



HARMONISED EUROPEAN STANDARD

**IMT cellular networks;
Harmonised Standard covering the essential requirements
of article 3.2 of the Directive 2014/53/EU;
Part 13: Evolved Universal Terrestrial Radio Access (E-UTRA)
User Equipment (UE)**

Reference

REN/MSG-TFES-11-13-RED

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Foreword

This final draft Harmonised European Standard (EN) has been produced by ETSI Technical Committee Mobile Standards Group (MSG), and is now submitted for the Vote phase of the ETSI standards EN Approval Procedure.

For non EU countries the present document may be used for regulatory (Type Approval) purposes.

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.9] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.2].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A-1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

The present document is part 13 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.12].

Proposed national transposition dates	
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Date of withdrawal of any conflicting National Standard (dow):	18 months after doa

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the [ETSI Drafting Rules](#) (Verbal forms for the expression of provisions).

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Introduction

The present document is part of a set of standards developed by ETSI and is designed to fit in a modular structure to cover all radio and telecommunications terminal equipment within the scope of the Radio Equipment Directive [i.2]. The present document is produced following the guidance in ETSI EG 203 336 [i.3] as applicable.

1 Scope

The present document applies to the following radio equipment type:

- User Equipment for Evolved Universal Terrestrial Radio Access (E-UTRA).

This radio equipment type is capable of operating in all or any part of the frequency bands given in tables from 1-1 through 1-5.

Table 1-1: E-UTRA UE operating bands

E-UTRA Band	Direction of UE transmission	E-UTRA operating bands
1	Transmit	1 920 MHz to 1 980 MHz
	Receive	2 110 MHz to 2 170 MHz
3	Transmit	1 710 MHz to 1 785 MHz
	Receive	1 805 MHz to 1 880 MHz
7	Transmit	2 500 MHz to 2 570 MHz
	Receive	2 620 MHz to 2 690 MHz
8	Transmit	880 MHz to 915 MHz
	Receive	925 MHz to 960 MHz
20	Transmit	832 MHz to 862 MHz
	Receive	791 MHz to 821 MHz
22	Transmit	3 410 MHz to 3 490 MHz
	Receive	3 510 MHz to 3 590 MHz
28	Transmit	703 MHz to 748 MHz
	Receive	758 MHz to 803 MHz
32 (note)	Transmit	N/A
	Receive	1 452 MHz to 1 496 MHz
33	Transmit and Receive	1 900 MHz to 1 920 MHz
34	Transmit and Receive	2 010 MHz to 2 025 MHz
38	Transmit and Receive	2 570 MHz to 2 620 MHz
40	Transmit and Receive	2 300 MHz to 2 400 MHz
42	Transmit and Receive	3 400 MHz to 3 600 MHz
43	Transmit and Receive	3 600 MHz to 3 800 MHz

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

Table 1-2: E-UTRA UE Intra-band contiguous CA operating bands

E-UTRA CA Band	E-UTRA Band	Direction of UE transmission	E-UTRA operating bands
CA_1	1	Transmit	1 920 MHz to 1 980 MHz
		Receive	2 110 MHz to 2 170 MHz
CA_3	3	Transmit	1 710 MHz to 1 785 MHz
		Receive	1 805 MHz to 1 880 MHz
CA_7	7	Transmit	2 500 MHz to 2 570 MHz
		Receive	2 620 MHz to 2 690 MHz
CA_38	38	Transmit and Receive	2 570 MHz to 2 620 MHz
CA_40	40	Transmit and Receive	2 300 MHz to 2 400 MHz
CA_42	42	Transmit and Receive	3 400 MHz to 3 600 MHz

Table 1-3: E-UTRA UE Inter-band CA operating bands (two bands)

E-UTRA CA Band	E-UTRA Band	UL operating band	DL operating band
		BS receive/UE transmit	BS transmit/UE receive
		$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$
CA_1-3	1	1 920 MHz to 1 980 MHz	2 110 MHz to 2 170 MHz
	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
CA_1-7	1	1 920 MHz to 1 980 MHz	2 110 MHz to 2 170 MHz
	7	2 500 MHz to 2 570 MHz	2 620 MHz to 2 690 MHz
CA_1-8	1	1 920 MHz to 1 980 MHz	2 110 MHz to 2 170 MHz
	8	880 MHz to 915 MHz	925 MHz to 960 MHz
CA_1-20	1	1 920 MHz to 1 980 MHz	2 110 MHz to 2 170 MHz
	20	832 MHz to 862 MHz	791 MHz to 821 MHz
CA_1-42	1	1 920 MHz to 1 980 MHz	2 110 MHz to 2 170 MHz
	42	3 400 MHz to 3 600 MHz	3 400 MHz to 3 600 MHz
CA_3-7	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
	7	2 500 MHz to 2 570 MHz	2 620 MHz to 2 690 MHz
CA_3-8	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
	8	880 MHz to 915 MHz	925 MHz to 960 MHz
CA_3-20	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
	20	832 MHz to 862 MHz	791 MHz to 821 MHz
CA_3-28	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
	28	703 MHz to 748 MHz	758 MHz to 803 MHz
CA_3-42	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
	42	3 400 MHz to 3 600 MHz	3 400 MHz to 3 600 MHz
CA_7-20	7	2 500 MHz to 2 570 MHz	2 620 MHz to 2 690 MHz
	20	832 MHz to 862 MHz	791 MHz to 821 MHz
CA_7-28	7	2 500 MHz to 2 570 MHz	2 620 MHz to 2 690 MHz
	28	703 MHz to 748 MHz	758 MHz to 803 MHz
CA_8-20	8	880 MHz to 915 MHz	925 MHz to 960 MHz
	20	832 MHz to 862 MHz	791 MHz to 821 MHz
CA_8-40	8	880 MHz to 915 MHz	925 MHz to 960 MHz
	40	2 300 MHz to 2 400 MHz	2 300 MHz to 2 400 MHz
CA_20-32	20	832 MHz to 862 MHz	791 MHz to 821 MHz
	32	N/A	1 452 MHz to 1 496 MHz

Table 1-4: E-UTRA UE Inter-band CA operating bands (three bands)

E-UTRA CA Band	E-UTRA Band	UL operating band	DL operating band
		BS receive/UE transmit	BS transmit/UE receive
		$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$
CA_1-3-8	1	1 920 MHz to 1 980 MHz	2 110 MHz to 2 170 MHz
	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
	8	880 MHz to 915 MHz	925 MHz to 960 MHz
CA_1-3-20	1	1 920 MHz to 1 980 MHz	2 110 MHz to 2 170 MHz
	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
	20	832 MHz to 862 MHz	791 MHz to 821 MHz
CA_1-7-20	1	1 920 MHz to 1 980 MHz	2 110 MHz to 2 170 MHz
	7	2 500 MHz to 2 570 MHz	2 620 MHz to 2 690 MHz
	20	832 MHz to 862 MHz	791 MHz to 821 MHz
CA_3-7-20	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
	7	2 500 MHz to 2 570 MHz	2 620 MHz to 2 690 MHz
	20	832 MHz to 862 MHz	791 MHz to 821 MHz

Table 1-5: Intra-band non-contiguous CA operating bands (with two sub-blocks)

E-UTRA CA Band	E-UTRA Band	Uplink (UL) operating band	Downlink (DL) operating band
		BS receive/UE transmit	BS transmit/UE receive
		$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$
CA_3-3	3	1 710 MHz to 1 785 MHz	1 805 MHz to 1 880 MHz
CA_7-7	7	2 500 MHz to 2 570 MHz	2 620 MHz to 2 690 MHz
CA_42-42	42	3 400 MHz to 3 600 MHz	3 400 MHz to 3 600 MHz

The present document covers requirements for E-UTRA FDD and E-UTRA TDD User Equipment from 3GPP™ Releases 8, 9, 10 and 11 defined in ETSI TS 136 101 [3]. This includes the requirements for E-UTRA UE operating bands and E-UTRA CA operating bands from 3GPP™ Release 12 defined in ETSI TS 136 101 [i.13].

NOTE: For Band 20:

- For user equipment designed to be mobile or nomadic, the requirements in the present document measured at the antenna port also show conformity to the corresponding requirement defined as TRP (total radiated power), as described in Commission Decision 2010/267/EU [i.6], ECC Decision (09)03 [i.7] and CEPT Report 30 [i.8].
- For user equipment designed to be fixed or installed, the present document does not address the requirements described in Commission Decision 2010/267/EU [i.6], ECC Decision (09)03 [i.7] and CEPT Report 30 [i.8].

The present document contains requirements to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference.

2 References

2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are necessary for the application of the present document.

- [1] ETSI TS 136 521-1 (V12.7.0) (10-2015): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) conformance specification; Radio transmission and reception; Part 1: Conformance testing (3GPP TS 36.521-1 version 12.7.0 Release 12)".
- [2] ETSI TS 136 508 (V12.7.0) (10-2015): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Common test environments for User Equipment (UE) conformance testing (3GPP TS 36.508 version 12.7.0 Release 12)".
- [3] ETSI TS 136 101 (V11.14.0) (10-2015): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (3GPP TS 36.101 version 11.14.0 Release 11)".
- [4] IEC 60068-2-1 (2007): "Environmental testing - Part 2-1: Tests - Test A: Cold".
- [5] IEC 60068-2-2 (2007): "Environmental testing - Part 2-2: Tests - Test B: Dry heat".

2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] Void.

- [i.2] Directive 2014/53/EU of the European Parliament and of the Council of 16 April 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC.
- [i.3] ETSI EG 203 336 (V1.1.1) (06-2015) "Electromagnetic compatibility and Radio spectrum Matters (ERM); Guide for the selection of technical parameters for the production of Harmonised Standards covering article 3.1(b) and article 3.2 of Directive 2014/53/EU".
- [i.4] Recommendation ITU-R SM.329-12 (2012): "Unwanted emissions in the spurious domain".
- [i.5] ETSI TR 100 028 (all parts) (V1.4.1): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics".
- [i.6] Commission Decision 2010/267/EU of 6 May 2010 on harmonised technical conditions of use in the 790-862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union.
- [i.7] ECC Decision (09)03 of 30 October 2009 on harmonised conditions for mobile/fixed communications networks (MFCN) operating in the band 790 - 862 MHz.
- [i.8] CEPT Report 30 of 30 October 2009 to the European Commission in response to the Mandate on "The identification of common and minimal (least restrictive) technical conditions for 790 - 862 MHz for the digital dividend in the European Union".
- [i.9] Commission Implementing Decision C(2015) 5376 final of 4.8.2015 on a standardisation request to the European Committee for Electrotechnical Standardisation and to the European Telecommunications Standards Institute as regards radio equipment in support of Directive 2014/53/EU of the European Parliament and of the Council.
- [i.10] ETSI TS 136 509 (V10.3.0) (09-2014): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Packet Core (EPC); Special conformance testing functions for User Equipment (UE) (3GPP TS 36.509 version 10.3.0 Release 10)".
- [i.11] ETSI TR 103 288 (V1.1.1) (05-2015): "Electromagnetic compatibility and Radio spectrum Matters (ERM); Report of the CENELEC/ETSI Joint Working Group in response to the EC letter ENTRP/F5/DP/MM/entr.f5.(2013)43164 to the ESOs".
- [i.12] ETSI EN 301 908-1 (V11.1.1): "IMT cellular networks; Harmonised Standard covering the essential requirements of article 3.2 of the Radio Equipment Directive 2014/53/EU; Part 1: Introduction and common requirements".
- [i.13] ETSI TS 136 101 (V12.9.0) (10-2015): "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (3GPP TS 36.101 version 12.9.0 Release 12)".

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

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

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

carrier aggregation: aggregation of two or more component carriers in order to support wider transmission bandwidths

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

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

Table 3.1-1: CA bandwidth classes and corresponding nominal guard bands

CA Bandwidth Class	Aggregated Transmission Bandwidth Configuration	Number of contiguous CC	Nominal Guard Band BW_{GB}
A	$N_{RB,agg} \leq 100$	1	$a_1 BW_{Channel(1)} - 0,5\Delta f_1$ (note 2)
B	$N_{RB,agg} \leq 100$	2	$0,05 \max(BW_{Channel(1)}, BW_{Channel(2)}) - 0,5\Delta f_1$
C	$100 < N_{RB,agg} \leq 200$	2	$0,05 \max(BW_{Channel(1)}, BW_{Channel(2)}) - 0,5\Delta f_1$

NOTE 1: $BW_{Channel(j)}$, $j = 1, 2, 3$, is the channel bandwidth of an E-UTRA component carrier according to table 5.4.2-1 and $\Delta f_1 = \Delta f$ for the downlink with Δf the subcarrier spacing while $\Delta f_1 = 0$ for the uplink.
 NOTE 2: $a_1 = 0,16/1,4$ for $BW_{Channel(1)} = 1,4$ MHz whereas $a_1 = 0,05$ for all other channel bandwidths.

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

channel bandwidth: RF bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell

NOTE 1: The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

NOTE 2: Channel Bandwidth and Transmission Bandwidth Configuration for one E UTRA carrier are described in figure 3.1-1 as in ETSI TS 136 101 [3].

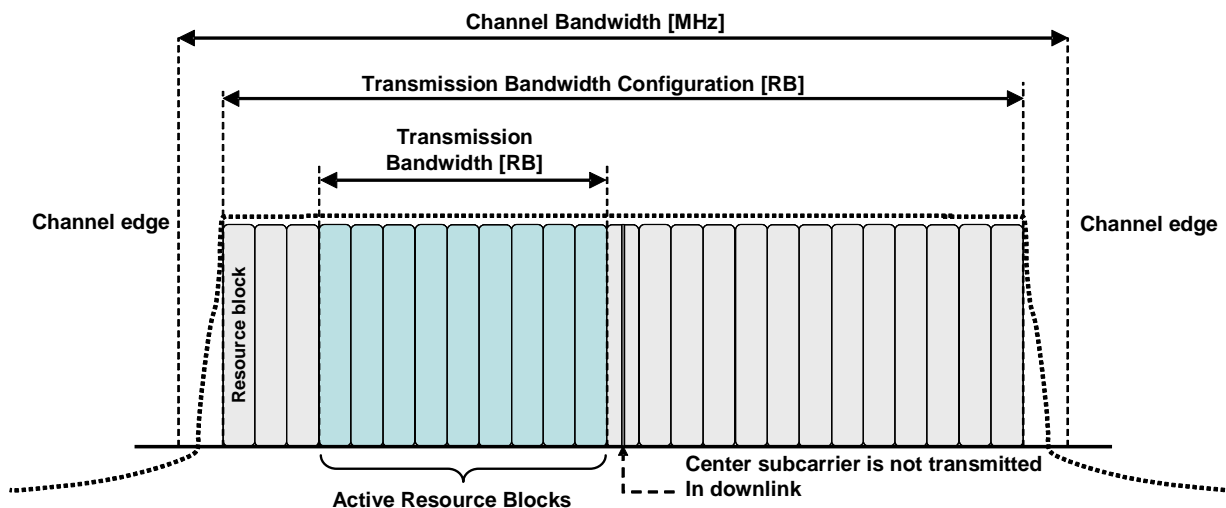


Figure 3.1-1: Channel Bandwidth and Transmission Bandwidth Configuration for one E-UTRA carrier

channel bandwidth for Carrier Aggregation: RF bandwidth aggregated from more than one E-UTRA RF carriers with the transmission bandwidth configured in the uplink or downlink of different cells

NOTE: Aggregated channel bandwidth and aggregated channel bandwidth edges for more than one E-UTRA carrier are described in figure 3.1-2 as in ETSI TS 136 101 [3].

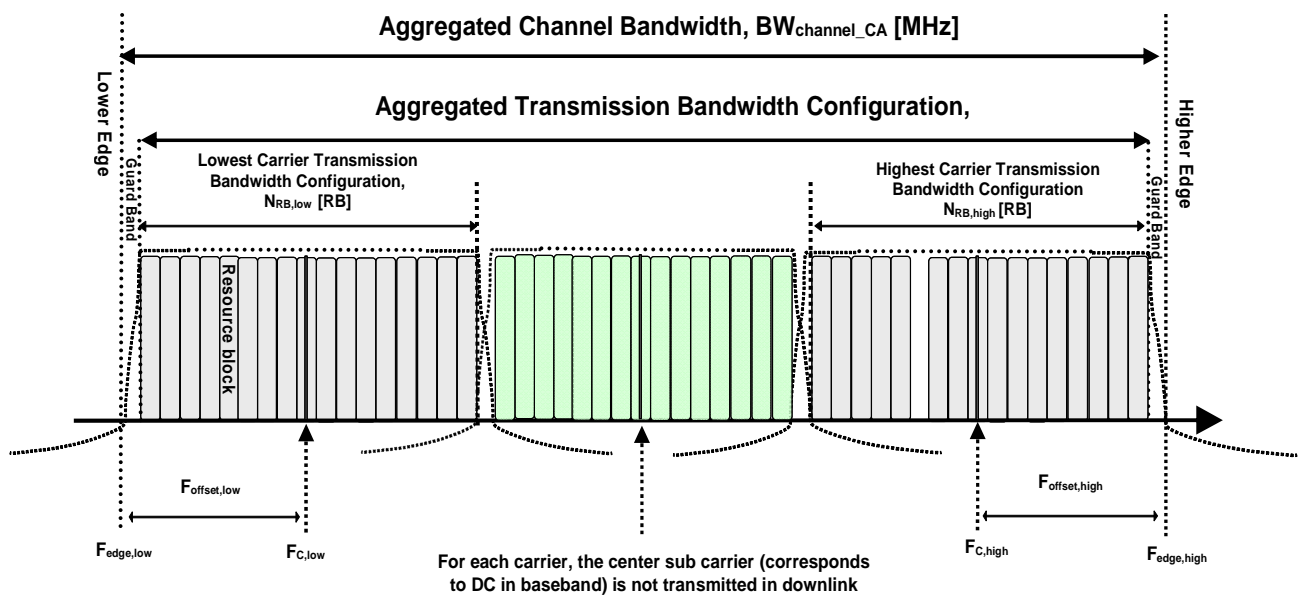


Figure 3.1-2: Aggregated channel bandwidth and aggregated channel bandwidth edges for more than one E-UTRA carrier

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

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

inter-band carrier aggregation: carrier aggregation of component carriers in different operating bands

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

intra-band contiguous carrier aggregation: contiguous carriers aggregated in the same operating band

intra-band non-contiguous carrier aggregation: non-contiguous carriers aggregated in the same operating band

Maximum Output Power (MOP): 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

NOTE: The period of measurement is assumed to be at least one subframe (1 ms) unless otherwise stated.

network signalled value: signalling value sent from the BS to the UE to indicate additional unwanted emission requirements to the UE

occupied bandwidth: 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 $\beta/2$ of the total mean power of a given emission

operating band: frequency range (paired or unpaired) that is defined with a specific set of technical requirements, in which E-UTRA operates

NOTE: Operating bands for E-UTRA are designated with Arabic numerals, while the corresponding operating bands for UTRA are designated with Roman numerals.

