2 and 8.2.1.4.5-4 as appropriate.
2. Measure the average throughput for a duration sufficient to achieve statistical significance according to Annex G clause G.3.
3. Repeat steps from 1 to 2 for each test interval in Tables 8.2.1.4.5-2 and 8.2.1.4.5-4 as appropriate. Count the number of NACKs, ACKs and statDTXs on the UL PUCCH 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.

8.2.1.4.4.3 Message contents

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

8.2.1.4.5 Test requirement

Tables 8.2.1.4.5-1 to 8.2.1.4.5-5 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 clause A.3.3.2 for each throughput test shall meet or exceed the specified value in Tables 8.2.1.4.5-2 and 8.2.1.4.5-4 for the specified SNR.

Table 8.2.1.4.5-1: Test Parameters for Testing Single-Layer Spatial Multiplexing

Parameter	Unit	Test [4.1]	Test [4.2]	Test [4.2]
Reference signal power $(E_{RS}/I_{or})^{(p)}$ NOTE 1	dB	3 + TT	TBD + TT	TBD + TT
N_{oc} at antenna port	dBm/15kHz	TBD	TBD	TBD
Precoding granularity NOTE 2	PRB	6	50	TBD
[PMI delay]	[ms]	[6]	[6]	[6]
NOTE 1: The superscript (p) indicates the number of cell-specific TX antenna ports used for transmission of the PDSCH NOTE 2: Precoding feedback with a granularity of PRB in frequency (1 RB = 180 kHz wide in frequency for 0.5ms)				

Table 8.2.1.4.5-2: 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	-2.5 + TT	
[4.2]	10 MHz QPSK 1/3	[R.10]	EPA5	2x2 High	70	-2.8 + TT	
[4.3]	10 MHz QPSK 1/3	[R.13]	EVA5	4x2 Low	70	TBD + TT	

Table 8.2.1.4.5-3: Test Parameters for Testing Multi-Layer Spatial Multiplexing

Parameter	Unit	Test [5.1,5.2]	Test [5.3]
Reference signal power $(E_{RS}/I_{or})^{(p)}$ NOTE 1	dB	3 + TT	TBD + TT
N_{oc} at antenna port	dBm/15kHz	TBD	TBD
Precoding granularity NOTE 2	PRB	50	6
PMI delay	[ms]	6	6
NOTE 1: The superscript (p) indicates the number of cell-specific TX antenna ports used for transmission of the PDSCH NOTE 2: Precoding feedback with a granularity of PRB in frequency (1 RB = 180 kHz wide in frequency for 0.5ms)			

Table 8.2.1.4.5-4: 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 FDD]	EVA5	2x2 Low	70	12.9 + TT	
[5.2]	10 MHz 16QAM 1/2	[R.11 FDD]	ETU70	2x2 Low	70	14.3 + TT	
[5.3]	10 MHz 16QAM 1/2	[R.14 FDD]	EVA5	4x2 Low	70	TBD + TT	

Table 8.2.1.4.5-5: Additional Common Spatial Multiplexing Test Parameters (FDD)

Parameter	Unit	Value	Comments
TX antenna port number	p	$p \in \{0,1\}$ for 2 antenna ports $p \in \{0,1,2,3\}$ for 4 antenna ports	As specified in TS 36.211 [8] clause 6.2.1
DCI Format		1B for single-layer spatial multiplexing 2 for multi-layer spatial multiplexing	1B is used for the compact scheduling of one PDSCH codeword with precoding information and 2 is used for scheduling PDSCH to UEs configured in closed-loop spatial multiplexing mode, as specified in TS 36.212 [9] clause 5.3.3.1
Resource allocation header		0	Type 0 is indicated (no header for Type 2), as specified in TS 36.213 [10] clause 7.1.6
Resource Allocation		Type 2 for single-layer spatial multiplexing Type 0 for multi-layer spatial multiplexing	A resource allocation consist of two parts: a type field and information consisting of the actual resource allocation, as specified in TS 36.213 [10] clause 7.1.6
Transmission Mode		2 for single-layer spatial multiplexing 4 for multi-layer spatial multiplexing	Closed-loop Rank=1 precoding and Closed-loop spatial multiplexing, , as specified in TS 36.213 [10] clause 7.1
TPC command for PUCCH	dB	1	As specified in TS 36.213 [10] clause 5.1.2
Codeword-to-layer mapping for spatial multiplexing		1 for single-layer spatial multiplexing 2 for multi-layer spatial multiplexing	The value is for number of layers and the number of codewords, as specified in 36.211 [8] clause 6.3.3.2
TPMI		2 for 2 TX antenna ports 4 for 4 TX antenna ports	This is only used for single-layer spatial multiplexing, as specified in TS 36.212 clause 5.3.3.1.3A
PMI		0	This is only used for single-layer spatial multiplexing, as specified in TS 36.212 [9] clause 5.3.3.1.3A
Transport blocks		Transport block 1 is enabled Transport block 2 is disabled	This is only used for multi-layer spatial multiplexing, as specified in TS 36.212 [9] clause 5.3.3.1.5
P_A	dB	-3 for 2 TX antenna ports -6 for 4 TX antenna ports	P_A is signalled by higher layers, where it provides information about the exact power setting of the PDSCH transmission, as specified in TS 36.213 [10] clause 5.2
P_B		1 for 2 TX antenna ports 1 for 4 TX antenna ports	P_B is signalled by higher layers, offset between Type A and Type B PDSCH REs, where the actual value depends on the number of antennas used, as specified in TS 36.213 [10] clause 5.2
ρ_B / ρ_A	cell-specific ratio	1 for 2 TX antenna ports 1 for 4 TX antenna ports	As specified in TS 36.213 [10] clause 5.2

8.2.2 TDD (Fixed Reference Channel)

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:

- *SNR to be presented for throughput undefined*
- *A diagram showing connections between the SS, multi-path fading simulator and AWGN noise source and the UE antenna port (s) is missing*

- *The Message contents are undefined*
- *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.

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, 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 the downlink physical channel setup according to table [FFS] 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 and 8.2.2.1.3-6 for the specified SNR.

Table 8.2.2.1.3-1: Test Parameters for Testing QPSK

Table 8.2.2.1.3-2: Minimum performance QPSK (FRC)

Table 8.2.2.1.3-3: Test Parameters for Testing 16QAM

Table 8.2.2.1.3-4: Minimum performance 16QAM (FRC)

Table 8.2.2.1.3-5: Test Parameters for Testing 64QAM

Table 8.2.2.1.3-6: Minimum performance 64QAM (FRC)

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

Test Environment: Normal, [FFS: Other combinations of temperature and voltage, as specified in clauses FFS of this document]

Frequencies to be tested: Mid Range [as specified in clause FFS of this document]

Bandwidths to be tested: [10MHz: as specified in clause FFS of this document]

1. Connect the SS, the multi-path fading simulator and AWGN noise source as specified in clause B.1.1 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 [clause FFS in reference FFS].
4. Propagation conditions are set according to [FFS in clause FFS of this document].
5. Ensure the UE is in State 4 according to TS 36.508 [Ref FFS] clause FFS and receiving payload data from the SS. Message contents are defined in clause 8.2.2.1.4.3.

8.2.1.1.4.2 Test procedure

1. Set the parameters of the 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.

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

3. Repeat steps from 1 to 2 for each test interval in Tables 8.2.2.1.5-1, 8.2.2.1.5-2 and 8.2.2.1.5-3.

8.2.1.1.4.3 Message contents

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

8.2.1.1.5 Test requirement

Tables 8.2.2.1.5-1, 8.2.2.1.5-2 and 8.2.2.1.5-3 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 and 8.2.2.1.5-3 for the specified SNR.

Table 8.2.2.1.5-1: Test requirement QPSK (FRC)

Table 8.2.2.1.5-2: Test requirement 16QAM (FRC)

Table 8.2.2.1.5-3: Test requirement 64QAM (FRC)

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 throughput requirements are undefined*
- *The DL Reference Measurement Channel (RMC) for QPSK R=1/3 cod rate,16QAM R=1/2 code rate and 64QAM R=5/6 code rate undefined*
- *The bandwidth (BW) selection undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- *SNR to be presented for throughput undefined*
- *The core requirements themselves contain no formal reference to the interfering signal as defined in 36.101 Annex D*
- *The Initial Conditions including UE setup are undefined*

- *A diagram showing connections between the SS and AWGN noise source and the UE antenna port (s) is missing*
- *The Message contents are undefined*
- *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

[FFS]

8.2.2.2.2 Test applicability

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

8.2.2.2.3 Minimum conformance requirements

[FFS]

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

Test Environment: Normal, [FFS: Other combinations of temperature and voltage, as specified in clauses FFS of this document]

Frequencies to be tested: Mid Range [FFS: According to channel bandwidth and frequency band, as specified in clause FFS of this document]

Bandwidths to be tested: [10MHz: as specified in clause FFS of this document]

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 [clause FFS in reference FFS].
4. Propagation conditions are set according to [FFS in clause FFS of this document].
5. Ensure the UE is in State 4 according to TS 36.508 [Ref FFS] clause FFS 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

[FFS]

8.2.2.2.4.3 Message contents

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

8.2.2.2.5 Test requirement

[FFS]

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 throughput requirements are undefined*

- *The DL Reference Measurement Channel (RMC) for QPSK R=1/3 cod rate,16QAM R=1/2 code rate and 64QAM R=5/6 code rate undefined*
- *The bandwidth (BW) selection undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- *SNR to be presented for throughput undefined*
- *The core requirements themselves contain no formal reference to the interfering signal as defined in 36.101 Annex D*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS and AWGN noise source and the UE antenna port (s) is missing*
- *The Message contents are undefined*
- *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

[FFS]

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

[FFS]

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

Test Environment: Normal, [FFS: Other combinations of temperature and voltage, as specified in clauses FFS of this document]

Frequencies to be tested: Mid Range [FFS: According to channel bandwidth and frequency band, as specified in clause FFS of this document]

Bandwidths to be tested: [10MHz: as specified in clause FFS of this document]

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 [clause FFS in reference FFS].
4. Propagation conditions are set according to [FFS in clause FFS of this document].
5. Ensure the UE is in State 4 according to TS 36.508 [Ref FFS] clause FFS 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

[FFS]

8.2.2.3.4.3 Message contents

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

8.2.2.3.5 Test requirement

[FFS]

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 aspects are either missing or not yet determined:

- *The throughput requirements are undefined*
- *The DL Reference Measurement Channel (RMC) for QPSK R=1/3 cod rate,16QAM R=1/2 code rate and 64QAM R=5/6 code rate undefined*
- *The bandwidth (BW) selection undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- *SNR to be presented for throughput undefined*
- *The core requirements themselves contain no formal reference to the interfering signal as defined in 36.101 Annex D*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS and AWGN noise source and the UE antenna port (s) is missing*
- *The Message contents are undefined*
- *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

[FFS]

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

[FFS]

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

Test Environment: Normal, [FFS: Other combinations of temperature and voltage, as specified in clauses FFS of this document]

Frequencies to be tested: Mid Range [FFS: According to channel bandwidth and frequency band, as specified in clause FFS of this document]

Bandwidths to be tested: [10MHz: as specified in clause FFS of this document]

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 [clause FFS in reference FFS].
4. Propagation conditions are set according to [FFS in clause FFS of this document].