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

reference bandwidth: bandwidth in which an emission level is specified

resource block: physical resource consisting of a number of symbols in the time domain and a number of consecutive subcarriers spanning 180 kHz in the frequency domain

sub-block: one contiguous allocated block of spectrum for transmission and reception by the same UE, in which there may be multiple instances of sub-blocks within an RF bandwidth

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

NOTE: See figure 3.1-1.

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

NOTE: See figure 3.1-1.

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:

Δf_{OOB}	Δ Frequency of out-of-band emission
BW_{Channel}	Channel bandwidth
$BW_{\text{Channel_CA}}$	Aggregated channel bandwidth, expressed in MHz
BW_{GB}	Virtual guard band to facilitate transmitter (receiver) filtering above/below edge CCs
$BW_{\text{Interferer}}$	Channel Bandwidth of the interferer
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
BW_{UTRA}	Channel Bandwidth UTRA
F	Frequency
$F_{\text{Interferer (offset)}}$	Frequency offset of the interferer
$F_{\text{Interferer}}$	Frequency of the interferer
F_{Ioffset}	Frequency offset of the interferer
F_C	Frequency of the carrier centre frequency
$F_{\text{CA_low}}$	The centre frequency of the <i>lowest carrier</i> , expressed in MHz
$F_{\text{CA_high}}$	The centre frequency of the <i>highest carrier</i> , expressed in MHz
$F_{\text{DL_low}}$	The lowest frequency of the downlink operating band
$F_{\text{DL_high}}$	The highest frequency of the downlink operating band
$F_{\text{UL_low}}$	The lowest frequency of the uplink operating band
$F_{\text{UL_high}}$	The highest frequency of the uplink operating band
$F_{\text{edge_low}}$	The <i>lower edge</i> of aggregated channel bandwidth, expressed in MHz
$F_{\text{edge_high}}$	The <i>higher edge</i> of aggregated channel bandwidth, expressed in MHz
$F_{\text{offset_NS_23}}$	Frequency offset in MHz needed if NS_23 is used
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 normalized to the subcarrier spacing) at the UE antenna connector, including the own-cell downlink signal or 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 normalized 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 normalized 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 normalized to the subcarrier spacing) at the UE antenna connector
I_{ot}	The received power spectral density of the total noise and interference for a certain RE (average power obtained within the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector
L_{CRB}	Transmission bandwidth which represents the length of a contiguous resource block allocation expressed in units of resources blocks
N_{oc}	The power spectral density of a white noise source (average power per RE normalized to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector
N_{oc1}	The power spectral density of a white noise source (average power per RE normalized to the subcarrier spacing), simulating interference in non-CRS symbols in ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector
N_{oc2}	The power spectral density of a white noise source (average power per RE normalized to the subcarrier spacing), simulating interference in CRS symbols in ABS subframe from all cells that are not defined in a test procedure, as measured at the UE antenna connector
N_{oc3}	The power spectral density of a white noise source (average power per RE normalized to the subcarrier spacing), simulating interference in non-ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector
$N_{Offs-DL}$	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_{RB_agg}	Aggregated Transmission Bandwidth Configuration The number of the aggregated RBs within the fully allocated Aggregated Channel bandwidth
N_{UL}	Uplink EARFCN
NS_x	Network signalled value "x"
P	Number of cell-specific antenna ports
p	Antenna port number
$P_{Interferer}$	Modulated mean power of the interferer
P_{UMAX}	Maximum UE Power with possible power reduction due to modulation type, network signalling values and location near the edge of the band
R_{av}	Minimum average throughput per RB

3.3 Abbreviations

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

AC	Access Channel
ACLR	Adjacent Channel Leakage Ratio
ACS	Adjacent Channel Selectivity
BS	Base Station
BW	BandWidth
CA	Carrier Aggregation
CA_NS	Network Signalled value in Carrier Aggregation
CA_X	CA for band X where X is the applicable E-UTRA operating band
CA_X-Y	CA for band X and Band Y where X and Y are the applicable E-UTRA operating band
CC	Component Carrier
CW	Continuous Wave
DCI	Downlink Control Information

DL	DownLink
EARFCN	E-UTRA Absolute Radio Frequency Channel Number
EFTA	European Free Trade Association
ERM	Electromagnetic compatibility and Radio spectrum Matters
EUT	Equipment Under Test
E-UTRA	Evolved UMTS Terrestrial Radio Access
FDD	Frequency Division Duplex
GSM	Global System for Mobile
HARQ	Hybrid Acknowledge Request
IMT	International Mobile Telecommunications
LTE	Long Term Evolution
LTE-A	LTE Advanced
MAC	Medium Access Control
MBW	Measurement BandWidth
MOP	Maximum Output Power
MSG	Mobile Standards Group
OOB	Out Of Band
PCC	Primary Component Carrier
PDCCH	Physical Downlink Control Channel
PDSCH	Physical Downlink Shared Channel
PHICH	Physical Hybrid ARQ Indicator Channel
PUSCH	Physical Uplink Shared Channel
QPSK	Quadrature Phase Shift Keying
RB	Resource Block
RE	Resource Element
REFSENS	Reference Sensitivity power level
RF	Radio Frequency
RMC	Reference Measurement Channel
RNTI	Radio Network Temporary Identifier
RRC	Radio Resource Control
SCC	Secondary Component Carrier
SS	System Simulator
TDD	Time Division Duplex
TFES	Task Force for European Standards for IMT
TH	Temperature High
TH/VH	High extreme Temperature/High extreme Voltage
TH/VL	High extreme Temperature/Low extreme Voltage
TL	Temperature Low
TL/VH	Low extreme Temperature/High extreme Voltage
TL/VL	Low extreme Temperature/Low extreme Voltage
TPC	Transmitter Power Control
TRP	Total Radiated Power
UE	User Equipment
UL	Uplink
UL-MIMO	Uplink Multiple Antenna transmission
UMTS	Universal Mobile Telecommunications System
UTRA	UMTS Terrestrial Radio Access
UTRA	Universal Terrestrial Radio Access
VH	Higher extreme Voltage
VL	Lower extreme Voltage

4 Technical requirements specifications

4.1 Environmental profile

The technical requirements of the present document apply under the environmental profile for operation of the equipment, which shall be declared by the supplier. The equipment shall comply with all the technical requirements of the present document at all times when operating within the boundary limits of the declared operational environmental profile.

4.2 Conformance requirements

4.2.0 General

The requirements in the present document are based on the assumption that the operating band (see tables 1-1 through 1-5) is shared between systems of the IMT family (for band 3 and 8 also GSM) or systems having compatible characteristics.

4.2.1 Introduction

To meet the essential requirement under article 3.2 of Directive 2014/53/EU [i.2] for IMT User Equipment (UE), a set of essential parameters in addition to those in ETSI EN 301 908-1 [i.12] have been identified. Table 4.2.1-1 provides a cross reference between these essential parameters and the corresponding technical requirements for equipment within the scope of the present document.

Table 4.2.1-1: Cross references

Essential parameter	Corresponding technical requirements	Corresponding test suite
Transmitter spectrum mask	4.2.3 Transmitter Spectrum emissions mask	5.3.2
Transmitter unwanted emissions in the out-of-band domain	4.2.11 Transmitter adjacent channel leakage power ratio	5.3.10
Transmitter unwanted emissions in the spurious domain	4.2.4 Transmitter spurious emissions	5.3.3
Transmitter power limits	4.2.2 Transmitter maximum output power	5.3.1
Transmitter Power Control (TPC)	4.2.5 Transmitter minimum output power	5.3.4
Transmitter power accuracy	4.2.2 Transmitter maximum output power	5.3.4
Receiver unwanted emissions in the spurious domain	4.2.10 Receiver spurious emissions	5.3.9
Receiver blocking	4.2.7 Receiver Blocking characteristics	5.3.6
Receiver desensitization	4.2.8 Receiver spurious response	5.3.7
Receiver spurious response rejection	4.2.9 Receiver Intermodulation characteristics	5.3.8
Receiver radio-frequency intermodulation	4.2.6 Receiver Adjacent Channel Selectivity (ACS)	5.3.5
Receiver adjacent signal selectivity	4.2.12 Receiver Reference Sensitivity Level	5.3.11
Receiver sensitivity		
Antenna		
Equipment operating under the control of a network	ETSI EN 301 908-1 [i.12], clause 4.2.4 Control and Monitoring functions	

Unless otherwise stated, the transmitter and 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 should be assumed for each antenna port(s). A UE with integral antenna(s) may be taken into account by converting these power levels into field strength requirements, assuming a 0 dBi gain antenna.

4.2.2 Transmitter Maximum Output Power

4.2.2.1 Transmitter maximum output power for Single Carrier

4.2.2.1.1 Definition

The following UE Power Classes define the maximum output power for any transmission bandwidth within the channel bandwidth. The period of measurement shall be at least one sub-frame (1 ms).

4.2.2.1.2 Limits

The UE maximum output power shall be within the shown value in table 4.2.2.1.2-1.

Table 4.2.2.1.2-1: UE power classes

E-UTRA Band	Power Class 3 (dBm)	Tolerance (dB)
1	23	±2,7
3	23	±2,7 (see note)
7	23	±2,7 (see note)
8	23	±2,7 (see note)
20	23	±2,7 (see note)
22	23	+3,0/-4,5
28	23	+2,7/-3,2
33	23	±2,7
34	23	±2,7
38	23	±2,7
40	23	±2,7
42	23	+3,0/-4,0
43	23	+3,0/-4,0

NOTE: For transmission bandwidths (ETSI TS 136 521-1 [1], clause 5) confined within F_{UL_low} and $F_{UL_low} + 4$ MHz or $F_{UL_high} - 4$ MHz and F_{UL_high} , the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1,5 dB (tolerance = +2,7/-4,2).

NOTE 1: These requirements do not take into account the maximum power reductions allowed to the UE in subject to certain transmission conditions specified in ETSI TS 136 101 [3], clauses 6.2.3 and 6.2.4.

NOTE 2: The range of UE maximum output power for the various power classes are specified in ETSI TS 136 101 [3], clause 6.2.2. The values in table 4.2.2.1.2-1 correspond to the measurement limits taking into account the measurement uncertainty of measurement equipment (see clause 5.2).

4.2.2.1.3 Conformance

Conformance tests described in clause 5.3.1 shall be carried out.

4.2.2.2 Transmitter output power for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

4.2.2.2.1 Definition

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

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

4.2.2.2.2 Limits

For intra-band contiguous carrier aggregation the maximum output power is specified in table 4.2.2.2.2-1.

Table 4.2.2.2.2-1: UE power class for CA

E-UTRA CA band	Power Class 3 (dBm)	Tolerance (dB)
CA_1C	23	±2,7
CA_3C	23	±2,7 (see note 1)
CA_7C	23	±2,7 (see note 1)
CA_38C	23	±2,7
CA_40C	23	±2,7
CA_42C	23	+2,7/-3,7
NOTE 1: If all transmitted resource blocks (ETSI TS 136 521-1 [1], clause 5) over all component carriers are confined within F_{UL_low} and $F_{UL_low} + 4$ MHz or/and $F_{UL_high} - 4$ MHz and F_{UL_high} , the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1,5 dB.		
NOTE 2: For intra-band contiguous carrier aggregation the maximum power requirement shall apply to the total transmitted power over all component carriers (per UE).		

NOTE 1: These requirements do not take into account the maximum power reductions allowed to the UE in subject to certain transmission conditions specified in ETSI TS 136 101 [3], clauses 6.2.3A and 6.2.4A.

NOTE 2: The range of UE maximum output power for the various power classes are specified in ETSI TS 136 101 [3], clause 6.2.2A. The values in table 4.2.2.2.2-1 correspond to the measurement limits taking into account the measurement uncertainty of measurement equipment (see clause 5.2).

4.2.2.2.3 Conformance

Conformance tests described in clause 5.3.1 shall be carried out.

4.2.2.3 Transmitter output power for UL-MIMO

4.2.2.3.1 Definition

The following UE Power Classes define the maximum output power for UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme. The UL-MIMO configurations are specified in table 4.2.2.3.1-1.

Table 4.2.2.3.1-1: UL-MIMO configuration in closed-loop spatial multiplexing scheme

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

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

4.2.2.3.2 Limits

The UE maximum output power shall be within the shown value in table 4.2.2.3.2-1.

Table 4.2.2.3.2-1: UE power class for UL-MIMO in closed loop spatial multiplexing scheme

E-UTRA Band	Power Class 3 (dBm)	Tolerance (dB)
1	23	+2,7/-3,7
3	23	+2,7/-3,7 (see note)
7	23	+2,7/-3,7 (see note)
8	23	+2,7/-3,7 (see note)
20	23	+2,7/-3,7 (see note)
22	23	+2,7/-5,2 (see note)
28	23	+2,7/-3,7
33	23	+2,7/-3,7
34	23	+2,7/-3,7
38	23	+2,7/-3,7
40	23	+2,7/-3,7
42	23	+3,0/-5,0
43	23	+3,0/-5,0

NOTE: For transmission bandwidths (ETSI TS 136 521-1 [1], clause 5) confined within F_{UL_low} and $F_{UL_low} + 4$ MHz or $F_{UL_high} - 4$ MHz and F_{UL_high} , the maximum output power requirement is relaxed by reducing the lower tolerance limit by 1,5 dB (tolerance = +2,7/-4,2).

NOTE 1: These requirements do not take into account the maximum power reductions allowed to the UE in subject to certain transmission conditions specified in ETSI TS 136 101 [3], clauses 6.2.3 and 6.2.4.

NOTE 2: The range of UE maximum output power for the various power classes are specified in ETSI TS 136 101 [3], clause 6.2.2B. The values in table 4.2.2.3.2-1 correspond to the measurement limits taking into account the measurement uncertainty of measurement equipment (see clause 5.2).

4.2.2.3.3 Conformance

Conformance tests described in clause 5.3.1 shall be carried out.

4.2.3 Transmitter Spectrum Emission Mask

4.2.3.1 Transmitter spectrum emission mask for Single Carrier

4.2.3.1.1 Definition

The spectrum emission mask of the UE applies to frequencies (Δf_{OoB}) starting from the \pm edge of the assigned E-UTRA channel bandwidth.

4.2.3.1.2 Limits

The power of any UE emission shall fulfil requirements in tables from 4.2.3.1.2-1 to 4.2.3.1.2-3.

Table 4.2.3.1.2-1: General E-UTRA spectrum emission mask, E UTRA bands ≤ 3 GHz

Δf_{OOB} (MHz)	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
0 to 1	-8,5	-11,5	-13,5	-16,5	-18,5	-19,5	30 kHz
1 to 2,5	-8,5	-8,5	-8,5	-8,5	-8,5	-8,5	1 MHz
2,5 to 2,8	-23,5	-8,5	-8,5	-8,5	-8,5	-8,5	1 MHz
2,8 to 5		-8,5	-8,5	-8,5	-8,5	-8,5	1 MHz
5 to 6		-23,5	-11,5	-11,5	-11,5	-11,5	1 MHz
6 to 10			-23,5	-11,5	-11,5	-11,5	1 MHz
10 to 15				-23,5	-11,5	-11,5	1 MHz
15 to 20					-23,5	-11,5	1 MHz
20 to 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 MHz - 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 shall be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4: For the 2,5 MHz - 2,8 MHz offset range with 1,4 MHz channel bandwidth, the measurement position is at Δf_{OOB} equals to 3 MHz.

Table 4.2.3.1.2-2: General E-UTRA spectrum emission mask, 3 GHz < E-UTRA bands ≤ 4,2 GHz

Δf_{OOB} (MHz)	Spectrum emission limit (dBm)/Channel bandwidth						
	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Measurement bandwidth
0 to 1	-8,2	-11,2	-13,2	-16,2	-18,2	-19,2	30 kHz
1 to 2,5	-8,2	-8,2	-8,2	-8,2	-8,2	-8,2	1 MHz
2,5 to 2,8	-23,2						1 MHz
2,8 to 5							1 MHz
5 to 6		-23,2	-11,2	-11,2	-11,2	-11,2	1 MHz
6 to 10			-23,2				1 MHz
10 to 15				-23,2			1 MHz
15 to 20					-23,2		1 MHz
20 to 25						-23,2	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: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0,5 MHz and -0,5 MHz, respectively.

NOTE 3: The measurements shall be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4: For the 2,5-2,8 MHz offset range with 1,4 MHz channel bandwidth, the measurement position is at Δf_{OOB} equals to 3 MHz.

Table 4.2.3.1.2-3: Additional spectrum emission mask (network signalled value "NS_01")

E-UTRA band	Frequency range	Channel Bandwidth	Spectrum emission limit (dBm)	Measurement Bandwidth
20	$863 \text{ MHz} \leq f \leq 867 \text{ MHz}$	10 MHz (note 2)	-11,5	1 MHz
	$867 \text{ MHz} \leq f \leq 870 \text{ MHz}$	10 MHz (note 2)	-14,5	1 MHz

NOTE 1: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0,5 MHz and -0,5 MHz, respectively.

NOTE 2: The conformance shall be assessed at test frequency 857 MHz with 50 RB allocation.

NOTE: The values in table 4.2.3.1.2-3 are for conformance testing and can therefore be considered as worst case values. For coexistence studies different values can be used, because effects such as partial spectrum allocation or hand/head attenuation may result in lower OOB emissions during typical LTE UE usage (see [i.11]).

4.2.3.1.3 Conformance

Conformance tests described in clause 5.3.2 shall be carried out.

4.2.3.2 Transmitter spectrum emission mask for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

4.2.3.2.1 Definition

For intra-band contiguous carrier aggregation the spectrum emission mask of the UE applies to frequencies (Δf_{OOB}) starting from the \pm edge of the aggregated channel bandwidth.

4.2.3.2.2 Limits

For intra-band contiguous carrier aggregation the bandwidth class C, the power of any UE emission shall not exceed the levels specified in tables 4.2.3.2.2-1 and 4.2.3.2.2-2 for the specified channel bandwidth.

Table 4.2.3.2.2-1: General E-UTRA CA spectrum emission mask for Bandwidth Class C, E UTRA bands \leq 3 GHz

Spectrum emission limit [dBm]/BW _{Channel_CA}						
Δf_{OOB} (MHz)	25RB+100RB (24,95 MHz)	50RB+100RB (29,9 MHz)	75RB+75RB (30 MHz)	75RB+100RB (34,85 MHz)	100RB+100RB (39,8 MHz)	Measurement bandwidth
\pm 0-1	-20,5	-21	-21	-22	-22,5	30 kHz
\pm 1-5	-8,5	-8,5	-8,5	-8,5	-8,5	1 MHz
\pm 5-24,95	-11,5	-11,5	-11,5	-11,5	-11,5	1 MHz
\pm 24,95-29,9	-23,5	-23,5				1 MHz
\pm 29,9-29,95						1 MHz
\pm 29,95-30						1 MHz
\pm 30-34,85						1 MHz
\pm 34,85-34,9			-23,5			1 MHz
\pm 34,9-35				-23,5		1 MHz
\pm 35-39,8						1 MHz
\pm 39,8-39,85					-23,5	1 MHz
\pm 39,85-44,8						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: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0,5 MHz and -0,5 MHz, respectively.
NOTE 3: The measurements shall be performed above the upper edge of the aggregated channel bandwidth and below the lower edge of the aggregated channel bandwidth.

Table 4.2.3.2.2-2: General E-UTRA CA spectrum emission mask for Bandwidth Class C, 3 GHz < E UTRA bands \leq 4,2 GHz

Spectrum emission limit [dBm]/BW _{Channel_CA}						
Δf_{OOB} (MHz)	25RB+100RB (24,95 MHz)	50RB+100RB (29,9 MHz)	75RB+75RB (30 MHz)	75RB+100RB (34,85 MHz)	100RB+100RB (39,8 MHz)	Measurement bandwidth
\pm 0-1	-20,2	-20,7	-20,7	-21,7	-22,2	30 kHz
\pm 1-5	-8,2	-8,2	-8,2	-8,2	-8,2	1 MHz
\pm 5-24,95	-11,2	-11,5	-11,2	-11,2	-11,2	1 MHz
\pm 24,95-29,9	-23,2	-23,2				1 MHz
\pm 29,9-29,95						1 MHz
\pm 29,95-30						1 MHz
\pm 30-34,85						1 MHz
\pm 34,85-34,9			-23,2			1 MHz
\pm 34,9-35				-23,2		1 MHz
\pm 35-39,8						1 MHz
\pm 39,8-39,85					-23,2	1 MHz
\pm 39,85-44,8						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: At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0,5 MHz and -0,5 MHz, respectively.
NOTE 3: The measurements shall be performed above the upper edge of the aggregated channel bandwidth and below the lower edge of the aggregated channel bandwidth.

4.2.3.2.3 Conformance

Conformance tests described in clause 5.3.2 shall be carried out.

4.2.3.3 Transmitter spectrum emission mask for UL-MIMO

4.2.3.3.1 Definition

For UE supporting UL-MIMO, the requirements for out-of-band emissions resulting from the modulation process and non-linearity in the transmitters are specified at each transmit antenna connector.

The spectrum emission mask of the UE applies to frequencies (Δf_{OOB}) starting from the edge of the assigned E-UTRA channel bandwidth.

4.2.3.3.2 Limits

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in clause 4.2.3.1.2 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in tables 4.2.2.3.1-1 and 4.2.2.3.1-2.

4.2.3.3.3 Conformance

Conformance tests described in clause 5.3.2 shall be carried out.

4.2.3.4 Transmitter spectrum emission mask for Multi-Cluster PUSCH within a component carrier

4.2.3.4.1 Definition

For UE supporting multi cluster PUSCH within a component carrier for the operating band.

The spectrum emission mask of the UE applies to frequencies (Δf_{OOB}) starting from the edge of the assigned E-UTRA channel bandwidth.

4.2.3.4.2 Limits

The power of any UE emission shall fulfil requirements specified in tables 4.2.3.1.2-1 and 4.2.3.1.2-2.

4.2.3.4.3 Conformance

Conformance tests described in clause 5.3.2 shall be carried out.

4.2.4 Transmitter Spurious Emissions

4.2.4.1 Transmitter spurious emissions for Single Carrier

4.2.4.1.1 Definition

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 in line with Recommendation ITU-R SM.329-12 [i.4] and E-UTRA operating band requirement to address UE co-existence.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

4.2.4.1.2 Limits

The spurious emission limits in table 4.2.4.1.2-2 apply for the frequency ranges that are more than Δf_{OOB} (MHz) from the edge of the channel bandwidth shown in table 4.2.4.1.2-1.

The measured average power of spurious emission for general requirements shall not exceed the described values in table 4.2.4.1.2-2.

The measured average power of spurious emission for E-UTRA operating band specific requirements to protected bands shall not exceed the described values in tables 4.2.4.1.2-3 and 4.2.4.1.2-6.

Table 4.2.4.1.2-1: Δf_{OoB} boundary between E-UTRA channel and spurious emission domain

Channel bandwidth	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Δf_{OoB} (MHz)	2,8	6	10	15	20	25

NOTE 1: For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the measurement bandwidth defined for the protected band.

Table 4.2.4.1.2-2: General spurious emissions limits

Frequency range	Maximum level	Measurement bandwidth	Comment
9 kHz \leq f < 150 kHz	-36 dBm	1 kHz	
150 kHz \leq f < 30 MHz	-36 dBm	10 kHz	
30 MHz \leq f < 1 000 MHz	-36 dBm	100 kHz	
1 GHz \leq f < 12,75 GHz	-30 dBm	1 MHz	
12,75 GHz \leq f < 5 th harmonic of the upper frequency edge of the UL operating band in GHz	-30 dBm	1 MHz	See note
NOTE: Shall apply for Band 22, 42 and Band 43.			

The additional requirements in table 4.2.4.1.2-3 apply for the frequency ranges that are more and less than Δf_{OoB} (MHz) from the edge of the channel bandwidth shown in table 4.2.4.1.2-1.

Table 4.2.4.1.2-3: Spurious emission band UE co-existence limits (network signalled value "NS_01")

E-UTRA Band	Spurious emission					Comment	
	Protected band	Frequency range (MHz)		Maximum Level (dBm)	MBW (MHz)		
1	E-UTRA Band 1, 7, 8, 20, 22, 28, 32, 38, 40, 42, 43	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	E-UTRA Band 3, 34	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 3
	Frequency range	1 900	-	1 915	-15,5	5	Notes 3, 8
	Frequency range	1 915	-	1 920	+1,6	5	Notes 3, 8
3	E-UTRA Band 1, 7, 8, 20, 28, 32, 33, 34, 38, 43	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	E-UTRA Band 3	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 3
	E-UTRA Band 22, 42	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2
7	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 32, 33, 34, 40, 42, 43	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	Frequency range	2 570	-	2 575	+1,6	5	Notes 3, 4
	Frequency range	2 575	-	2 595	-15,5	5	Notes 3, 4
	Frequency range	2 595	-	2 620	-40	1	Notes 3, 4
8	E-UTRA Band 1, 20, 28, 32, 33, 34, 38, 40	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	
	E-UTRA band 3	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2
	E-UTRA band 7	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2
	E-UTRA Band 8	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 3
	E-UTRA Band 22, 42, 43	$F_{\text{DL_low}}$	-	$F_{\text{DL_high}}$	-50	1	Note 2

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)	Comment
20	E-UTRA Band 1, 3, 7, 8, 22, 32, 33, 34, 40, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 20	F_{DL_low}	-	F_{DL_high}	-50	1	Note 3
	E-UTRA Band 38, 42	F_{DL_low}	-	F_{DL_high}	-50	1	Note 2
	Frequency range	758	-	788	-50	1	
22	E-UTRA Band 1, 3, 7, 8, 20, 28, 32, 33, 34, 38, 40, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
	Frequency range	3 510	-	3 525	-40	1	Note 3
	Frequency range	3 525	-	3 590	-50	1	
28	E-UTRA Band 3, 7, 8, 20, 32, 34, 38	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 1, 22, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	Note 2
	E-UTRA Band 1	F_{DL_low}	-	F_{DL_high}	-50	1	Note 6
	Frequency range	758	-	773	-32	1	Note 3
	Frequency range	773	-	803	-50	1	
	Frequency range	470	-	694	-42	8	Notes 3, 7
33	E-UTRA Band 1, 7, 8, 20, 22, 28, 32, 34, 38, 40, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 3	F_{DL_low}	-	F_{DL_high}	-50	1	Note 3
34	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 32, 33, 38, 40, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
38	E-UTRA Band 1, 3, 8, 20, 22, 28, 32, 33, 34, 40, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
	Frequency range	2 620	-	2 645	-15,5	5	Notes 3, 5
	Frequency range	2 645	-	2 690	-40	1	Notes 3, 5
40	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 32, 33, 34, 38, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
42	E-UTRA Band 1, 3, 7, 8, 20, 28, 32, 33, 34, 38, 40	F_{DL_low}	-	F_{DL_high}	-50	1	
43	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 32, 33, 34, 38, 40	F_{DL_low}	-	F_{DL_high}	-50	1	
NOTE 1: F_{DL_low} and F_{DL_high} refer to each frequency range of the protected E-UTRA band.							
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in table 4.2.4.1.2-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2 nd , 3 rd or 4 th harmonic spurious emissions. Due to spreading of the harmonic emission the exception shall be allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of $(2 \text{ MHz} + N \times L_{CRB} \times 180 \text{ kHz})$, where N is 2, 3, 4 for the 2 nd , 3 rd or 4 th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.							
NOTE 3: These requirements shall also apply for the frequency ranges that are less than Δf_{OoB} (MHz) in table 4.2.4.1.2-1 from the edge of the channel bandwidth.							
NOTE 4: This requirement shall be applicable for any channel bandwidths within the range 2 500 - 2 570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2 560,5 - 2 562,5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2 552 - 2 560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.							
NOTE 5: This requirement shall be applicable for any channel bandwidths within the range 2 570 - 2 615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2 605,5 - 2 607,5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2 597 - 2 605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For carriers with channel bandwidth overlapping the frequency range 2 615 - 2 620 MHz the requirement shall apply with the maximum output power configured to +19 dBm.							

E-UTRA Band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Comment
NOTE 6:	As exceptions, measurements with a level up to the applicable requirement of -36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3 rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth (see figure 5.4.2-1 in ETSI TS 136 521-1 [1]) for which the 3 rd harmonic totally or partially overlaps the measurement bandwidth (MBW).				
NOTE 7:	This requirement shall be applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.				
NOTE 8:	This requirement shall be applicable for any channel bandwidths within the range 1 920 - 1 980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1 927,5 - 1 929,5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1 930 - 1 938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.				

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

Table 4.2.4.1.2-4: Additional spurious emissions limits (network signalled value "NS_01")

E-UTRA band	Protected Frequency range	Maximum Level (dBm)	MBW (MHz)
20	470 MHz ≤ f ≤ 790 MHz	-65	8 MHz
NOTE: The conformance shall be assessed using the measurement position placed at the following centre frequencies: 474 MHz, 586 MHz, 690 MHz, 754 MHz, 770 MHz and 786 MHz.			

Table 4.2.4.1.2-5: Additional spurious emissions limits (network signalled value "NS_22")

E-UTRA band	Protected Frequency range (MHz)	Channel bandwidth/ Maximum Level (dBm)	MBW (MHz)
		5, 10, 15, 20 MHz	
42, 43	3 400 ≤ f ≤ 3 800	-23 (note 1)	5 MHz
		-40 (note 2)	1 MHz
NOTE 1: This requirement shall apply within an offset between 5 MHz and 25 MHz from the lower and from the upper edge of the channel bandwidth.			
NOTE 2: This requirement shall apply from 3 400 MHz up to 25 MHz below the lower E-UTRA channel edge and from 25 MHz above the upper E-UTRA channel edge up to 3 800 MHz.			

Table 4.2.4.1.2-6: Additional spurious emissions limits (network signalled value "NS_23")

E-UTRA band	Protected Frequency range (MHz)	Channel bandwidth/ Maximum Level (dBm)	MBW (MHz)
		5, 10, 15, 20 MHz	
42, 43	3 400 ≤ f ≤ 3 800	-23 (note 1)	5 MHz
		-40 (note 2)	1 MHz
NOTE 1: This requirement shall apply within an offset between 5 MHz and 25 MHz from the lower and from the upper edge of the channel bandwidth.			
NOTE 2: This requirement shall apply from 3 400 MHz up to 25 MHz below the lower E-UTRA channel edge and from 25 MHz above the upper E-UTRA channel edge up to 3 800 MHz.			
NOTE 3: F _{offset_NS_23} is: 0 MHz for 5 MHz channel BW, 5 MHz for 10 MHz channel BW, 9 MHz for 15 MHz channel BW and 12 MHz for 20 MHz channel BW.			

4.2.4.1.3 Conformance

Conformance tests described in clause 5.3.3 shall be carried out.

4.2.4.2 Transmitter spurious emissions for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

4.2.4.2.1 Definition

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 in line with Recommendation ITU-R SM.329-12 [i.4] and E-UTRA operating band requirement to address UE co-existence.

To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result shall be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

4.2.4.2.2 Limits

For intra-band contiguous carrier aggregation the spurious emission limits apply for the frequency ranges that are more than Δf_{OOB} (MHz) in table 4.2.4.2.2-1 from the \pm edge of the aggregated channel bandwidth. For frequencies Δf_{OOB} greater than F_{OOB} as specified in table 4.2.4.2.2-1 the spurious requirements in table 4.2.4.2.2-2 are applicable.

For frequencies Δf_{OOB} greater than F_{OOB} as specified in table 4.2.4.2.2-1 the measured average power of spurious emission for general requirements, shall not exceed the described values in table 4.2.4.2.2-2.

For the specified carrier aggregation configurations for co-existence with protected bands, the measured average power of spurious emission, shall not exceed the described value in table 4.2.4.2.2-3.

Table 4.2.4.2.2-1: Boundary between E-UTRA Δf_{OOB} and spurious emission domain for intra-band contiguous CA

CA Bandwidth Class	OOB boundary F_{OOB} (MHz)
A	table 4.2.4.1.2-1
C	$BW_{\text{Channel_CA}} + 5$

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

Table 4.2.4.2.2-2: General spurious emissions limits for intra-band contiguous CA

Frequency Range	Maximum Level	Measurement Bandwidth	Comment
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	-36 dBm	1 kHz	
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	-36 dBm	10 kHz	
$30 \text{ MHz} \leq f < 1\,000 \text{ MHz}$	-36 dBm	100 kHz	
$1 \text{ GHz} \leq f < 12,75 \text{ GHz}$	-30 dBm	1 MHz	
$12,75 \text{ GHz} \leq f < 5^{\text{th}}$ harmonic of the upper frequency edge of the UL operating band in GHz	-30 dBm	1 MHz	See note

NOTE: Shall apply for Band 22, 42 and Band 43.