5. Ensure the UE is in State 4 according to TS 36.508 [Ref FFS] clause FFS 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

[FFS]

8.2.2.4.4.3 Message contents

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

8.2.2.4.5 Test requirement

[FFS]

8.2.2.5 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 throughput requirements are undefined*
- *The DL Reference Measurement Channel (RMC) for QPSK R=1/3 cod rate,16QAM R=1/2 code rate and 64QAM R=5/6 code rate undefined*
- *The bandwidth (BW) selection undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- *SNR to be presented for throughput undefined*
- *The core requirements themselves contain no formal reference to the interfering signal as defined in 36.101 Annex D*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS and AWGN noise source and the UE antenna port (s) is missing*
- *The Message contents are undefined*
- *The Test system uncertainties applicable to this test are undefined*
- *Test tolerances for SNR have not yet been applied*

8.2.2.5.1 Test purpose

[FFS]

8.2.2.5.2 Test applicability

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

8.2.2.5.3 Minimum conformance requirements

[FFS]

The normative reference for this requirement is TS 36.101 [2] clause 8.2.2.3.

8.2.2.5.4 Test description

8.2.2.5.4.1 Initial conditions

Test Environment: Normal, [FFS: Other combinations of temperature and voltage, as specified in clauses FFS of this document]

Frequencies to be tested: Mid Range [FFS: According to channel bandwidth and frequency band, as specified in clause FFS of this document]

Bandwidths to be tested: [10MHz: as specified in clause FFS of this document]

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 [clause FFS in reference FFS].
4. Propagation conditions are set according to [FFS in clause FFS of this document].
5. Ensure the UE is in State 4 according to TS 36.508 [Ref FFS] clause FFS and receiving payload data from the SS. Message contents are defined in clause 8.2.2.5.4.3.

8.2.2.5.4.2 Test procedure

[FFS]

8.2.2.5.4.3 Message contents

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

8.2.2.5.5 Test requirement

[FFS]

8.3 Demodulation of PDSCH (User-Specific Reference Symbols)

[FFS]

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 propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- $\hat{I}_{or} / I_{oc}$ *to be presented for PDCCH BLER undefined*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS, interfering source and the UE antenna port (s) is missing*
- *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*

8.4.1.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH 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		
PHICH mapping		1 PHICH group, normal PHICH duration		
Cell ID		0		
Reference signal power $(E_{RS}/I_{or})^{(p)}$	dB	0		
Power difference between PCFICH and PDCCH	dB	0		
N_{oc} at antenna port	dBm/15kHz			
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	Correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.1]	**10 MHz**	**8 CCE**	**[R.15 FDD]**	**ETU70**	**Low**	**1**	**-1.7**

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

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 Figure [FFS in clause FFS of this document].

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.3.2.

4. Propagation conditions are set according to Annex B clauses B.1.1, B.2.1 and B.2.2.

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 8.4.1.4.3.

8.4.1.1.4.2 Test procedure

[FFS]

8.4.1.1.4.3 Message contents

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

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	Correlation Matrix	Reference value	
						Pm-dsg (%)	SNR (dB)
[8.1]	**10 MHz**	**8 CCE**	**[R.15 FDD]**	**ETU70**	**Low**	**1**	**-1.7 + [TT]**

8.4.1.2 FDD PCFICH/PDCCH Transmit Diversity Performance

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 PCFICH/PDCCH performance requirement given in terms of the SNR required for PDCCH BLER = 1% is undefined.*
- *The Reference Measurement Channel undefined*
- *The bandwidth (BW) selection undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- $\hat{I}_{or} / I_{oc}$ *to be presented for PDCCH BLER undefined*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS, interfering source and the UE antenna port (s) is missing*
- *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*

8.4.2.1.1 Test purpose

This test verifies the demodulation performance of PCFICH/PDCCH with a given SNR for which a certain PDCCH BLER of the specified reference measurement channels [clause FFS] is achieved.

8.4.2.1.2 Test applicability

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

8.4.2.1.3 Minimum conformance requirements

[FFS]

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

Test Environment: Normal, [FFS: Other combinations of temperature and voltage, as specified in clauses FFS of this document]

Frequencies to be tested: [FFS: According to channel bandwidth and frequency band, as specified in clause FFS of this document]

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 [clause FFS in reference FFS].

4. Propagation conditions are set according to [FFS in clause FFS of this document].

5. Ensure the UE is in State 4 according to TS 36.508 [Ref FFS] clause FFS and receiving payload data from the SS. Message contents are defined in clause 8.4.2.4.3.

8.4.2.1.4.2 Test procedure

[FFS]

8.4.2.1.4.3 Message contents

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

8.4.2.1.5 Test requirement

[FFS]

8.4.2.2 TDD PCFICH/PDCCH Transmit Diversity Performance

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 PHICH performance requirement given in term of the probability of missed detection of Hybrid Indicator ("ACK to NACK") for a given SNR is undefined.*
- *The Reference Measurement Channel undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- $\hat{I}_{or} / I_{oc}$ *to be presented for PHICH error rates undefined*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS, interfering source and the UE antenna port (s) is missing*
- *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*

8.5.1.1.1 Test purpose

This test verifies the demodulation performance of PHICH 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

[FFS]

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

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 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.3.2.

4. Propagation conditions are set according to Annex B clauses B.1.1, B.2.1 and B.2.2.

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 8.5.1.4.3.