Table 4.2.4.2.2-3: Spurious emission band UE co-existence limits for intra-band contiguous CA (network signalled value "NS_01")

E-UTRA CA Configuration	Spurious emission						
	Protected band	Frequency range (MHz)			Maximum Level (dBm)	MBW (MHz)	Comment
CA_1C	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 32, 38, 40, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
CA_3C	E-UTRA Band 1, 7, 8, 20, 28, 32, 33, 34, 38, 40, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
	E-UTRA Band 3	F_{DL_low}	-	F_{DL_high}	-50	1	Note 3
	E-UTRA Band 22, 42	F_{DL_low}	-	F_{DL_high}	-50	1	Note 2
CA_7C	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 32, 33, 34, 40, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
CA_38C	E-UTRA Band 1, 3, 8, 20, 28, 33, 34, 40, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
CA_40C	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 32, 33, 34, 38, 42, 43	F_{DL_low}	-	F_{DL_high}	-50	1	
CA_42C	E-UTRA Band 1, 3, 7, 8, 20, 28, 32, 33, 34, 38	F_{DL_low}	-	F_{DL_high}	-50	1	
NOTE 1: F_{DL_low} and F_{DL_high} refer to each E-UTRA frequency band specified in table 5.2-1, in ETSI TS 136 521-1 [1].							
NOTE 2: As exceptions, measurements with a level up to the applicable requirements defined in table 4.2.4.1.2-2 shall be permitted for each assigned E-UTRA carrier used in the measurement due to 2 nd , 3 rd or 4 th harmonic spurious emissions. An exception is allowed if there is at least one individual RE within the transmission bandwidth (see figure 5.4.2-1 in ETSI TS 136 521-1 [1]) for which the 2 nd , 3 rd or 4 th harmonic, i.e. the frequency equal to two or three times the frequency of that RE, is within the measurement bandwidth (MBW).							
NOTE 3: The requirement shall also apply for the frequency ranges that are less than Δf_{OOB} (MHz) in tables 4.2.4.1.2-1 and 4.2.4.2.2-1 from the edge of the aggregated channel bandwidth.							

Table 4.2.4.2.2-4: Additional Spurious emission band UE co-existence limits for intra-band contiguous CA (network signalled value "CA_NS_02")

E-UTRA CA Configuration	Protected band	Frequency range (MHz)		Maximum Level (dBm)	MBW (MHz)	Comment	
CA_1C	E-UTRA band 34	F_{DL_low}	-	F_{DL_high}	-50	1	See note
	Frequency range	1 900	-	1 915	-15,5	5	See note
	Frequency range	1 915	-	1 920	+1,6	5	See note
NOTE: The requirement shall also apply for the frequency ranges that are less than Δf_{OOB} (MHz) in tables 4.2.4.1.2-1 and 4.2.4.2.2-1 from the edge of the aggregated channel bandwidth.							

Table 4.2.4.2.2-5: Additional Spurious emission band UE co-existence limits for intra-band contiguous CA (network signalled value "CA_NS_05")

E-UTRA CA Configuration	Protected band	Frequency range (MHz)		Maximum Level (dBm)	MBW (MHz)	Comment	
CA_38C	Frequency range	2 620	-	2 645	-15,5	5	Notes 1, 2
	Frequency range	2 645	-	2 690	-40	1	Notes 1, 2
NOTE 1: This requirement shall be applicable for carriers with aggregated channel bandwidths are confined in 2 570 - 2 615 MHz. For assigned carriers with bandwidths overlapping the frequency range 2 615 - 2 620 MHz the requirements apply with the maximum output power configured to +19 dBm.							
NOTE 2: The requirement shall also apply for the frequency ranges that are less than Δf_{OOB} (MHz) in tables 4.2.4.1.2-1 and 4.2.4.2.2-1 from the edge of the aggregated channel bandwidth.							

Table 4.2.4.2.2-6: Additional Spurious emission band UE co-existence limits for intra-band contiguous CA (network signalled value "CA_NS_06")

E-UTRA CA Configuration	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Comment
CA_7C	Frequency range	2 570 - 2 575	+1,6	5	See note
	Frequency range	2 575 - 2 595	-15,5	5	See note
	Frequency range	2 595 - 2 620	-40	1	See note
NOTE: The requirement shall also apply for the frequency ranges that are less than Δf_{OOB} (MHz) in tables 4.2.4.1.2-1 and 4.2.4.2.2-1 from the edge of the aggregated channel bandwidth.					

Table 4.2.4.2.2-7: Additional Spurious emission band UE co-existence limits for intra-band contiguous CA (network signalled value "CA_NS_08")

E-UTRA CA Configuration	Protected band	Frequency band (MHz)	Channel bandwidth/Spectrum emission limit (dBm)	MBW
			5, 10, 15, 20 MHz	
CA_42C	42, 43	$3\,400 \leq f \leq 3\,800$	-23 (note 1)	5 MHz
			-40 (note 2)	1 MHz
NOTE 1: This requirement shall apply within an offset between 5 MHz and 25 MHz from the lower and from the upper edge of the channel bandwidth.				
NOTE 2: This requirement shall apply from 3 400 MHz up to 25 MHz below the lower E-UTRA channel edge and from 25 MHz above the upper E-UTRA channel edge up to 3 800 MHz.				

4.2.4.2.3 Conformance

Conformance tests described in clause 5.3.3 shall be carried out.

4.2.4.3 Transmitter spurious emissions for UL-MIMO

4.2.4.3.1 Definition

For UE supporting UL-MIMO, the requirements for Spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products are specified at each transmit antenna connector.

4.2.4.3.2 Limits

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in clause 4.2.4.1.2 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in table 4.2.2.3.1-1.

For single-antenna port scheme, the general requirements in clause 4.2.4.1.2 apply.

4.2.4.3.3 Conformance

Conformance tests described in clause 5.3.3 shall be carried out.

4.2.4.4 Transmitter spurious emissions for Multi-Cluster PUSCH within a component carrier

4.2.4.4.1 Definition

For UE supporting multi cluster PUSCH within a component carrier for the operating band.

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.

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 shall be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

4.2.4.4.2 Limits

The spurious emission limits in table 4.2.4.1.2-2 apply for the frequency ranges that are more than Δf_{OOB} (MHz) from the edge of the channel bandwidth shown in table 4.2.4.1.2-1.

The measured average power of spurious emission for general requirements shall not exceed the described values in table 4.2.4.1.2-2.

4.2.4.4.3 Conformance

Conformance tests described in clause 5.3.3 shall be carried out.

4.2.5 Transmitter Minimum Output Power

4.2.5.1 Transmitter minimum output power for Single Carrier

4.2.5.1.1 Definition

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

4.2.5.1.2 Limits

The minimum output power measured shall not exceed the values specified in table 4.2.5.1.2-1.

Table 4.2.5.1.2-1: 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	For carrier frequency $f \leq 3,0$ GHz: ≤ -39 dBm For carrier frequency $3,0$ GHz $< f \leq 4,2$ GHz: $\leq -38,7$ dBm					
Measurement bandwidth	1,08 MHz	2,7 MHz	4,5 MHz	9,0 MHz	13,5 MHz	18 MHz

4.2.5.1.3 Conformance

Conformance tests described in clause 5.3.4 shall be carried out.

4.2.5.2 Transmitter minimum output power for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

4.2.5.2.1 Definition

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

4.2.5.2.2 Limits

For intra-band contiguous carrier aggregation the minimum output power is defined as the mean power in one sub-frame (1 ms). The minimum output power shall not exceed the values specified in table 4.2.5.2.2-1.

Table 4.2.5.2.2-1: Minimum output power for intra-band contiguous CA UE

	CC Channel bandwidth/Minimum output power/Measurement bandwidth					
	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Minimum output power	For carrier frequency $f \leq 3,0$ GHz: ≤ -39 dBm For carrier frequency $3,0$ GHz $< f \leq 4,2$ GHz: $\leq -38,7$ dBm					
Measurement bandwidth			4,5 MHz	9,0 MHz	13,5 MHz	18 MHz

4.2.5.2.3 Conformance

Conformance tests described in clause 5.3.4 shall be carried out.

4.2.5.3 Transmitter minimum output power for UL-MIMO

4.2.5.3.1 Definition

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

For UE with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the minimum output power is defined as the sum of the mean power at each UE antenna connector in one sub-frame (1 ms).

4.2.5.3.2 Limits

The minimum sum of mean output power of the UE at each antenna connector measured shall not exceed the values specified in table 4.2.5.3.2-1.

Table 4.2.5.3.2-1: Minimum output power for UL-MIMO

	Channel bandwidth/Minimum output power/Measurement bandwidth					
	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Minimum output power	For carrier frequency $f \leq 3,0$ GHz: ≤ -39 dBm For carrier frequency $3,0$ GHz $< f \leq 4,2$ GHz: $\leq -38,7$ dBm					
Measurement bandwidth	1,08 MHz	2,7 MHz	4,5 MHz	9,0 MHz	13,5 MHz	18 MHz

4.2.5.3.3 Conformance

Conformance tests described in clause 5.3.4 shall be carried out.

4.2.6 Receiver Adjacent Channel Selectivity (ACS)

4.2.6.1 Receiver Adjacent Channel Selectivity (ACS) for Single Carrier

4.2.6.1.1 Definition

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive an 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).

4.2.6.1.2 Limits

The throughput R_{av} shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1] under the conditions specified in table 4.2.6.1.2-2 and also under the conditions specified in table 4.2.6.1.2-3.

Table 4.2.6.1.2-1: 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 4.2.6.1.2-2: 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
Power in Transmission Bandwidth Configuration	dBm	REFSENS + 14 dB					
$P_{\text{Interferer}}$	dBm	REFSENS +45,5 dB	REFSENS +45,5 dB	REFSENS +45,5 dB	REFSENS +45,5 dB	REFSENS +42,5 dB	REFSENS +39,5 dB
$BW_{\text{Interferer}}$	MHz	1,4	3	5	5	5	5
$F_{\text{Interferer}}$ (offset)	MHz	1,4025	3,0075	5,0025	7,5075	10,0125	12,5025
NOTE 1: The transmitter shall be set to 4 dB below P_{CMAX_L} or $P_{\text{CMAX}_L\text{-CA}}$ as defined in clause 6.2.5 in ETSI TS 136 101 [3].							
NOTE 2: The interferer shall consist of the Reference measurement channel specified in clause A.3.2 of ETSI TS 136 521-1 [1] with set-up according to clause C.3.1 of ETSI TS 136 521-1 [1].							
NOTE 3: REFSENS as defined in ETSI TS 136 521-1 [1].							

Table 4.2.6.1.2-3: 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
Power in Transmission Bandwidth Configuration	dBm	-56,5	-56,5	-56,5	-56,5	-53,5	-50,5
$P_{\text{Interferer}}$	dBm	-25					
$BW_{\text{Interferer}}$	MHz	1,4	3	5	5	5	5
$F_{\text{Interferer}}$ (offset)	MHz	1,4025	3,0075	5,0025	7,5075	10,0125	12,5025
NOTE 1: The transmitter shall be set to 24 dB below P_{CMAX_L} or $P_{\text{CMAX}_L\text{-CA}}$ as defined in clause 6.2.5 in ETSI TS 136 101 [3].							
NOTE 2: The interferer shall consist of the Reference measurement channel specified in clause A.3.2 of ETSI TS 136 521-1 [1] with set-up according to clause C.3.1 of ETSI TS 136 521-1 [1].							

4.2.6.1.3 Conformance

Conformance tests described in clause 5.3.5.1 shall be carried out.

4.2.6.2 Receiver Adjacent Channel Selectivity (ACS) for Carrier Aggregation in DL-only bands

4.2.6.2.1 Definition

Adjacent Channel Selectivity (ACS) is a measure of a receiver's ability to receive an 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).

4.2.6.2.2 Limits

For inter-band carrier aggregation with uplink assigned to one E-UTRA band, the adjacent channel requirements are defined with the uplink active on the band other than the band whose downlink is being tested. The UE shall meet the requirements specified in clause 4.2.6.1.2 for each component carrier while both downlink carriers are active. For E-UTRA CA configurations including an operating band without uplink band (as noted in table 1-1), the requirements for both downlinks shall be met with the uplink active in the band capable of UL operation.

4.2.6.2.3 Conformance

Conformance tests described in clause 5.3.5.2 shall be carried out.

4.2.7 Receiver Blocking Characteristics

4.2.7.1 Receiver Blocking Characteristics for Single Carrier

4.2.7.1.1 Definition

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.

4.2.7.1.2 Limits

With parameters specified in tables 4.2.7.1.2-1 and 4.2.7.1.2-2, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1].

With parameters specified in tables 4.2.7.1.2-3 and 4.2.7.1.2-4, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1], except for the spurious response frequencies.

For table 4.2.7.1.2-4 in frequency range 1, 2 and 3, up to $\max(24, 6 \cdot \lceil N_{RB} / 6 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1 MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configuration. For these exceptions the requirements of clause 4.2.8.1 Spurious response are applicable.

With parameters specified in table 4.2.7.1.2-5, the throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1].

Table 4.2.7.1.2-1: In-band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1,4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
BW _{Interferer}	MHz	1,4	3	5	5	5	5
F _{offset, case 1}	MHz	2,1125	4,5075	7,5125	7,5025	7,5075	7,5125
F _{offset, case 2}	MHz	3,5075	7,5075	12,5075	12,5125	12,5025	12,5075
NOTE 1: The transmitter shall be set to 4 dB below P _{C_{MAX,L}} at the minimum uplink configuration specified in ETSI TS 136 101 [3] (table 7.3.1-2 with P _{C_{MAX,L}} as defined in clause 6.2.5).							
NOTE 2: The interferer shall consist of the Reference measurement channel specified in clause A.3.2 of ETSI TS 136 521-1 [1] with a set-up according to clause C.3.1 of ETSI TS 136 521-1 [1].							
NOTE 3: REFSENS as defined in ETSI TS 136 521-1 [1].							

Table 4.2.7.1.2-2: In-band blocking

E-UTRA band	Parameter	Units	Case 1	Case 2
		$P_{\text{Interferer}}$	dBm	-56
	$F_{\text{Interferer}}$ (Offset)	MHz	= $-BW/2 - F_{\text{offset, case 1}}$ and = $+BW/2 + F_{\text{offset, case 1}}$	$\leq -BW/2 - F_{\text{offset, case 2}}$ and $\geq +BW/2 + F_{\text{offset, case 2}}$
1, 3, 7, 8, 20, 22, 28, 33, 34, 38, 40, 42, 43	$F_{\text{Interferer}}$	MHz	(note 2)	$F_{\text{DL_low}} - 15$ to $F_{\text{DL_high}} + 15$

NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.

NOTE 2: For each carrier frequency the requirement is valid for two frequencies:
a) the carrier frequency $-BW/2 - F_{\text{offset, case 1}}$; and
b) the carrier frequency $+BW/2 + F_{\text{offset, case 1}}$.

NOTE 3: $F_{\text{Interferer}}$ range values for unwanted modulated interfering signal are interferer center frequencies.

Table 4.2.7.1.2-3: Out-of-band blocking parameters

Rx Parameter	Units	Channel bandwidth					
		1,4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9

NOTE 1: The transmitter shall be set to 4 dB below $P_{\text{CMAX_L}}$ at the minimum uplink configuration specified in ETSI TS 136 101 [3] (table 7.3.1-2 with $P_{\text{CMAX_L}}$ as defined in clause 6.2.5).

NOTE 2: Reference measurement channel is clause A.3.2 of ETSI TS 136 521-1 [1].

NOTE 3: REFSENS as defined in ETSI TS 136 521-1 [1].

Table 4.2.7.1.2-4: Out-of-band blocking

E-UTRA band	Parameter	Units	Frequency		
			Range 1	Range 2	Range 3
	$P_{\text{Interferer}}$	dBm	-44	-30	-15
1, 3, 7, 8, 20, 22, 28, 33, 34, 38, 40, 42 (NOTE 2), 43 (NOTE 2)	$F_{\text{Interferer}}$ (CW)	MHz	$F_{\text{DL_low}} - 15$ to $F_{\text{DL_low}} - 60$	$F_{\text{DL_low}} - 60$ to $F_{\text{DL_low}} - 85$	$F_{\text{DL_low}} - 85$ to 1 MHz
			$F_{\text{DL_high}} + 15$ to $F_{\text{DL_high}} + 60$	$F_{\text{DL_high}} + 60$ to $F_{\text{DL_high}} + 85$	$F_{\text{DL_high}} + 85$ to +12 750 MHz

NOTE 1: Range 3 shall be tested only with the highest channel bandwidth.

NOTE 2: The power level of the interferer ($P_{\text{Interferer}}$) for Range 3 shall be modified to -20 dBm for $F_{\text{Interferer}} > 2\,800$ MHz and $F_{\text{Interferer}} < 4\,400$ MHz.

Table 4.2.7.1.2-5: 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 $\Delta f = 15$ kHz)	MHz	0,9075	1,7025	2,7075	5,2125	7,7025	10,2075

NOTE 1: The transmitter shall be set a 4 dB below $P_{\text{CMAX_L}}$ at the minimum uplink configuration specified in ETSI TS 136 101 [3] (table 7.3.1-2 with $P_{\text{CMAX_L}}$ as defined in clause 6.2.5).

NOTE 2: Reference measurement channel is in clause A.3.2 of ETSI TS 136 521-1 [1].

NOTE 3: REFSENS as defined in ETSI TS 136 521-1 [1].

4.2.7.1.3 Conformance

Conformance tests described in clause 5.3.6.1 shall be carried out.

4.2.7.2 Receiver Blocking Characteristics for Carrier Aggregation in DL-only bands

4.2.7.2.1 Definition

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.

4.2.7.2.2 Limits

With parameters specified in tables 4.2.7.1.2-1 and 4.2.7.2.2-1, the throughput on SCC shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1].

With parameters specified in tables 4.2.7.1.2-3 and 4.2.7.2.2-2, the throughput on SCC shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1], except for the spurious response frequencies.

For table 4.2.7.2.2-2 in frequency range 1, 2 and 3, up to $\max(24, 6 \cdot \lceil N_{RB} / 6 \rceil)$ exceptions are allowed for spurious response frequencies in each assigned frequency channel when measured using a 1 MHz step size, where N_{RB} is the number of resource blocks in the downlink transmission bandwidth configuration. For these exceptions the requirements of clause 4.2.8.2 Spurious response are applicable.

With parameters specified in table 4.2.7.1.2-5, the throughput on SCC shall be $\geq 95\%$ of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1].

Table 4.2.7.2.2-1: In-band blocking for additional operating bands for carrier aggregation

E-UTRA band	Parameter	Unit	Case 1	Case 2
		$P_{\text{Interferer}}$	dBm	-56
	$F_{\text{Interferer}}$ (offset)	MHz	$= -BW/2 - F_{\text{offset, case 1}}$ & $= +BW/2 + F_{\text{offset, case 1}}$	$\leq -BW/2 - F_{\text{offset, case 2}}$ & $\geq +BW/2 + F_{\text{offset, case 2}}$
32	$F_{\text{Interferer}}$	MHz	(Note 2)	$F_{\text{DL_low}} - 15$ to $F_{\text{DL_high}} + 15$
NOTE 1: For certain bands, the unwanted modulated interfering signal may not fall inside the UE receive band, but within the first 15 MHz below or above the UE receive band.				
NOTE 2: For each carrier frequency the requirement is valid for two frequencies: a. the carrier frequency $-BW/2 - F_{\text{offset, case 1}}$; and b. the carrier frequency $+BW/2 + F_{\text{offset, case 1}}$.				
NOTE 3: $F_{\text{Interferer}}$ range values for unwanted modulated interfering signal are interferer center frequencies.				

Table 4.2.7.2.2-2: Out-of-band blocking for inter-band carrier aggregation with one active uplink

Parameter	Unit	Range 1	Range 2	Range 3
P_{wanted}	dBm	Table 4.2.7.1.2-3 for all component carriers		
$P_{\text{interferer}}$	dBm	$-44 + \Delta R_{\text{IB},c}$	$-30 + \Delta R_{\text{IB},c}$	$-15 + \Delta R_{\text{IB},c}$
$F_{\text{interferer}}$ (CW)	MHz	$-60 < f - F_{\text{DL_Low}(j)} < -15$ or $15 < f - F_{\text{DL_High}(j)} < 60$	$-85 < f - F_{\text{DL_Low}(j)} \leq -60$ or $60 \leq f - F_{\text{DL_High}(j)} < 85$	$1 \leq f \leq F_{\text{DL_Low}(1)} - 85$ or $F_{\text{DL_High}(j)} + 85 \leq f \leq F_{\text{DL_Low}(j+1)} - 85$ or $F_{\text{DL_High}(X)} + 85 \leq f \leq 12\,750$
<p>NOTE 1: $F_{\text{DL_Low}(j)}$ and $F_{\text{DL_High}(j)}$ denote the respective lower and upper frequency limits of the operating band containing carrier j, $j = 1, \dots, X$, with carriers numbered in increasing order of carrier frequency and X the number of component carriers in the band combination ($X = 2$ or $X = 3$ for the present document).</p> <p>NOTE 2: For $F_{\text{DL_Low}(j+1)} - F_{\text{DL_High}(j)} < 145$ MHz and $F_{\text{interferer}}$ in $F_{\text{DL_High}(j)} < f < F_{\text{DL_Low}(j+1)}$, $F_{\text{interferer}}$ can be in both Range 1 and Range 2. Then the lower of the $P_{\text{interferer}}$ applies.</p> <p>NOTE 3: For $F_{\text{DL_Low}(j)} - 15$ MHz $\leq f \leq F_{\text{DL_High}(j)} + 15$ MHz the appropriate adjacent channel selectivity and in-band blocking requirements in the respective clauses 7.5A.3.3 and 7.6.1A.3.3 shall be applied for carrier j.</p> <p>NOTE 4: $\Delta R_{\text{IB},c}$ according to table 7.3.3-1A of ETSI TS 136 521-1 [1] shall apply when serving cell c is measured.</p>				

4.2.7.2.3 Conformance

Conformance tests described in clause 5.3.6.2 shall be carried out.

4.2.8 Receiver Spurious Response

4.2.8.1 Receiver Spurious Response for Single Carrier

4.2.8.1.1 Definition

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out-of-band blocking limit as specified in table 4.2.7.1.2-4 is not met.

4.2.8.1.2 Limits

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1] with parameters specified in tables 4.2.8.1.2-1 and 4.2.8.1.2-2.

Table 4.2.8.1.2-1: Spurious response parameters

Rx Parameter	Units	Channel bandwidth					
		1,4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + channel bandwidth specific value below					
		6	6	6	6	7	9
NOTE 1: The transmitter shall be set to 4 dB below $P_{\text{C}_{\text{MAX_L}}}$ at the minimum uplink configuration specified in ETSI TS 136 101 [3] (table 7.3.1-2 with $P_{\text{C}_{\text{MAX_L}}}$ as defined in clause 6.2.5).							
NOTE 2: Reference measurement channel is clause A.3.2 of ETSI TS 136 521-1 [1].							
NOTE 3: REFSENS as defined in ETSI TS 136 521-1 [1].							

Table 4.2.8.1.2-2: Spurious Response

Parameter	Unit	Level
$P_{\text{Interferer (CW)}}$	dBm	-44
$F_{\text{Interferer}}$	MHz	Spurious response frequencies

4.2.8.1.3 Conformance

Conformance tests described in clause 5.3.7.1 shall be carried out.

4.2.8.2 Receiver Spurious Response for Carrier Aggregation in DL-only bands

4.2.8.2.1 Definition

Spurious response is a measure of the receiver's ability to receive a wanted signal on its assigned channel frequency without exceeding a given degradation due to the presence of an unwanted CW interfering signal at any other frequency at which a response is obtained i.e. for which the out-of-band blocking limit as specified in table 4.2.7.2.2-2 is not met.

4.2.8.2.2 Limits

The throughput shall be ≥ 95 % of the maximum throughput on SCC of the reference measurement channels as specified in ETSI TS 136 521-1 [1] with parameters specified in tables 4.2.8.1.2-1 and 4.2.8.1.2-2.

4.2.8.2.3 Conformance

Conformance tests described in clause 5.3.7.2 shall be carried out.

4.2.9 Receiver Intermodulation Characteristics

4.2.9.1 Receiver Intermodulation Characteristics for Single Carrier

4.2.9.1.1 Definition

Intermodulation response rejection is a measure of the capability of the receiver to receive 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.

4.2.9.1.2 Limits

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1] with parameters specified in table 4.2.9.1.2-1 for the specified wanted signal mean power in the presence of two interfering signals.

Table 4.2.9.1.2-1: Test parameters for Wide band intermodulation

Rx Parameter	Units	Channel bandwidth					
		1,4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
Power in Transmission Bandwidth Configuration	dBm	REFSENS + channel bandwidth specific value below					
		12	8	6	6	7	9
$P_{\text{Interferer 1 (CW)}}$	dBm	-46					
$P_{\text{Interferer 2 (Modulated)}}$	dBm	-46					
$BW_{\text{Interferer 2}}$		1,4	3	5			
$F_{\text{Interferer 1 (Offset)}}$	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			
$F_{\text{Interferer 2 (Offset)}}$		MHz	$2 \times F_{\text{Interferer 1}}$				
NOTE 1: The transmitter shall be set to 4 dB below $P_{\text{C}_{\text{MAX_L}}}$ at the minimum uplink configuration specified in ETSI TS 136 101 [3] (table 7.3.1-2 with $P_{\text{C}_{\text{MAX_L}}}$ as defined in clause 6.2.5).							
NOTE 2: Reference measurement channel is clause A.3.2 of ETSI TS 136 521-1 [1].							
NOTE 3: The modulated interferer shall consist of the Reference measurement channel specified in clause A.3.2 of ETSI TS 136 521-1 [1] with set-up according to clause C.3.1 of ETSI TS 136 521-1 [1]. The interfering modulated signal is 5 MHz E-UTRA signal as described in annex C of ETSI TS 136 521-1 [1] for channel bandwidth ≥ 5 MHz.							
NOTE 4: REFSENS as defined in ETSI TS 136 521-1 [1].							

4.2.9.1.3 Conformance

Conformance tests described in clause 5.3.8.1 shall be carried out.

4.2.9.2 Receiver Intermodulation Characteristics for Carrier Aggregation in DL-only bands

4.2.9.2.1 Definition

Intermodulation response rejection is a measure of the capability of the receiver to receive 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.

4.2.9.2.2 Limits

The throughput shall be ≥ 95 % of the maximum throughput on SCC of the reference measurement channels as specified in ETSI TS 136 521-1 [1] with parameters specified in table 4.2.9.1.2-1 for the specified wanted signal mean power in the presence of two interfering signals.

4.2.9.2.3 Conformance

Conformance tests described in clause 5.3.8.2 shall be carried out.

4.2.10 Receiver Spurious Emissions

4.2.10.1 Receiver Spurious Emissions for Single Carrier

4.2.10.1.1 Definition

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

4.2.10.1.2 Limits

The measured spurious emissions derived in clause 5.3.9 shall not exceed the maximum level specified in table 4.2.10.1.2-1.

Table 4.2.10.1.2-1: General receiver spurious emission requirements

Frequency Band	Measurement bandwidth	Maximum level	Note
$30 \text{ MHz} \leq f < 1 \text{ GHz}$	100 kHz	-57 dBm	
$1 \text{ GHz} \leq f \leq 12,75 \text{ GHz}$	1 MHz	-47 dBm	
$12,75 \text{ GHz} \leq f \leq 5^{\text{th}}$ harmonic of the upper frequency edge of the DL operating band in GHz	1 MHz	-47 dBm	Note 1
NOTE 1: Shall apply only for Band 22, 42 and Band 43.			
NOTE 2: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in ETSI TS 136 101 [3], clause C.3.1.			

4.2.10.1.3 Conformance

Conformance tests described in clause 5.3.9 shall be carried out.

4.2.10.2 Receiver Spurious Emissions in DL-only bands

4.2.10.2.1 Definition

The spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the UE antenna connector.

4.2.10.2.2 Limits

The measured spurious emissions in SCC derived in clause 5.3.9 shall not exceed the maximum level specified in table 4.2.10.2.2-1.

Table 4.2.10.2.2-1: General receiver spurious emission requirements

Frequency Band	Measurement bandwidth	Maximum level	Note
$30 \text{ MHz} \leq f < 1 \text{ GHz}$	100 kHz	-57 dBm	
$1 \text{ GHz} \leq f \leq 12,75 \text{ GHz}$	1 MHz	-47 dBm	
NOTE 1: Unused PDCCH resources are padded with resource element groups with power level given by PDCCH_RA/RB as defined in ETSI TS 136 101 [3], clause C.3.1.			
NOTE 2: The requirements apply when the UE is configured for carrier aggregation but is not transmitting.			

4.2.10.2.3 Conformance

Conformance tests described in clause 5.3.9 shall be carried out.

4.2.11 Transmitter Adjacent Channel Leakage Power Ratio

4.2.11.1 Transmitter adjacent channel leakage power ratio for Single Carrier

4.2.11.1.1 Definition

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency.

4.2.11.1.2 Limits

If the measured adjacent channel power is greater than -50 dBm then the measured $E\text{-UTRA}_{\text{ACLR}}$ shall be higher than the limits in table 4.2.11.1.2-1.

Table 4.2.11.1.2-1: E-UTRA UE ACLR

	Channel bandwidth/E-UTRA _{ACLR1} /measurement bandwidth					
	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
E-UTRA _{ACLR1}	29,2 dB	29,2 dB	29,2 dB	29,2 dB	29,2 dB	29,2 dB
E-UTRA channel Measurement bandwidth	1,08 MHz	2,7 MHz	4,5 MHz	9,0 MHz	13,5 MHz	18 MHz
UE channel	+1,4 MHz or -1,4 MHz	+3 MHz or -3 MHz	+5 MHz or -5 MHz	+10 MHz or -10 MHz	+15 MHz or -15 MHz	+20 MHz or -20 MHz

If the measured UTRA channel power is greater than -50 dBm then the measured UTRA_{ACLR1}, UTRA_{ACLR2} shall be higher than the limits in table 4.2.11.2-2.

Table 4.2.11.1.2-2: UTRA UE ACLR

	Channel bandwidth/UTRA _{ACLR1/2} /measurement bandwidth					
	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
UTRA _{ACLR1}	32,2 dB	32,2 dB	32,2 dB	32,2 dB	32,2 dB	32,2 dB
Adjacent channel centre frequency offset (in MHz)	0,7 + BW _{UTRA} /2 / -0,7 - BW _{UTRA} /2	1,5 + BW _{UTRA} /2 / -1,5 - BW _{UTRA} /2	2,5 + BW _{UTRA} /2 / -2,5 - BW _{UTRA} /2	5 + BW _{UTRA} /2 / -5 - BW _{UTRA} /2	7,5 + BW _{UTRA} /2 / -7,5 - BW _{UTRA} /2	10 + BW _{UTRA} /2 / -10 - BW _{UTRA} /2
UTRA _{ACLR2}	-	-	35,2 dB	35,2 dB	35,2 dB	35,2 dB
Adjacent channel centre frequency offset (in MHz)	-	-	2,5 + 3 x BW _{UTRA} /2 / -2,5 - 3 x BW _{UTRA} /2	5 + 3 x BW _{UTRA} /2 / -5 - 3 x BW _{UTRA} /2	7,5 + 3 x BW _{UTRA} /2 / -7,5 - 3 x BW _{UTRA} /2	10 + 3 x BW _{UTRA} /2 / -10 - 3 x BW _{UTRA} /2
E-UTRA channel Measurement bandwidth	1,08 MHz	2,7 MHz	4,5 MHz	9,0 MHz	13,5 MHz	18 MHz
UTRA 5 MHz channel Measurement bandwidth (see note 1)	3,84 MHz	3,84 MHz	3,84 MHz	3,84 MHz	3,84 MHz	3,84 MHz
UTRA 1,6 MHz channel measurement bandwidth (see note 2)	1,28 MHz	1,28 MHz	1,28 MHz	1,28 MHz	1,28 MHz	1,28 MHz

NOTE 1: Shall apply for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.
NOTE 2: Shall apply for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.
NOTE 3: BW_{UTRA} for UTRA FDD shall be 5 MHz and for UTRA TDD shall be 1,6 MHz.

4.2.11.1.3 Conformance

Conformance tests described in clause 5.3.10 shall be carried out.

4.2.11.2 Transmitter adjacent channel leakage power ratio for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

4.2.11.2.1 Definition

For intra-band contiguous carrier aggregation the UTRA Adjacent Channel Leakage power Ratio (UTRA_{ACLR}) is the ratio of the filtered mean power centred on the assigned carrier aggregated channel bandwidth to the filtered mean power centred on an adjacent(s) UTRA channel frequency.

UTRA Adjacent Channel Leakage power Ratio is specified for both the first UTRA adjacent channel ($UTRA_{ACLR1}$) and the 2nd UTRA adjacent channel ($UTRA_{ACLR2}$). The UTRA channel power is measured with a RRC bandwidth filter with roll-off factor $\alpha = 0,22$. The assigned aggregated channel bandwidth power is measured with a rectangular filter with measurement bandwidth specified in table 4.2.11.2.2-1.

For intra-band contiguous carrier aggregation the carrier aggregation E-UTRA Adjacent Channel Leakage power Ratio ($CA\ E\text{-}UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent aggregated channel bandwidth at nominal channel spacing. The assigned aggregated channel bandwidth power and adjacent aggregated channel bandwidth power are measured with rectangular filters with measurement bandwidth specified in table 4.2.11.2.2-2.

4.2.11.2.2 Limits

If the measured adjacent UTRA channel power is greater than -50 dBm then the measured $UTRA_{ACLR1}$ and $UTRA_{ACLR2}$, shall be higher than the limits in table 4.2.11.2.2-1.

Table 4.2.11.2.2-1: UTRA UE ACLR for CA

	CA bandwidth class/ $UTRA_{ACLR1/2}$ /measurement bandwidth
CA bandwidth class C	
$UTRA_{ACLR1}$	32,2 dB
Adjacent channel centre frequency offset (in MHz)	$\frac{+ BW_{Channel_CA} / 2 + BW_{UTRA} / 2}{- BW_{Channel_CA} / 2 - BW_{UTRA} / 2}$
$UTRA_{ACLR2}$	35,2 dB
Adjacent channel centre frequency offset (in MHz)	$\frac{+ BW_{Channel_CA} / 2 + 3 \times BW_{UTRA} / 2}{- BW_{Channel_CA} / 2 - 3 \times BW_{UTRA} / 2}$
CA E-UTRA channel Measurement bandwidth	$BW_{Channel_CA} - 2 \times BW_{GB}$
UTRA 5 MHz channel Measurement bandwidth (note 1)	3,84 MHz
UTRA 1,6 MHz channel measurement bandwidth (note 2)	1,28 MHz
NOTE 1: Shall apply for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.	
NOTE 2: Shall apply for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.	

If the measured adjacent E-UTRA channel power is greater than -50 dBm then the measured $CA\ E\text{-}UTRA_{ACLR}$, shall be higher than the limits in table 4.2.11.2.2-2.

Table 4.2.11.2.2-2: CA E-UTRA ACLR

	CA bandwidth class/ $CA\ E\text{-}UTRA_{ACLR}$ /Measurement bandwidth
CA bandwidth class C	
$CA\ E\text{-}UTRA_{ACLR}$	29,2 dB
CA E-UTRA channel Measurement bandwidth	$BW_{Channel_CA} - 2 \times BW_{GB}$
Adjacent channel centre frequency offset (in MHz)	$\frac{+ BW_{Channel_CA}}{- BW_{Channel_CA}}$

4.2.11.2.3 Conformance

Conformance tests described in clause 5.3.10 shall be carried out.