8.5.1.1.4.2 Test procedure

[FFS]

8.5.1.1.4.3 Message contents

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

8.5.1.1.5 Test requirement

[FFS]

8.5.1.2 FDD PHICH Transmit Diversity Performance

[FFS]

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:

- *The PHICH performance requirement given in term of PHICH error rates for a given SNR is undefined.*
- *The Reference Measurement Channel undefined*

- *The bandwidth (BW) selection undefined*
- *The propagations(Doppler) and channel model selections undefined*
- *The transmission scheme (1Tx or 2Tx) undefined*
- $\hat{I}_{or} / I_{oc}$ *to be presented for PHICH error rates undefined*
- *The Initial Conditions including UE setup are undefined*
- *A diagram showing connections between the SS, interfering source and the UE antenna port (s) is missing*
- *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 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

[FFS]

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

Test Environment: Normal, [FFS: Other combinations of temperature and voltage, as specified in clauses FFS of this document]

Frequencies to be tested: [FFS: According to channel bandwidth and frequency band, as specified in clause FFS of this document]

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 [clause FFS in reference FFS].

4. Propagation conditions are set according to [FFS in clause FFS of this document].

5. Ensure the UE is in State 4 according to TS 36.508 [Ref FFS] clause FFS and receiving payload data from the SS. Message contents are defined in clause 8.5.1.4.3.

8.5.2.1.4.2 Test procedure

[FFS]

8.5.2.1.4.3 Message contents

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

8.5.2.1.5 Test requirement

[FFS]

8.5.2.2 TDD PHICH Transmit Diversity Performance

[FFS]

8.6 Demodulation of PBCH

RAN4 will specify the PBCH performance requirements and has recommended that these requirements do not need to be tested.

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.

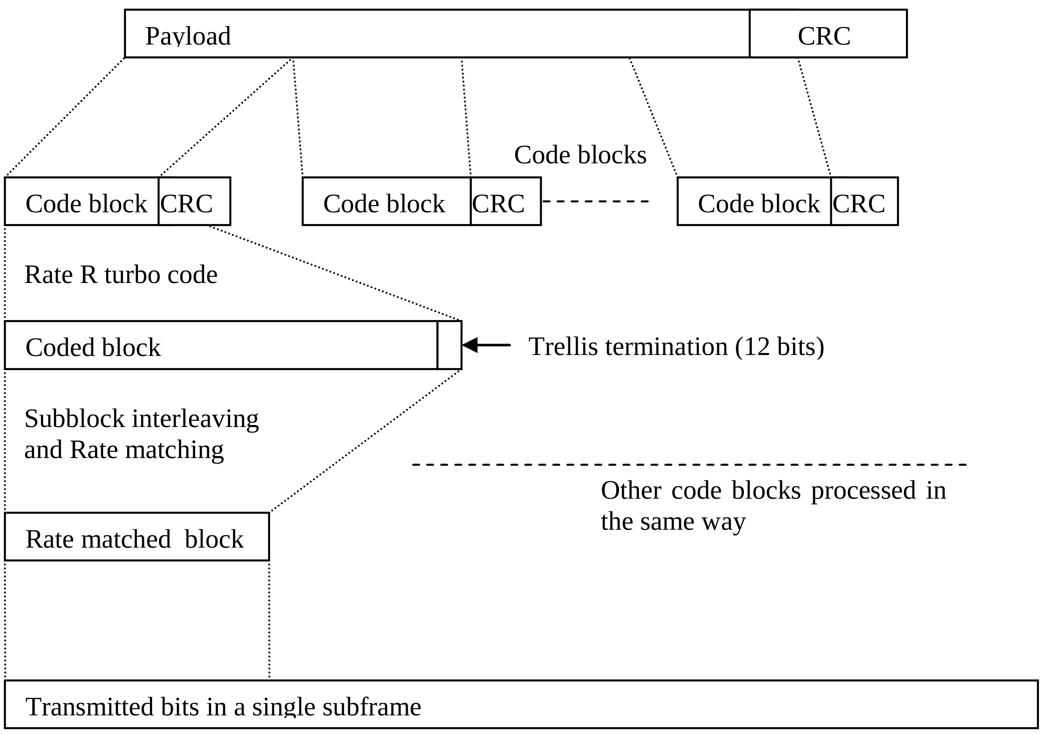

Figure A-1. Schematic overview of the encoding process

A.2 UL reference measurement channels

A.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.

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]

3. If there is more than one *A* that minimises the equation above, then the larger value is chosen per default.

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.3.2-1 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							
For Sub-Frames 1,2,3,4,6,7,8,9	Bits	408	1320	2216	4392	6712	8760
For Sub-Frame 5	Bits	328	1064	1800	4392	6712	8760
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		1	1	1	1	2	2
Code block CRC size	Bits	0	0	0	0	24	24
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	1080	3492	6012	13512	20412	27312
For Sub-Frame 0	Bits	528	2940	5460	12960	19860	26760
Max. Throughput averaged over 1 frame	kbps	374.4	1249.6	2132.8	4392	6712	8760
NOTE 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 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							

Table A.3.2-2 Fixed Reference Channel for Receiver Requirements (TDD)

Parameter	Unit	Value					
Nominal Avg. Inf. Bit Rate	kbps						
Number of HARQ Processes	Processes	1	1	1	1	1	1
Maximum number of HARQ transmission		1	1	1	1	1	1
Information Bit Payload per Sub-Frame	Bits						
Number of Code Blocks							
Binary Channel Bits Per Sub-Frame	Bits						
Coding Rate							
Bandwidth	MHz	1.4	3	5	10	15	20
Number of OFDM symbols per Sub-Frame							
					11.5		
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
NOTE 1: 2 symbols allocated to PDCCH NOTE 2: The RLC should be configured to Unacknowledged Mode							