4.2.11.3 Transmitter adjacent channel leakage power ratio for UL-MIMO

4.2.11.3.1 Definition

E-UTRA ACLR (E-UTRAACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidth specified in table 4.2.11.3.2-1.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in table 4.2.11.3.2-1 apply to each transmit antenna connector with the UL-MIMO configurations specified in table 4.2.2.3.1-1.

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 4.2.11.3.2-2.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in table 4.2.11.3.2-2 apply to each transmit antenna connector with the UL-MIMO configurations specified in table 4.2.2.3.1-1.

4.2.11.3.2 Limits

If the measured E-UTRA adjacent channel power is greater than -50 dBm then the $E-UTRA_{ACLR}$ shall be higher than the valued specified in table 4.2.11.3.2-1.

Table 4.2.11.3.2-1: 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
$E-UTRA_{ACLR1}$	29,2 dB	29,2 dB	29,2 dB	29,2 dB	29,2 dB	29,2 dB
E-UTRA channel Measurement bandwidth	1,08 MHz	2,7 MHz	4,5 MHz	9,0 MHz	13,5 MHz	18 MHz
UE channel	+1,4 MHz or -1,4 MHz	+3 MHz or -3 MHz	+5 MHz or -5 MHz	+10 MHz or -10 MHz	+15 MHz or -15 MHz	+20 MHz or -20 MHz

If the measured UTRA channel power is greater than -50 dBm then the $UTRA_{ACLR1}$ and $UTRA_{ACLR2}$ shall be higher than the valued specified in table 4.2.11.3.2-2.

Table 4.2.11.3.2-2: General requirements for $UTRA_{ACLR1/2}$

	Channel bandwidth/E- $UTRA_{ACLR1/2}$ /measurement bandwidth					
	1,4 MHz	3,0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
E-$UTRA_{ACLR1}$	32,2 dB	32,2 dB	32,2 dB	32,2 dB	32,2 dB	32,2 dB
Adjacent channel centre frequency offset (in MHz)	0,7 + $BW_{UTRA}/2$ / -0,7 - $BW_{UTRA}/2$	1,5 + $BW_{UTRA}/2$ / -1,5 - $BW_{UTRA}/2$	2,5 + $BW_{UTRA}/2$ / -2,5 - $BW_{UTRA}/2$	5 + $BW_{UTRA}/2$ / -5 - $BW_{UTRA}/2$	7,5 + $BW_{UTRA}/2$ / -7,5 - $BW_{UTRA}/2$	10 + $BW_{UTRA}/2$ / -10 - $BW_{UTRA}/2$
$UTRA_{ACLR2}$	-	-	35,2 dB	35,2 dB	35,2 dB	35,2 dB
Adjacent channel centre frequency offset (in MHz)	-	-	2,5 + 3 x $BW_{UTRA}/2$ / -2,5 - 3 x $BW_{UTRA}/2$	5 + 3 *x $BW_{UTRA}/2$ / -5 - 3 x $BW_{UTRA}/2$	7,5 + 3 x $BW_{UTRA}/2$ / -7,5 - 3 x $BW_{UTRA}/2$	10 + 3 x $BW_{UTRA}/2$ / -10 - 3 x $BW_{UTRA}/2$
E-$UTRA$ channel Measurement bandwidth	1,08 MHz	2,7 MHz	4,5 MHz	9,0 MHz	13,5 MHz	18 MHz
$UTRA$ 5 MHz channel Measurement bandwidth (note 1)	3,84 MHz	3,84 MHz	3,84 MHz	3,84 MHz	3,84 MHz	3,84 MHz
$UTRA$ 1,6 MHz channel measurement bandwidth (note 2)	1,28 MHz	1,28 MHz	1,28 MHz	1,28 MHz	1,28 MHz	1,28 MHz
NOTE 1: Shall apply for E- $UTRA$ FDD co-existence with $UTRA$ FDD in paired spectrum.						
NOTE 2: Shall apply for E- $UTRA$ TDD co-existence with $UTRA$ TDD in unpaired spectrum.						

4.2.11.3.3 Conformance

Conformance tests described in clause 5.3.10 shall be carried out.

4.2.11.4 Transmitter adjacent channel leakage power ratio for Multi-Cluster PUSCH within a component carrier

4.2.11.4.1 Definition

For UE supporting multi cluster PUSCH within a component carrier for the operating band.

Adjacent Channel Leakage power Ratio (ACLR) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency.

4.2.11.4.2 Limits

If the measured adjacent channel power is greater than -50 dBm then the measured $E-UTRA_{ACLR}$ shall be higher than the limits in table 4.2.11.1.2-1.

If the measured $UTRA$ channel power is greater than -50 dBm then the measured $UTRA_{ACLR1}$, $UTRA_{ACLR2}$ shall be higher than the limits in table 4.2.11.2-2.

4.2.11.4.3 Conformance

Conformance tests described in clause 5.3.10 shall be carried out.

4.2.12 Receiver Reference Sensitivity Level

4.2.12.0 General

Unless otherwise stated, the receiver characteristics are specified at the antenna connector(s) of the UE. For UE(s) with an integral antenna only, a reference antenna(s) with a gain of 0 dBi should be assumed for each antenna port(s).

4.2.12.1 Receiver Reference Sensitivity Level for Single Carrier

4.2.12.1.1 Definition

Reference sensitivity measures 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.

4.2.12.1.2 Limits

The throughput shall be ≥ 95 % of the maximum throughput of the reference measurement channels as specified in ETSI TS 136 521-1 [1], annexes A.2.2, A.2.3 and A.3.2 (with one sided dynamic OCNG Pattern OP.1 FDD/TDD for the DL-signal as described in ETSI TS 136 521-1 [1], annex A.5.1.1/A.5.2.1) with parameters specified in table 4.2.12.1.2-1 and table 7.3.3-2.

Table 4.2.12.1.2-1: Reference sensitivity QPSK P_{REFSENS}

E-UTRA Band	Channel bandwidth						Duplex Mode
	1,4 MHz (dBm)	3 MHz (dBm)	5 MHz (dBm)	10 MHz (dBm)	15 MHz (dBm)	20 MHz (dBm)	
1	-	-	-99,3	-96,3	-94,5	-93,3	FDD
3	-101,0	-98,0	-96,3	-93,3	-91,5	-90,3	FDD
7	-	-	-97,3	-94,3	-92,5	-91,3	FDD
8	-101,5	-98,5	-96,3	-93,3	-	-	FDD
20	-	-	-96,3	-93,3	-90,5	-89,3	FDD
22	-	-	-96,0	-93,0	-91,2	-90,0	FDD
28	-	-99,5	-97,8	-94,8	-93,0	-90,3	FDD
33	-	-	-99,3	-96,3	-94,5	-93,3	TDD
34	-	-	-99,3	-96,3	-94,5	-	TDD
38	-	-	-99,3	-96,3	-94,5	-93,3	TDD
40	-	-	-99,3	-96,3	-94,5	-93,3	TDD
42	-	-	-98,0	-95,0	-93,2	-92,0	TDD
43	-	-	-98,0	-95,0	-93,2	-92,0	TDD

NOTE 1: The transmitter shall be set to maximum output power level (ETSI TS 136 521-1 [1], table 7.3.5-2).

NOTE 2: The reference measurement channel is specified in ETSI TS 136 521-1 [1], clause A.3.2 with one sided dynamic OCNG Pattern OP.1 FDD/TDD as described in ETSI TS 136 521-1 [1], clauses A.5.1.1/A.5.2.1.

NOTE 3: The signal power is specified per port.

The reference receive sensitivity (REFSENS) requirement specified in table 4.2.12.1.2-1 shall be met for an uplink transmission bandwidth less than or equal to that specified in ETSI TS 136 521-1 [1], table 7.3.5-2.

4.2.12.1.3 Conformance

Conformance tests described in clause 5.3.11 shall be carried out.

5 Testing for compliance with technical requirements

5.1 Environmental conditions for testing

Tests defined in the present document shall be carried out at representative points within the boundary limits of the declared operational environmental profile.

Where technical performance varies subject to environmental conditions, tests shall be carried out under a sufficient variety of environmental conditions (within the boundary limits of the declared operational environmental profile) to give confidence of compliance for the affected technical requirements.

Normally it should be sufficient for all tests to be conducted using normal test conditions except where otherwise stated. For guidance on the use of other conditions to be used in order to show compliance reference can be made to ETSI TS 136 521-1 [1].

For each operating frequency band of the UE, the tests in the present document are performed with appropriate frequencies defined in ETSI TS 136 508 [2].

5.2 Interpretation of the measurement results

The interpretation of the results recorded in a test report for the measurements described in the present document shall be as follows:

- the measured value related to the corresponding limit will be used to decide whether an equipment meets the requirements of the present document;
- the value of the measurement uncertainty for the measurement of each parameter shall be included in the test report;
- the recorded value of the measurement uncertainty shall be, for each measurement, equal to or lower than the figures in table 5.2-1.

For the test methods, according to the present document, the measurement uncertainty figures shall be calculated and shall correspond to an expansion factor (coverage factor) $k = 1,96$ (which provide confidence level of respectively 95 % in the case where the distributions characterising the actual measurement uncertainties are normal (Gaussian)).

Principles for the calculation of measurement uncertainty are contained in ETSI TR 100 028 [i.5], in particular in annex C of the ETSI TR 100 028-2 [i.5]. For guidance on other measurement conditions reference can be made to annex (s) of ETSI TS 136 521-1 [1].

Table 5.2-1 is based on this expansion factor.

Table 5.2-1: Maximum measurement uncertainty of the test system

Parameter	Conditions	Test system uncertainty
Transmitter maximum output power		±0,7 dB
Transmitter spectrum emissions mask		±1,5 dB
Transmitter spurious emissions	9 kHz < f ≤ 4 GHz: ±2,0 dB 4 GHz < f ≤ 12,75 GHz: ±4,0 dB	±2,0 dB ±4,0 dB
Transmitter Minimum output power		±1,0 dB
Receiver Adjacent Channel Selectivity (ACS)		±1,1 dB
Receiver Blocking characteristics	1 MHz < f _{interferer} ≤ 3 GHz 3 GHz < f _{interferer} ≤ 12,75 GHz	±1,3 dB ±3,2 dB
Receiver spurious response	1 MHz < f _{interferer} ≤ 3 GHz 3 GHz < f _{interferer} ≤ 12,75 GHz	±1,3 dB ±3,2 dB
Receiver intermodulation characteristics		±1,4 dB
Receiver spurious emissions	30 MHz ≤ f ≤ 4,0 GHz: ±2,0 dB 4 GHz < f ≤ 12,75 GHz: ±4,0 dB	±2,0 dB ±4,0 dB
Transmitter adjacent channel leakage power ratio	-	±0,8 dB
NOTE 1: For RF tests it should be noted that the uncertainties in table 5.2-1 apply to the test system operating into a nominal 50 Ω load and do not include system effects due to mismatch between the EUT and the test system.		
NOTE 2: If the test system for a test is known to have a measurement uncertainty greater than that specified in table 5.2-1, this equipment can still be used provided that an adjustment is made as follows: any additional uncertainty in the test system over and above that specified in table 5.2-1 should be used to tighten the test requirements - making the test harder to pass (for some tests, e.g. receiver tests, this may require modification of stimulus signals). This procedure will ensure that a test system not compliant with table 5.2-1 does not increase the probability of passing an EUT that would otherwise have failed a test if a test system compliant with table 5.2-1 had been used.		

5.3 Essential radio test suites

5.3.0 General

This clause describes the test suites that shall be used for E-UTRA FDD and TDD.

5.3.1 Transmitter Maximum Output Power

5.3.1.1 Transmitter maximum output power for Single Carrier

5.3.1.1.1 Method of test

5.3.1.1.1.1 Initial conditions

Test environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, mid range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.1.1.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.2.2.1.4.1-1 of ETSI TS 136 521-1 [1]. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 2) Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200 ms for the UE to reach P_{UMAX} level.
- 3) Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 4) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.2.2.

5.3.1.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.2.1.2 in order to show compliance.

5.3.1.2 Transmitter maximum output power for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

5.3.1.2.1 Method of test

5.3.1.2.1.1 Initial conditions

Test environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Test CC Combination setting (N_{RB_agg}): lowest N_{RB_agg} , highest N_{RB_agg} , as specified in ETSI TS 136 521-1 [1], in clause 5.4.2A.1 for the CA Configuration.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals for PCC are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.2.2A.1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.1.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 for all downlink physical channels, except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.2.2A.1.4.1-1 of ETSI TS 136 521-1 [1] on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 5) Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200 ms for the UE to reach P_{UMAX} level.
- 6) Measure the mean transmitted power over all component carriers in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 7) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.2.2A.1.

5.3.1.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.2.2.2 in order to show compliance.

5.3.1.3 Transmitter maximum output power for UL-MIMO

5.3.1.3.1 Method of test

5.3.1.3.1.1 Initial conditions

Test environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, mid range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.2.2B.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.1.3.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.2.2B.4.1-1 of ETSI TS 136 521-1 [1]. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 2) Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200 ms for the UE to reach P_{UMAX} level.
- 3) Measure the mean power of the UE in the channel bandwidth of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 4) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.2.2B.

5.3.1.3.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.2.3.2 in order to show compliance.

5.3.2 Transmitter Spectrum Emission Mask

5.3.2.1 Transmitter spectrum emission mask for Single Carrier

5.3.2.1.1 Method of test

5.3.2.1.1.1 Initial conditions

Test environment: normal, as specified in annex B.

Frequencies to be tested: low range, mid range and high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz, 10 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.2.1.1.2 Procedure

- 1) SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.2.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 2) Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at P_{UMAX} level.
- 3) Measure the power of the transmitted signal with a measurement filter of bandwidths according to tables 4.2.3.1.2-1 or 4.2.3.1.2-2 or 4.2.3.1.2-3, as applicable. The center frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.
- 4) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.2.1.

5.3.2.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.3.1.2 in order to show compliance.

5.3.2.2 Transmitter spectrum emission mask for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

5.3.2.2.1 Method of test

5.3.2.2.1.1 Initial conditions

Test environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Test CC Combination setting (N_{RB_agg}): lowest N_{RB_agg} , highest N_{RB_agg} , as specified in ETSI TS 136 521-1 [1], in clause 5.4.2A.1 for the CA Configuration.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals for PCC are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.6.2.1A.1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.

- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.2.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 for all downlink physical channels, except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.6.2.1A.1.4.1-1 of ETSI TS 136 521-1 [1] on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 5) Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200 ms for the UE to reach P_{UMAX} level.
- 6) Measure the power of the transmitted signal with a measurement filter of bandwidths according to tables 4.2.3.2.2-1 or 4.2.3.2.2-2, as applicable. The centre frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.
- 7) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.2.1A.1.

5.3.2.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.3.2.2 in order to show compliance.

5.3.2.3 Transmitter spectrum emission mask for UL-MIMO

5.3.2.3.1 Method of test

5.3.2.3.1.1 Initial conditions

Test environment: normal, as specified in annex B.

Frequencies to be tested: low range, mid range and high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz, 10 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.6.2.1B.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.2.3.1.2 Procedure

- 1) SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.2.1B.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 2) Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at P_{UMAX} level.
- 3) Measure the power of the transmitted signal with a measurement filter of bandwidths according to tables 4.2.3.1.2-1 or 4.2.3.1.2-2, as applicable. The center frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.
- 4) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.2.1B.

5.3.2.3.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.3.3.2 in order to show compliance.

5.3.2.4 Transmitter spectrum emission mask for Multi-Cluster PUSCH within a component carrier

5.3.2.4.1 Method of test

5.3.2.4.1.1 Initial conditions

Test environment: normal, as specified in annex B.

Frequencies to be tested: low range, mid range and high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz, 10 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.2.4.1.2 Procedure

- 1) SS sends uplink scheduling information via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.2.1_1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 2) Send continuously uplink power control "up" commands in the uplink scheduling information to the UE until the UE transmits at P_{UMAX} level.

- 3) Measure the power of the transmitted signal with a measurement filter of bandwidths according to tables 4.2.3.1.2-1 or 4.2.3.1.2-2, as applicable. The center frequency of the filter shall be stepped in continuous steps according to the same table. The measured power shall be recorded for each step. The measurement period shall capture the active TSs.
- 4) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.2.1.1.

5.3.2.4.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.3.4.2 in order to show compliance.

5.3.3 Transmitter Spurious Emissions

5.3.3.1 Transmitter spurious emissions for Single Carrier

5.3.3.1.1 Method of test

5.3.3.1.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: low range, mid range, high range; see ETSI TS 136 508 [2].

Channel bandwidth to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2].

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.3.1.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.3.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 2) Send continuously Up power control commands in the uplink scheduling information to the UE until the UE transmits at P_{UMAX} level.
- 3) For each applicable requirement in tables from 4.2.4.1.2-2 to 4.2.4.1.2-6; measure the power of the transmitted signal with a measurement filter of bandwidths. The center frequency of the filter shall be stepped in contiguous steps according to the tables. The measured power shall be verified for each step. The measurement period shall capture the active time slots.
- 4) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clauses 6.6.3.1, 6.6.3.2 and 6.6.3.3.

5.3.3.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.4.1.2 in order to show compliance.

5.3.3.2 Transmitter spurious emissions for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

5.3.3.2.1 Method of test

5.3.3.2.1.1 Initial conditions

Test environment: normal; as specified in annex B.

Frequencies to be tested: low range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Test CC Combination setting (N_{RB_agg}): lowest N_{RB_agg} , highest N_{RB_agg} , as specified in ETSI TS 136 521-1 [1], clause 5.4.2A.1 for the CA Configuration.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals for PCC are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.6.3.1A.1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.3.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 for all downlink physical channels, except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.6.3.1A.1.4.1-1 of ETSI TS 136 521-1 [1] on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 5) Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200 ms for the UE to reach P_{UMAX} level.
- 6) For each applicable requirement in tables from 4.2.4.2.2-2 to 4.2.4.2.2-7; measure the power of the transmitted signal with a measurement filter of bandwidths for each component carrier. The centre frequency of the filter shall be stepped in contiguous steps according to the tables. The measured power shall be verified for each step. The measurement period shall capture the active time slots.
- 7) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clauses 6.6.3.2A.1 and 6.6.3.2A.2.

5.3.3.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.4.2.2 in order to show compliance.

5.3.3.3 Transmitter spurious emissions for UL-MIMO

5.3.3.3.1 Method of test

5.3.3.3.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: low range, mid range, high range; see ETSI TS 136 508 [2].

Channel bandwidth to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2].

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.6.3B.1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.3.3.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.3B.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 2) Send continuously Up power control commands in the uplink scheduling information to the UE until the UE transmits at P_{UMAX} level.
- 3) For each applicable requirement in tables 4.2.4.1.2-2 and 4.2.4.1.2-3; Measure the power of the transmitted signal with a measurement filter of bandwidths. The center frequency of the filter shall be stepped in contiguous steps according to the tables. The measured power shall be verified for each step. The measurement period shall capture the active time slots.
- 4) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clauses 6.6.3B.1 and 6.6.3B.2.

5.3.3.3.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.4.3.2 in order to show compliance.

5.3.3.4 Transmitter spurious emissions for Multi-Cluster PUSCH within a component carrier

5.3.3.4.1 Method of test

5.3.3.4.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: low range, mid range, high range; see ETSI TS 136 508 [2].

Channel bandwidth to be tested: Highest channel bandwidth as defined in ETSI TS 136 508 [2].

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.3.4.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.3.1_1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 2) Send continuously Up power control commands in the uplink scheduling information to the UE until the UE transmits at P_{UMAX} level.
- 3) For the requirements in table 4.2.4.1.2-2; Measure the power of the transmitted signal with a measurement filter of bandwidths. The center frequency of the filter shall be stepped in contiguous steps according to the tables. The measured power shall be verified for each step. The measurement period shall capture the active time slots.
- 4) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.3.1.1.

5.3.3.4.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.4.4.2 in order to show compliance.

5.3.4 Transmitter Minimum Output Power

5.3.4.1 Transmitter minimum output power for Single Carrier

5.3.4.1.1 Method of test

5.3.4.1.1.1 Initial conditions

Test Environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, mid range and high range; see ETSI TS 136 508 [2].

Channel bandwidths to be tested: lowest, 5 MHz and highest channel bandwidth, as specified in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.

- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.4.1.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.3.2.1.4.1-1. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 2) Send continuous uplink power control "down" commands in the uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.
- 3) Measure the mean power of the UE in the associated measurement bandwidth specified in table 4.5.2.1-1 for the specific channel bandwidth under test. The period of measurement shall be the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 4) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.3.2.

5.3.4.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.5.1.2 in order to show compliance.

5.3.4.2 Transmitter minimum output power for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

5.3.4.2.1 Method of test

5.3.4.2.1.1 Initial conditions

Test environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Test CC Combination setting (N_{RB_agg}): lowest N_{RB_agg} , highest N_{RB_agg} , as specified in ETSI TS 136 521-1 [1], clause 5.4.2A.1 for the CA Configuration.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals for PCC are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.3.2A.1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.4.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 for all downlink physical channels, except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.

- 4) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.3.2A.1.4.1-1 of ETSI TS 136 521-1 [1] on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 5) Send continuously uplink power control "down" commands in every uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.
- 6) Measure the mean transmitted power of each component carrier in the CA configuration of the radio access mode. The period of measurement shall be at least the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 7) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.3.2A.1.

5.3.4.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.5.2.2 in order to show compliance.

5.3.4.3 Transmitter minimum output power for UL-MIMO

5.3.4.3.1 Method of test

5.3.4.3.1.1 Initial conditions

Test environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, mid range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.3.2B.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.4.3.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.3.2B.1.4.1-1 of ETSI TS 136 521-1 [1]. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 2) Send continuously uplink power control "down" commands in the uplink scheduling information to the UE to ensure that the UE transmits at its minimum output power.
- 3) Measure the sum of mean power of the UE at each UE antenna connector in the associated measurement bandwidth specified in table 4.2.5.3.2-1 for the specific channel bandwidth under test. The period of measurement shall be the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.

- 4) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.3.2B.

5.3.4.3.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.5.3.2 in order to show compliance.

5.3.5 Receiver Adjacent Channel Selectivity (ACS)

5.3.5.1 Receiver Adjacent Channel Selectivity (ACS) for Single Carrier

5.3.5.1.1 Method of test

5.3.5.1.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: mid range see ETSI TS 136 508 [2].

Channel bandwidth to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS and interfering source to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL and DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], table 7.5.4.1-1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.5.1.1.2 Procedure

- 1) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.5.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
- 2) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.5.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 3) Set the Downlink signal level to the value as defined in table 4.2.6.1.2-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.6.1.2-2 (Case 1) for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0$ GHz $< f \leq 4,2$ GHz, for at least the duration of the Throughput measurement (obtain correct UE output power as specified in ETSI TS 136 521-1 [1]).
- 4) Set the Interferer signal level to the value as defined in table 4.2.6.1.2-2 (Case 1) and frequency below the wanted signal, using a modulated interferer as defined in ETSI TS 136 521-1 [1], annex C.
- 5) Measure the average throughput for a duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].

- 6) Set the Downlink signal level to the value as defined in table 4.2.6.1.2-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.6.1.2-3 (Case 2) for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2$ GHz, for at least the duration of the throughput measurement (obtain correct UE output power as specified in ETSI TS 136 521-1 [1]).
- 7) Set the Interferer signal level to the value as defined in table 4.2.6.1.2-3 (Case 2) and frequency below the wanted signal, using a modulated interferer as defined in ETSI TS 136 521-1 [1], annex C.
- 8) Measure the average throughput for a duration sufficient to achieve statistical significance according to ETSI TS 136 521-1 [1], annex G.
- 9) Repeat for applicable channel bandwidths in both Case 1 and Case 2.
- 10) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.5.

5.3.5.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.6.1.2 in order to show compliance.

5.3.5.2 Receiver Adjacent Channel Selectivity (ACS) for Carrier Aggregation in DL-only bands

5.3.5.2.1 Method of test

5.3.5.2.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: mid range see ETSI TS 136 508 [2].

Channel bandwidth to be tested: Highest N_{RB_agg} for PCC and SCC.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS and interfering source to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL and DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], table 7.5.4.1-1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.5.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and clause C.3.1 for all downlink physical channels except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.5A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.

- 5) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.5A.3.4.1-1 on PCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 6) Set the Downlink signal level for PCC and SCC to the value as defined in table 4.2.6.1.2-2 (Case 1). Send Uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.6.1.2-2 (Case 1) for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$, for at least the duration of the Throughput measurement.
- 7) Set the Interferer signal level to the value as defined in table 4.2.6.1.2-2 (Case 1) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in ETSI TS 136 521-1 [1], annex C.
- 8) Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to ETSI TS 136 521-1 [1], clause G.2.
- 9) Repeat steps from 6 to 8, using an interfering signal above the wanted signal in Case 1 at step 7.
- 10) Set the Downlink signal level for PCC and SCC to the value as defined in table 4.2.6.1.2-3 (Case 2). Send Uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.6.1.2-3 (Case 2) for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$, for at least the duration of the Throughput measurement.
- 11) Set the Interferer signal level to the value as defined in table 4.2.6.1.2-3 (Case 2) and frequency below the wanted signal, using a modulated interferer bandwidth as defined in ETSI TS 136 521-1 [1], annex C.
- 12) Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 13) Repeat steps from 10 to 12, using an interfering signal above the wanted signal in Case 2 at step 11.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.5.

5.3.5.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.6.2.2 in order to show compliance.

5.3.6 Receiver Blocking Characteristics

5.3.6.1 Receiver Blocking Characteristics for Single Carrier

5.3.6.1.1 Method of test

5.3.6.1.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

For In-band blocking, the frequencies to be tested are mid range as defined in ETSI TS 136 508 [2].

For out-of-band blocking, the frequency to be tested is low or high range as defined in ETSI TS 136 508 [2].

For Narrow-band blocking, the frequencies to be tested are mid range as defined in ETSI TS 136 508 [2].

Channel bandwidth to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1. Range 3 of out-of-band blocking is tested only with highest bandwidth.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.1 and uplink signals according to clauses H.1 and H.3.0.

- 4) The UL and DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], table 7.6.2.4.1-1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.6.1.1.2 In-Band Procedure

- 1) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.6.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
- 2) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.6.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 3) Set the parameters of the signal generator for an interfering signal below the wanted signal in Case 1 according to tables 4.2.7.1.2-1 and 4.2.7.1.2-2 as specified in ETSI TS 136 521-1 [1].
- 4) Set the downlink signal level according to the table 4.2.7.1.2-1. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.7.1.2-1 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2$ GHz, for at least the duration of the throughput measurement as specified in ETSI TS 136 521-1 [1].
- 5) Measure the average throughput for a duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 6) Repeat steps from 3 to 5, using an interfering signal above the wanted signal in Case 1 at step 3.
- 7) Repeat steps from 3 to 6, using interfering signals in Case 2 at step 3) and 6). The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to ETSI TS 136 521-1 [1], table 7.6.1.4.2-1.
- 8) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.6.1.

5.3.6.1.1.3 Out-Of-Band Procedure

- 1) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.6.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
- 2) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.6.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 3) Set the parameters of the CW signal generator for an interfering signal according to table 4.2.7.1.2-4 as specified in ETSI TS 136 521-1 [1]. The frequency step size is 1 MHz.
- 4) Set the downlink signal level according to the table 4.2.7.1.2-3. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.7.1.2-3 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2$ GHz, for at least the duration of the throughput measurement as specified in ETSI TS 136 521-1 [1].
- 5) Measure the average throughput for a duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 6) For table 4.2.7.1.2-4 record the frequencies for which the throughput does not meet the requirements.

- 7) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.6.2.

5.3.6.1.1.4 Narrow-Band Procedure

- 1) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.6.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
- 2) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.6.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 3) Set the parameters of the CW signal generator for an interfering signal below the wanted signal according to table 4.2.7.1.2-5 as specified in ETSI TS 136 521-1 [1].
- 4) Set the downlink signal level according to the table 4.2.7.1.2-5. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.7.1.2-5 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2$ GHz, for at least the duration of the throughput measurement as specified in ETSI TS 136 521-1 [1].
- 5) Measure the average throughput for a duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 6) Repeat steps from 3 to 5, using an interfering signal above the wanted signal at step 3.
- 7) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.6.3.

5.3.6.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.7.1.2 in order to show compliance.

5.3.6.2 Receiver Blocking Characteristics for Carrier Aggregation in DL-only bands

5.3.6.2.1 Method of test

5.3.6.2.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: mid range see ETSI TS 136 508 [2].

Channel bandwidth to be tested: Highest N_{RB_agg} for PCC and SCC.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.1 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL and DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], table 7.6.2.4.1-1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.6.2.1.2 In-Band Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and clause C.3.2 for all downlink physical channels except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.6.1A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
- 5) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.6.1A.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 6) Set the parameters of the signal generator for an interfering signal below the SCC in Case 1 according to tables 4.2.7.1.2-1 and 4.2.7.2.2-1 for operating bands without uplink band (as noted in table 1-1).
- 7) Set the downlink signal level according to the table 4.2.7.1.2-1. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.7.1.2-1 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2$ GHz, for at least the duration of the throughput measurement.
- 8) Measure the average throughput of SCC for duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 9) Repeat steps from 6 to 8, using an interfering signal above the SCC in Case 1 at step 6.
- 10) Repeat steps from 6 to 9, using interfering signals in Case 2 at step 6 and 9. The ranges of case 2 are covered in steps equal to the interferer bandwidth. The test frequencies are chosen in analogy to ETSI TS 136 521-1 [1], table 7.6.1.4.2-1.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.6.1A.3.

5.3.6.2.1.3 Out-Of-Band Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and clause C.3.2 for all downlink physical channels except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.6.2A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
- 5) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.6.2A.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 6) Set the parameters of the signal generator for an interfering signal below the SCC's operating band according to table 4.2.7.2.2-2. The frequency step size is 1 MHz.
- 7) Set the downlink signal level according to the table 4.2.7.1.2-3 for both carriers. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.7.1.2-3 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2$ GHz, for at least the duration of the throughput measurement.
- 8) Measure the average throughput of SCC for duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 9) Record the frequencies for which the throughput does not meet the requirements.

- 10) Repeat steps from 6 to 9, using an interfering signal above the SCC's operating band at step 6.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.6.2A.3.

5.3.6.2.1.4 Narrow-Band Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and clause C.3.1 for all downlink physical channels except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.6.3A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
- 5) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.6.3A.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 6) Set the parameters of the CW signal generator for an interfering signal below the SCC according to table 4.2.7.1.2-5.
- 7) Set the downlink signal level according to the table 4.2.7.1.2-5. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.7.1.2-5 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0$ GHz $< f \leq 4,2$ GHz, for at least the duration of the throughput measurement.
- 8) Measure the average throughput of SCC for duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 9) Repeat steps from 6 to 8, using an interfering signal above the SCC at step 6.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.6.3A.3.

5.3.6.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.7.1.2 in order to show compliance.

5.3.7 Receiver Spurious Response

5.3.7.1 Receiver Spurious Response for Single Carrier

5.3.7.1.1 Method of test

5.3.7.1.1.1 Initial conditions

The initial conditions shall be the same as for those in out-of-band blocking in clause 5.3.6.1.1 in order to test spurious responses obtained in clause 5.3.6.1.2 under the same conditions.

5.3.7.1.1.2 Procedure

- 1) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.6.2.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
- 2) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.6.2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 3) Set the parameters of the CW signal generator for an interfering signal according to table 4.2.8.1.2-2. The spurious frequencies are taken from step 5) records in clause 5.3.6.1.1.2.

- 4) Set the downlink signal level according to the table 4.2.8.1.2-1. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.8.1.2-1 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$, for at least the duration of the throughput measurement as specified in ETSI TS 136 521-1 [1].
- 5) For the spurious frequency, measure the average throughput for a duration sufficient to achieve statistical significance.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.7.

5.3.7.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.8.1.2 in order to show compliance.

5.3.7.2 Receiver Spurious Response for Carrier Aggregation in DL-only bands

5.3.7.2.1 Method of test

5.3.7.2.1.1 Initial conditions

The initial conditions shall be the same as for those in out-of-band blocking in clause 5.3.6.2.1.1 in order to test spurious responses obtained in clause 5.3.6.2.1.3 under the same conditions.

5.3.7.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and clause C.3.2 for all downlink physical channels except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.6.2A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
- 5) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.6.2A.3.4.1-1 on PCC. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 6) Set the parameters of the CW signal generator for an interfering signal according to table 4.2.8.1.2-2. The spurious frequencies are taken from step 5) records in clause 5.3.6.2.1.3.
- 7) Set the downlink signal level according to the table 4.2.8.1.2-1 for both carriers. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.8.1.2-1 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$, for at least the duration of the throughput measurement.
- 8) For the spurious frequency, measure the average throughput on SCC for a duration sufficient to achieve statistical significance.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.7A.3.

5.3.7.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.8.1.2 in order to show compliance.

5.3.8 Receiver Intermodulation Characteristics

5.3.8.1 Receiver Intermodulation Characteristics for Single Carrier

5.3.8.1.1 Method of test

5.3.8.1.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: mid range; see ETSI TS 136 508 [2].

Channel bandwidths to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS and interfering sources to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1, C.3.1 and uplink signals according to clauses H.1 and H.3.1.
- 4) The UL and DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], table 7.8.4.1-1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.8.1.1.2 Procedure

- 1) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.8.1.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
- 2) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.8.1.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 3) Set the Downlink signal level to the value as defined in table 4.2.9.1.2-1. Send uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.9.1.2-1 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0 \text{ GHz} < f \leq 4,2 \text{ GHz}$, for at least the duration of the throughput measurement as specified in ETSI TS 136 521-1 [1].
- 4) Set the Interfering signal levels to the values as defined in table 4.2.9.1.2-1, using a modulated interferer bandwidth as defined in annex C of ETSI TS 136 521-1 [1].
- 5) Measure the average throughput for a duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 6) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.8.

5.3.8.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.9.1.2 in order to show compliance.

5.3.8.2 Receiver Intermodulation Characteristics for Carrier Aggregation in DL-only bands

5.3.8.2.1 Method of test

5.3.8.2.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: mid range; see ETSI TS 136 508 [2].

Channel bandwidths to be tested: Highest N_{RB_agg} for PCC and SCC.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS and interfering sources to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1, C.3.1 and uplink signals according to clauses H.1 and H.3.1.
- 4) The UL and DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], table 7.8.4.1-1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.8.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and clause C.3.1 for all downlink physical channels except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.8.1A.3.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
- 5) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.8.1A.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 6) Set the Downlink signal level to the value as defined in table 4.2.9.1.2-1. Send Uplink power control commands to the UE (less or equal to 1 dB step size should be used), to ensure that the UE output power is within +0, -3,4 dB of the target level in table 4.2.9.1.2-1 for carrier frequency $f \leq 3,0$ GHz or within +0, -4,0 dB of the target level for carrier frequency $3,0$ GHz $< f \leq 4,2$ GHz, for at least the duration of the Throughput measurement.
- 7) Set the Interfering signal levels to the values as defined in table 4.2.9.1.2-1 and frequency below the wanted signal, using a modulated interferer bandwidth as defined in annex C of ETSI TS 136 521-1 [1].
- 8) Measure the average throughput of SCC for a duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 9) Repeat steps from 6 to 8, using an interfering signal above the wanted signal at step 4.