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	328			4392		
For Sub-Frame 0	Bits	152			4392		
Number of Code Blocks per subframe		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	1080			13512		
For Sub-Frame 0	Bits	528			12960		
Max. Throughput averaged over 1 frame	Mbps	0.374			4.39		
NOTE 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 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]							

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				12960		
For Sub-Frame 0	Bits				12960		
Number of Code Blocks per subframe					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				27024		
For Sub-Frame 0	Bits				25920		
Max. Throughput averaged over 1 frame	Mbps				13.9		
NOTE 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 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]							

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		7992	13536	30576	45352	61664
For Sub-Frame 0	Bits		6456	12576	28336	45352	61664
Number of Code Blocks per subframe			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		10476	18036	40536	61236	81936
For Sub-Frame 0	Bits		8820	16380	38880	59580	80280
Max. Throughput averaged over 1 frame	Mbps		8.25	13.9	30.4	46.6	61.7
NOTE 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 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]							

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		224		256		
For Sub-Frame 0	Bits		224		256		
Number of Code Blocks per subframe			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		504		552		
For Sub-Frame 0	Bits		504		552		
Max. Throughput averaged over 1 frame	Mbps		0.224		0.256		
NOTE 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 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]							

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		4392	12960			
For Sub-Frame 0	Bits		4392	12960			
Number of Code Blocks per subframe			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		12912	25824			
For Sub-Frame 0	Bits		12384	24768			
Max. Throughput averaged over 1 frame	Mbps		4.39	13.0			
NOTE 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 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]							

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	328	4392	12960			
For Sub-Frame 0	Bits	152	3624	11448			
Number of Code Blocks per subframe							
For Sub-Frames 1,2,3,4,6,7,8,9		1	1	3			
For Sub-Frame 5		1	1	3			
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	960	12512	25024			
	Bits	480	12032	24064			
Max. Throughput averaged over 1 frame	Mbps	0.374	4.32	12.8			
NOTE 1: 2 symbols allocated to PDCCH for 20 MHz, 15 MHz and 15 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]							

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

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

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

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.

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 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.

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	TBD

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.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

$$f_s(t) = f_d \cos\theta(t)$$

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

$$\cos\theta(t) = \frac{D_s/2 - vt}{\sqrt{D_{\min}{}^2 + (D_s/2 - vt)^2}},\ 0 \le t \le D_s/v$$

$$\cos\theta(t) = \frac{-1.5D_s + vt}{\sqrt{D_{\min}{}^2 + (-1.5D_s + vt)^2}},\ D_s/v < t \le 2D_s/v$$

$$\cos\theta(t) = \cos\theta(t \mod (2D_s/v)),\ t > 2D_s/v$$

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. The parameters in the equation are shown in Table B.3-1 assuming a carrier frequency fc = 2690 MHz. The resulting Doppler shift is shown in Figure B.3-1.

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

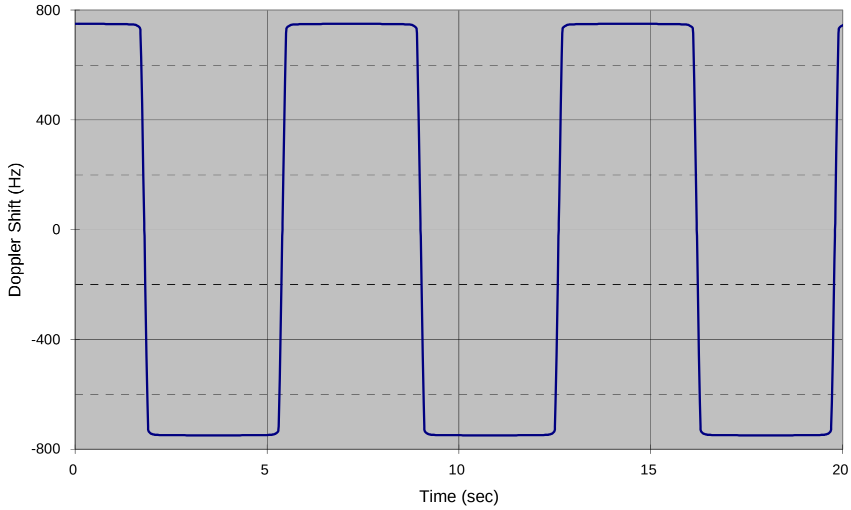

Figure B.3-1: Doppler shift trajectory

Annex C (normative): Downlink Physical Channels

C.0 Downlink signal levels

When the SS downlink connects to the UE via one Rx antenna port, the downlink power settings in Table C.0-1 are used unless otherwise specified in a test case.

When the SS downlink connects to the UE via two Rx antennas ports, the downlink power settings in Table C.0-2 are used unless otherwise specified in a test case.

Table C.0-1: Default Downlink power levels for 1 UE Rx antenna

	Channel bandwidth					
	1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Number of RBs	6	15	25	50	75	100
Power/dBm	-69	-65	-63	-60	-58	-57
NOTE 1: The powers are based on -77dBm per resource block, then scaled and rounded to the nearest integer dBm value.						

Table C.0-2: Default Downlink power levels for 2 UE Rx antenna

	Channel bandwidth					
	1.4 MHz	**3 MHz**	**5 MHz**	**10 MHz**	**15 MHz**	**20 MHz**
Number of RBs	6	15	25	50	75	100
Power/dBm	-72	-68	-66	-63	-61	-60
NOTE 1: The powers are based on -77dBm per resource block, then scaled and rounded to the nearest integer dBm value. The power is then split between the two antennas, and therefore specified per port.						