5.3.8.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.9.2.2 in order to show compliance.

5.3.9 Receiver Spurious Emissions

5.3.9.1 Receiver Spurious Emissions for Single Carrier

5.3.9.1.1 Method of test

5.3.9.1.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: low range, mid range and high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidth to be tested: highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect a spectrum analyser (or other suitable test equipment) to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.1.
- 4) The DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.9.1.1.2 Procedure

- 1) Sweep the spectrum analyser (or other suitable test equipment) over a frequency range from 30 MHz to 12,75 GHz and measure the average power of the spurious emissions.
- 2) Repeat step 1) for all E-UTRA Rx antennas of the UE.
- 3) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.9.

5.3.9.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.10.1.2 in order to show compliance.

5.3.9.2 Receiver Spurious Emissions in DL-only bands

5.3.9.2.1 Method of test

5.3.9.2.1.1 Initial conditions

Test Environment: normal, as specified in annex B.

Frequencies to be tested: mid range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidth to be tested: Highest N_{RB_agg} for PCC and SCC as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect a spectrum analyser (or other suitable test equipment) to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals for PCC are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.1.
- 4) The DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].

- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.9.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and clause C.3.1 for all downlink physical channels except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS transmits PDSCH via PDCCH DCI format 2A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.9A.4.1-1 on both PCC and SCC. The SS sends downlink MAC padding bits on the DL RMC.
- 5) Sweep the spectrum analyzer (or equivalent equipment) over a frequency range and measure the average power of spurious emission. During measurement SS sends no uplink scheduling information to the UE.
- 6) Repeat steps 1) to 5) for all E-UTRA DL-only band Rx antennas of the UE.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.9A.

5.3.9.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.10.2.2 in order to show compliance.

5.3.10 Transmitter Adjacent Channel Leakage Power Ratio

5.3.10.1 Transmitter adjacent channel leakage power ratio for Single Carrier

5.3.10.1.1 Method of test

5.3.10.1.1.1 Initial conditions

Test Environment: normal, TL/VL, TL/VH, TH/VL and TH/VH, as specified in annex B.

Frequencies to be tested: low range, mid range and high range; see ETSI TS 136 508 [2].

Channel bandwidth to be tested: lowest, 5 MHz, 10 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.10.1.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.2.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 2) Send continuous uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at P_{UMAX} level.
- 3) Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in tables 4.2.11.1.2-1 and 4.2.11.1.2-2. The period of the measurement shall be at least the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 4) Measure the filtered mean power for E-UTRA.
- 5) Measure the filtered mean power of the first E-UTRA adjacent channel.
- 6) Measure the RRC filtered mean power of the first and the second UTRA adjacent channel.
- 7) Calculate the ratio of the power between the values measured in step 4) over step 5) for $E-UTRA_{ACLR}$.
- 8) Calculated the ratio of the power between the values measured in step 4) over step 6) for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$.
- 9) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.2.3.

5.3.10.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.11.1-2 in order to show compliance.

5.3.10.2 Transmitter adjacent channel leakage power ratio for intra-band contiguous Carrier Aggregation (DL CA and UL CA)

5.3.10.2.1 Method of test

5.3.10.2.1.1 Initial conditions

Test environment: normal, TL/VL, TL/VH, TH/VL and TH/VH, as specified in annex B.

Frequencies to be tested: low range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Test CC Combination setting (N_{RB_agg}): lowest N_{RB_agg} , highest N_{RB_agg} , as specified in ETSI TS 136 521-1 [1], clause 5.4.2A.1 for the CA Configuration.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals for PCC are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.6.2.3A.1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.10.2.1.2 Procedure

- 1) Configure SCC according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 for all downlink physical channels, except PHICH.
- 2) The SS shall configure SCC as per ETSI TS 136 508 [2], clause 5.2A.4.
- 3) SS activates SCC by sending the activation MAC-CE. Wait for at least 2 seconds.
- 4) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.6.2.3A.1.4.1-1 of ETSI TS 136 521-1 [1] on both PCC and SCC. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 5) Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200 ms for the UE to reach P_{UMAX} level.
- 6) Measure the mean power over all component carriers of the UE in the CA configuration of the radio access mode according to the test configuration, which shall meet the requirements described in tables 4.2.11.2.2-1 and 4.2.11.2.2-2. The period of the measurement shall be at least the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 7) Measure the rectangular filtered mean power for CA E-UTRA.
- 8) Measure the rectangular filtered mean power of the first CA E-UTRA adjacent channel on both lower and upper side of the CA E-UTRA channel, respectively.
- 9) Measure the RRC filtered mean power of the first and the second UTRA for CA adjacent channel on both lower and upper side of the CA E-UTRA channel, respectively.
- 10) Calculate the ratio of the power between the values measured in step 7) over step 8) for CA E-UTRA_{ACLR}.
- 11) Calculated the ratio of the power between the values measured in step 7) over step 9) for UTRA_{ACLR1}, UTRA_{ACLR2}.
- 12) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.2.3A.1.

5.3.10.2.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.11.2.2 in order to show compliance.

5.3.10.3 Transmitter adjacent channel leakage power ratio for UL-MIMO

5.3.10.3.1 Method of test

5.3.10.3.1.1 Initial conditions

Test environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, mid range, high range; as specified in ETSI TS 136 508 [2], clause 4.3.1.

Channel bandwidths to be tested: lowest, 5 MHz, 10 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], clause 6.6.2.3B.

- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.
- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.10.3.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to table 6.6.2.3B.1.4.1-1 of ETSI TS 136 521-1 [1]. Since the UE has no payload and no loopback data to send the UE sends uplink MAC padding bits on the UL RMC.
- 2) Send continuously uplink power control "up" commands in every uplink scheduling information to the UE; allow at least 200 ms for the UE to reach P_{UMAX} level.
- 3) Measure the sum of the mean power at each antenna connector of UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in tables 4.2.11.3.2-1 and 4.2.11.3.2-2. The period of the measurement shall be at least the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 4) Measure the rectangular filtered mean power for E-UTRA at each antenna connector of UE.
- 5) Measure the rectangular filtered mean power of the first E-UTRA adjacent channel at each antenna connector of UE.
- 6) Measure the RRC filtered mean power of the first and the second UTRA adjacent channel at each antenna connector of UE.
- 7) Calculate the ratio of the power between the values measured in step 4) over step 5) for E-UTRAACLR.
- 8) Calculated the ratio of the power between the values measured in step 4) over step 6) for UTRAACLR1, UTRAACLR2.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.2.3B.

5.3.10.3.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.11.3.2 in order to show compliance.

5.3.10.4 Transmitter adjacent channel leakage power ratio for Multi-Cluster PUSCH within a component carrier

5.3.10.4.1 Method of test

5.3.10.4.1.1 Initial conditions

Test Environment: normal, TL/VL, TL/VH, TH/VL and TH/VH, as specified in annex B.

Frequencies to be tested: low range, mid range and high range; see ETSI TS 136 508 [2].

Channel bandwidth to be tested: Highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS to the UE to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.0.
- 4) The UL Reference Measurement channels are set according to ETSI TS 136 521-1 [1].
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.

- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.10.4.1.2 Procedure

- 1) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 6.6.2.3_2.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 2) Send continuous uplink power control "up" commands in the uplink scheduling information to the UE to ensure that the UE transmits at P_{UMAX} level.
- 3) Measure the mean power of the UE in the channel bandwidth of the radio access mode according to the test configuration, which shall meet the requirements described in tables 4.2.11.1.2-1 and 4.2.11.1.2-2. The period of the measurement shall be at least the continuous duration of one sub-frame (1 ms). For TDD slots with transient periods are not under test.
- 4) Measure the filtered mean power for E-UTRA.
- 5) Measure the filtered mean power of the first E-UTRA adjacent channel.
- 6) Measure the RRC filtered mean power of the first and the second UTRA adjacent channel.
- 7) Calculate the ratio of the power between the values measured in step 4) over step 5) for $E-UTRA_{ACLR}$.
- 8) Calculated the ratio of the power between the values measured in step 4) over step 6) for $UTRA_{ACLR1}$, $UTRA_{ACLR2}$.
- 9) Repeat for applicable test frequencies, channel bandwidths, operating bands and environmental conditions.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 6.6.2.3.2.

5.3.10.4.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.11.4.2 in order to show compliance.

5.3.11 Receiver Reference Sensitivity Level

5.3.11.1 Receiver Reference Sensitivity Level for Single Carrier

5.3.11.1.1 Method of test

5.3.11.1.1.1 Initial conditions

Test Environment: normal, TL/VL, TL/VH, TH/VL, TH/VH; as specified in annex B.

Frequencies to be tested: low range, mid range, high range see ETSI TS 136 508 [2].

Channel bandwidth to be tested: lowest, 5 MHz and highest channel bandwidth as defined in ETSI TS 136 508 [2], clause 4.3.1.

Uplink/Downlink configurations: as specified in ETSI TS 136 521-1 [1]:

- 1) Connect the SS and interfering source to the UE antenna connectors.
- 2) The parameter settings for the cell are set up according to ETSI TS 136 508 [2], clause 4.4.3.
- 3) Downlink signals are initially set up according to ETSI TS 136 521-1 [1], clauses C.0, C.1 and C.3.0 and uplink signals according to clauses H.1 and H.3.1.
- 4) The UL and DL Reference Measurement channels are set according to ETSI TS 136 521-1 [1], table 7.3.4.1-1.
- 5) Propagation conditions are set according to ETSI TS 136 521-1 [1], clause B.0.

- 6) Ensure the UE is in State 3A-RF according to ETSI TS 136 508 [2], clause 5.2A.2.

NOTE: When reference is made to test set up, call set up and test mode, guidance on the applicability of these can be found in ETSI TS 136 521-1 [1], ETSI TS 136 508 [2] and ETSI TS 136 509 [i.10] respectively.

5.3.11.1.1.2 Procedure

- 1) SS transmits PDSCH via PDCCH DCI format 1A for C_RNTI to transmit the DL RMC according to ETSI TS 136 521-1 [1], table 7.3.4.1-1. The SS sends downlink MAC padding bits on the DL RMC.
- 2) SS sends uplink scheduling information for each UL HARQ process via PDCCH DCI format 0 for C_RNTI to schedule the UL RMC according to ETSI TS 136 521-1 [1], table 7.3.4.1-1. Since the UE has no payload data to send, the UE transmits uplink MAC padding bits on the UL RMC.
- 3) Set the Downlink signal level to the appropriate REFSSENS value defined in table 4.2.12.1.2-1. Send continuously uplink power control "up" commands in the uplink scheduling information to the UE to ensure the UE transmits P_{UMAX} level for at least the duration of the Throughput measurement. (obtain correct UE output power as specified in ETSI TS 136 521-1 [1]).
- 4) Measure the average throughput for a duration sufficient to achieve statistical significance according to clause G.2 of ETSI TS 136 521-1 [1].
- 5) Repeat for applicable test frequencies, channel bandwidths and operating bands.

Details of the test method can be found in ETSI TS 136 521-1 [1], clause 7.3.

5.3.11.1.2 Test requirements

The results obtained shall be compared to the limits in clause 4.2.12.1.2 in order to show compliance.

Annex A (normative): Relationship between the present document and the essential requirements of Directive 2014/53/EU

The present document has been prepared under the Commission's standardisation request C(2015) 5376 final [i.9] to provide one voluntary means of conforming to the essential requirements of Directive 2014/53/EU on the harmonisation of the laws of the Member States relating to the making available on the market of radio equipment and repealing Directive 1999/5/EC [i.2].

Once the present document is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of the present document given in table A-1 confers, within the limits of the scope of the present document, a presumption of conformity with the corresponding essential requirements of that Directive, and associated EFTA regulations.

Table A-1: Relationship between the present document and the essential requirements of Directive 2014/53/EU

Harmonised Standard ETSI EN 301 908-13				
The following requirements are relevant to the presumption of conformity under the article 3.2 of Directive 2014/53/EU [i.2]				
Requirement			Requirement Conditionality	
No	Description	Reference: Clause No	U/C	Condition
1	Transmitter maximum output power	4.2.2	U	
2	Transmitter spectrum emission mask	4.2.3	U	
3	Transmitter spurious emissions	4.2.4	U	
4	Transmitter minimum output power	4.2.5	U	
5	Receiver adjacent channel selectivity (ACS)	4.2.6	U	
6	Receiver blocking characteristics	4.2.7	U	
7	Receiver spurious response	4.2.8	U	
8	Receiver intermodulation characteristics	4.2.9	U	
9	Receiver spurious emissions	4.2.10	U	
10	Transmitter adjacent channel leakage power ratio	4.2.11	U	
11	Receiver Reference Sensitivity Level	4.2.12	U	

Key to columns:

Requirement:

No A unique identifier for one row of the table which may be used to identify a requirement.

Description A textual reference to the requirement.

Clause Number Identification of clause(s) defining the requirement in the present document unless another document is referenced explicitly.

Requirement Conditionality:

U/C Indicates whether the requirement shall be unconditionally applicable (U) or is conditional upon the manufacturers claimed functionality of the equipment (C).

Condition Explains the conditions when the requirement shall or shall not be applicable for a requirement which is classified "conditional".

Presumption of conformity stays valid only as long as a reference to the present document is maintained in the list published in the Official Journal of the European Union. Users of the present document should consult frequently the latest list published in the Official Journal of the European Union.

Other Union legislation may be applicable to the product(s) falling within the scope of the present document.

Annex B (normative): Environmental profile

B.1 General

B.1.1 Introduction

This annex specifies the environmental profile of the UE.

B.1.2 Temperature

The UE shall fulfil all the requirements in the full temperature range of:

Table B.1.2-1: Temperature Test Environment

+15 °C to +35 °C	For normal conditions (with relative humidity up to 75 %)
-10 °C to +55 °C	For extreme conditions (see IEC 60068-2-1 [4] and IEC 60068-2-2 [5])

Outside this temperature range the UE, if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in ETSI TS 136 101 [3] for extreme operation.

The normative reference for this requirement is ETSI TS 136 101 [3], clause E.1.

Some tests are performed also in extreme temperature conditions. These test conditions are denoted as TL (Temperature Low, -10 °C) and TH (Temperature High, +55 °C).

B.1.3 Voltage

The UE shall fulfil all the requirements in the full voltage range, i.e. the voltage range between the extreme voltages.

The manufacturer shall declare the lower and higher extreme voltages and the approximate shutdown voltage. For the equipment that can be operated from one or more of the power sources listed below, the lower extreme voltage shall not be higher and the higher extreme voltage shall not be lower than that specified below.

Table B.1.3-1: Voltage Test Environment

Power source	Lower extreme Voltage	Higher extreme voltage	Normal conditions voltage
AC mains	0,9 × nominal	1,1 × nominal	nominal
Regulated lead acid battery	0,9 × nominal	1,3 × nominal	1,1 × nominal
Non regulated batteries:			
Leclanché	0,85 × nominal	Nominal	Nominal
Lithium	0,95 × nominal	1,1 × Nominal	1,1 × Nominal
Mercury/nickel and cadmium	0,90 × nominal		Nominal

Outside this voltage range the UE if powered on, shall not make ineffective use of the radio frequency spectrum. In no case shall the UE exceed the transmitted levels as defined in ETSI TS 136 101 [3] for extreme operation. In particular, the UE shall inhibit all RF transmissions when the power supply voltage is below the manufacturer declared shutdown voltage.

The normative reference for this requirement is ETSI TS 136 101 [3], clause E.2.

Some tests are performed also in extreme voltage conditions. These test conditions are denoted as VL (Lower extreme Voltage) and VH (Higher extreme Voltage).

B.1.4 Test environment

Where a normal environment is required then the normal conditions shown in clauses B.1.2 and B.1.3 shall be applied.

Where an extreme environment is required then the various combinations of extreme temperatures together with the extreme voltages shown in clauses B.1.2 and B.1.3 shall be applied. The combinations are:

- Low extreme Temperature/Low extreme Voltage (TL/VL);
- Low extreme Temperature/High extreme Voltage (TL/VH);
- High extreme Temperature/Low extreme Voltage (TH/VL);
- High extreme Temperature/High extreme Voltage (TH/VH).

Annex C (informative): Bibliography

- Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC (EMC Directive).
- CEPT/ERC/REC 74-01 (Siófok 1998, Nice 1999, Sesimbra 2002, Hradec Kralove 2005, Cardiff 2011): "Unwanted Emissions in the Spurious Domain".
- Directive 2006/95/EC of the European Parliament and of the Council of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits (LV Directive).
- Commission Decision 2008/477/EC of 13 June 2008 on the harmonisation of the 2 500-2 690 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Community.
- Commission Decision (EU) 2015/750 of 8 May 2015 on the harmonisation of the 1 452-1 492 MHz frequency band for terrestrial systems capable of providing electronic communications services in the Union.
- ECC Decision (15)01: "Harmonised technical conditions for mobile/fixed communications networks (MFCN) in the band 694-790 MHz including a paired frequency arrangement (Frequency Division Duplex 2x30 MHz) and an optional unpaired frequency arrangement (Supplemental Downlink)", Approved 06 March 2015.
- Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations.
- Directive 98/48/EC of the European Parliament and of the Council of 20 July 1998 amending Directive 98/34/EC laying down a procedure for the provision of information in the field of technical standards and regulations.

History

Document history				
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