It is [FFS] whether there is a requirement to specify constant power throughout all OFDM symbols, and if so how unallocated Resource elements should be treated.

The default signal level uncertainty is +/-3dB at each test port, unless otherwise specified in a test case or in Annex F.

C.1 General

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.2 Set-up

Table C.2-0 describes the mapping of downlink physical channels and signals to physical resources.

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 of subframe 0 of each subframe, 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.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

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: ρ_A= ρ_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	50	75	100
$BW_{Interferer}$	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.*

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 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 0(DSUUUDDSUUU) as specified in TS 36.211 [8] Table 4.2-2,assuming all uplink subframes are active.

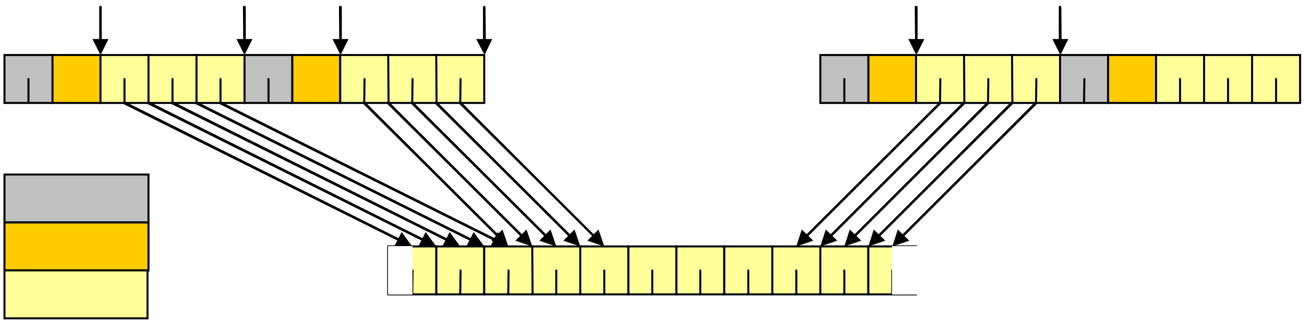

Figure E.2.2-1: Example of uplink – downlink configuration 0

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".

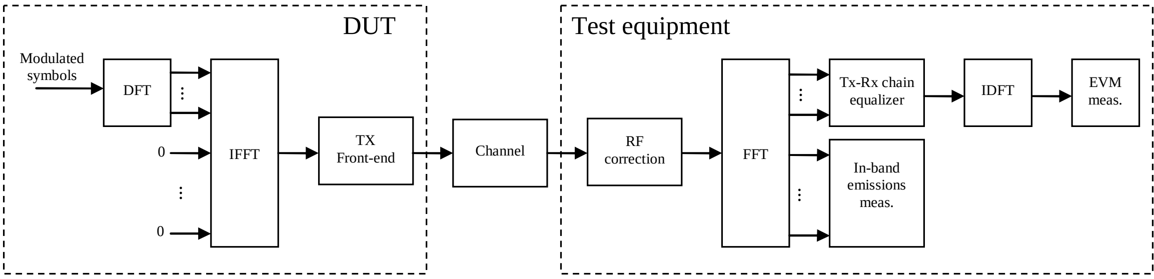

Figure E.2.5-1: EVM measurement points

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 $i_2(\nu)$ 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 subframe 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 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 reference symbol in the time axis and the number of allocated resource blocks in the frequency axis.)

From this preliminary equalizer coefficients are calculated:

Preliminary Equalizer Coefficients: PEC(f,t) = NS(f,t) / MS(f,t)

The PEC(f,t) are time averaged over 1 TS to derive the final equalizer coefficients EC(f):

$$EC(f) = \frac{1}{7} \sum_{OFDMsymbolsperTS} PEC(f,t)$$

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 separated into Amplitude A(EC(f)) and phase. A(EC(f)) is used to derive the spectral flatness as described in E.4.4.

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*N_{RB} (with N_{RB}: 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

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 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.3.3

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = \frac{Emissions_{absolute}(\Delta_{RB})}{\dfrac{1}{|T_s|\cdot N_{RB}}\sum_{t\in T_s}\sum_{c_l}^{c_l+(12\cdot N_{RB}-1)*\Delta f} |\mathrm{MS}(t,f)|^2}$$

where

N_{RB} is the number of allocated RBs,

and $\mathrm{MS}(t, f)$ is the frequency domain samples for the allocated bandwidth, as defined in the subsection E.3.3.

The basic in-band emissions measurement interval is defined over one slot in the time domain.

From the acquired samples 20 functions for in band emissions can be derived.

Dependent on the RB allocation, there are ranges in this function, which are general in band emissions, and other ranges, which are IQ image emissions. They are compared against different limits.

E.4.4 Spectral flatness

For spectral flatness calculate

$$\Delta P(f) = 10 * \log \frac{\frac{1}{12 * N_{RB}} \sum_{12*N_{RB}} |A(EC(f))|^2}{|A(EC(f)|^2}$$

A(EC(f)) as defined in E.3.3

$12*N_{RB}$: 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.

Annex F: 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	[TBD]	
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	
6.4.1 Out-of synchronization handling of output power	[TBD; High priority]	
6.5.1 Frequency Error	±15 Hz	
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
7.8.2 Narrow band intermodulation	[TBD; High priority]	
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	[TBD]	[TBD]	[TBD]
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
6.4.1 Out-of synchronization handling of output power	[TBD]	[TBD]	[TBD; High priority]
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: [TBD] dBm / 30kHz -25dBm to -10dBm / 1MHz For 3 MHz BW: [TBD] dBm / 30kHz -25dBm to -10dBm / 1MHz For 5 MHz BW: -15dBm / 30kHz -25dBm to -10dBm / 1MHz For 10 MHz BW: -18dBm / 30kHz -25dBm to -10dBm / 1MHz For 15 MHz BW: -20dBm / 30kHz -25dBm to -10dBm / 1MHz For 20 MHz BW: -21dBm / 30kHz -25dBm to -10dBm / 1MHz	1.5dB (Δf_{OOB} < 2 x Channel Bandwidth) 0dB ($\Delta f_{OOB} \geq$ 2 x Channel Bandwidth) 1.5dB 1.5dB 1.5dB 1.5dB 1.5dB	Formula: Minimum Requirement + TT

6.6.2.2 Additional Spectrum Emission Mask	For 1.4 MHz BW: NS_03 [TBD] dBm / 30kHz [TBD] dBm / 1MHz NS_04 [TBD] dBm / 30kHz [TBD] dBm / 1MHz NS_06 [TBD] dBm / 30kHz -13 dBm / 100kHz [TBD] dBm / 1MHz For 3 MHz BW: NS_03 [TBD] dBm / 30kHz [TBD] dBm / 1MHz NS_04 [TBD] dBm / 30kHz [TBD] dBm / 1MHz NS_06 [TBD] dBm / 30kHz -13 dBm / 100kHz [TBD] dBm / 1MHz For 5 MHz BW: NS_03, NS_04, NS_06 -15dBm / 30kHz -13dBm / 100kHz -25dBm to -10dBm / 1MHz For 10 MHz BW: NS_03, NS_04, NS_06 -18dBm / 30kHz -13dBm / 100kHz -25dBm to -10dBm / 1MHz For 15 MHz BW: NS_03, NS_04 -20dBm / 30kHz -25dBm to -10dBm / 1MHz For 20 MHz BW: NS_03, NS_04 -21dBm / 30kHz -25dBm to -10dBm / 1MHz	1.5dB ($\Delta f_{OOB} < 2$ x Channel Bandwidth) 0dB ($\Delta f_{OOB} \geq 2$ 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	Bands 1, 9, 11: -41 dBm / 300kHz [-55] dBm / 1MHz [-50] dBm / 1MHz Bands 2, 3, 4, 5, 7, 10: [-50] dBm / 1MHz Band 6: -41 dBm / 300kHz [-55] dBm / 1MHz [-50] dBm / 1MHz -37 dBm / 1MHz Band 8: -36 dBm / 100kHz [-50] dBm / 1MHz Band 13, 14: -35 dBm / 6.25kHz [-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	0 dB	Formula: Minimum Requirement + TT
6.7 Transmit intermodulation	[TBD]	[TBD]	[TBD]

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 Bands 2, 5: -104.2dBm Band 3, 8, 13: -103.2dBm Band 4: -106.2dBm For 3MHz Bands 2, 5: -100.2dBm Band 3, 8, 13: -99.2dBm Band 4: -102.2dBm For 5MHz Bands 1, 4, 6, 10: -100 dBm Band 2, 5, 7, 11: -98 dBm Band 3, 8, 13: -97 dBm Band 9: -99 dBm Band 3 + 0.5dBm for Multi band For 10MHz Bands 1, 4, 6, 10: -97 dBm Band 2, 5, 7, 11: -95 dBm Band 3, 8, 13: -94 dBm Band 9: -96 dBm Band 3 + 0.5dBm for Multi band For 15MHz Bands 1, 4, 10: -95.2 dBm Band 2, 7, 11: -93.2 dBm Band 3: -92.2 dBm Band 9: -94 dBm Band 3 + 0.5dBm for Multi band For 20MHz Bands 1, 4, 10: -94 dBm Band 2, 7, 11: -92 dBm Band 3: -91 dBm Band 9: -93 dBm Band 3 + 0.5dBm for 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) Interferer signal power For 1.4 MHz, 3 MHz, 5 MHz, 10 MHz BW: (REFSENS + [45] dB) For 15 MHz BW:	0 dB	Formula: Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged

	(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		
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: (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)	0 dB	Formula: Wanted signal power +TT CW Interferer signal power unchanged Modulated Interferer signal power unchanged T-put limit unchanged

	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		
7.8.2 Narrow band intermodulation	[TBD]	[TBD]	[TBD; High priority]
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.2.3 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	77	NA	43	855	576	86	1525	1297	129	2173	2050
1	106	3	44	871	592	87	1540	1314	130	2188	2067
2	131	8	45	887	608	88	1556	1331	131	2203	2085
3	154	14	46	903	625	89	1571	1349	132	2218	2103
4	176	22	47	919	641	90	1586	1366	133	2233	2121
5	197	32	48	935	657	91	1601	1383	134	2248	2139
6	218	42	49	951	674	92	1617	1401	135	2263	2156
7	238	52	50	967	690	93	1632	1418	136	2277	2174
8	257	64	51	982	706	94	1647	1435	137	2292	2192
9	277	75	52	998	723	95	1662	1453	138	2307	2210
10	295	87	53	1014	739	96	1677	1470	139	2322	2227
11	314	100	54	1030	756	97	1692	1487	140	2337	2245
12	333	112	55	1046	772	98	1708	1505	141	2352	2263
13	351	125	56	1061	789	99	1723	1522	142	2367	2281
14	369	139	57	1077	805	100	1738	1540	143	2381	2299
15	387	152	58	1093	822	101	1753	1557	144	2396	2317
16	405	166	59	1108	839	102	1768	1574	145	2411	2335
17	422	180	60	1124	855	103	1783	1592	146	2426	2352
18	440	194	61	1140	872	104	1798	1609	147	2441	2370
19	457	208	62	1155	889	105	1813	1627	148	2456	2388
20	474	222	63	1171	906	106	1828	1644	149	2470	2406
21	492	237	64	1186	922	107	1844	1662	150	2485	2424
22	509	251	65	1202	939	108	1859	1679	151	2500	2442
23	526	266	66	1217	956	109	1874	1697	152	2515	2460
24	543	281	67	1233	973	110	1889	1714	153	2530	2478
25	560	295	68	1248	990	111	1904	1732	154	2544	2496
26	577	310	69	1264	1007	112	1919	1750	155	2559	2513
27	593	325	70	1279	1024	113	1934	1767	156	2574	2531
28	610	341	71	1295	1040	114	1949	1785	157	2589	2549
29	627	356	72	1310	1057	115	1964	1802	158	2603	2567
30	643	371	73	1326	1074	116	1979	1820	159	2618	2585
31	660	387	74	1341	1091	117	1994	1838	160	2633	2603
32	676	402	75	1357	1108	118	2009	1855	161	2648	2621
33	693	418	76	1372	1126	119	2024	1873	162	2662	2639
34	709	433	77	1387	1143	120	2039	1890	163	2677	2657
35	725	449	78	1403	1160	121	2054	1908	164	2692	2675
36	742	465	79	1418	1177	122	2069	1926	165	2707	2693
37	758	480	80	1433	1194	123	2084	1943	166	2721	2711
38	774	496	81	1449	1211	124	2099	1961	167	2736	2729
39	790	512	82	1464	1228	125	2114	1979	168	2751	2747
40	807	528	83	1479	1245	126	2128	1997	169	2765	NA
41	823	544	84	1495	1263	127	2143	2014			
42	839	560	85	1510	1280	128	2158	2032			

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 77+ samples, otherwise continue

Having observed 1 error, pass the test at 106+ samples, fail the test at 3- samples, otherwise continue

Having observed 2 errors, pass the test at 131+ samples, fail the test at 8- samples, otherwise continue

Etc. etc.

Having observed 168 errors, pass the test at 2751+ samples, fail the test at 2747- samples, otherwise continue

Having observed 169 errors, pass the test at 2765+ samples, otherwise fail

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 77 samples. The maximum test time is 2765 samples.

NOTE 2: since subframe 0 and 5 contain less bits than the remaining subframes, 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

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
7.8.2 Narrow band Intermodulation		tbd	

G.3 Statistical testing of Performance Requirements

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 $\geq$ 59 / 233

Testing Throughput = 70% then the test limit is

Number of fails (NACK and statDTX) / number of samples $\leq$ 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: 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 blocks (SPR) 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: Minimum Test time

Δf doppler max	Minimum test time in sec (NOTE1)						
BW	SPR	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

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
8.2.1.1	subframes are independent	4xQPSK, 2x16QAM 4x 64QAM Normal BW=[10MHz]	To pass 8.2.1.1 each component in the test vector must pass
8.2.1.2			
8.2.1.3			
8.2.1.4			
8.2.2.1			
8.2.2.2			
8.2.2.3			
8.2.2.4			
8.2.2.5			
8.4.1.1			
8.4.2.1			
8.4.2.2			
8.5.1.1			
8.5.1.2			
8.5.2.1			
8.5.2.2			

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 (ε→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:

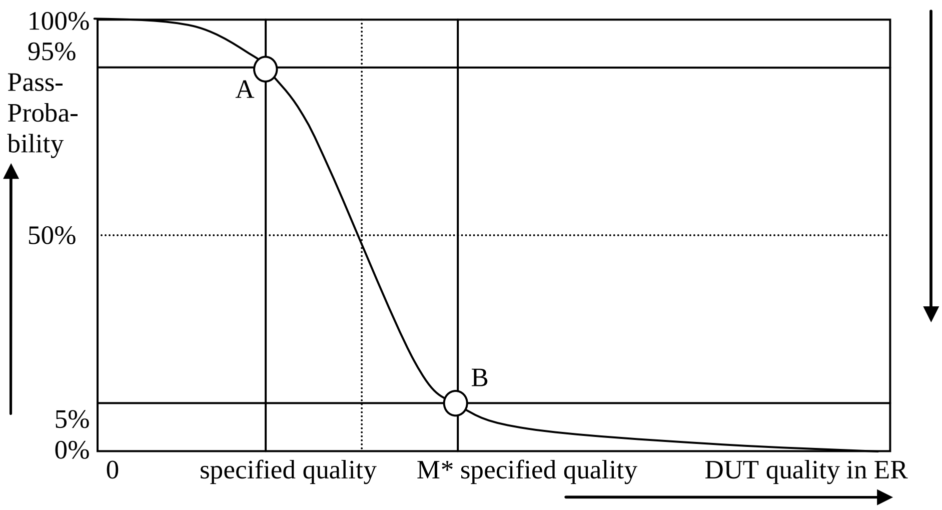

Figure G.X.8-1 Pass probability versus DUT quality

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

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.

$$\text{fail}(ne, d_f) := \frac{ne}{(ne + \text{qnbinom}(d_f, ne, ER))}$$

$$\text{pass}(ne, cl_p, M) := \frac{ne}{(ne + \text{qnbinom}(cl_p, ne, ER \cdot M))}$$

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 (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 R5w080018r2	0.0.9	0.1.0

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 PCFICH/PDCCH and PHICH	0.2.0	0.3.0

					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 Emission Mask	1.0.0	1.1.0

					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

History

Document history		
V8.0.1	January 2009	Publication