



Recommendation ITU-R M.2071-0
(01/2015)

**Generic unwanted emission
characteristics of mobile stations
using the terrestrial radio interfaces
of IMT-Advanced**

M Series
**Mobile, radiodetermination, amateur
and related satellite services**

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Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R M.2071-0*

Generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-Advanced

(Question ITU-R 229 3/5)

(2015)

Scope

This Recommendation provides the generic unwanted emission characteristics of mobile stations using the terrestrial radio interfaces of IMT-Advanced, suitable for establishing the technical basis for global circulation of IMT-Advanced terminals. Implementation of characteristics of mobile stations using the terrestrial radio interfaces of IMT-Advanced in any of the bands included in this Recommendation is subject to compliance with the Radio Regulations.

Keywords

IMT-Advanced, emission characteristics, out-of-band, unwanted, mobile station

The ITU Radiocommunication Assembly,

considering

- a) that unwanted emissions consist of both spurious and out-of-band (OoB) emissions according to No. **1.146** of the Radio Regulations (RR) and that spurious and OoB emissions are defined in RR Nos. **1.145** and **1.144**, respectively;
- b) that limitation of the maximum permitted levels of unwanted emissions of IMT-Advanced mobile stations (MSs) is necessary to protect other radio systems and services from interference and to enable coexistence between different technologies;
- c) that too stringent limits may lead to an increase in size or in complexity of IMT-Advanced radio equipment;
- d) that every effort should be made to keep limits for unwanted emissions at the lowest possible values taking account of economic factors and technological limitations;
- e) that Recommendation ITU-R SM.329 relates to the effects, measurements and limits to be applied to spurious domain emissions;
- f) that the same spurious emission limits apply equally to MSs of all radio interfaces;
- g) that Recommendation ITU-R SM.1541 relating to OoB emission specifies generic limits in the OoB domain which generally constitute the least restrictive OoB emission limits and encourages the development of more specific limits for each system;
- h) that the levels of spurious emissions of IMT-Advanced terminals shall comply with the limits specified in RR Appendix **3**;
- i) that Recommendation ITU-R M.1579 establishes the technical basis for global circulation of IMT-2000 and IMT-Advanced MSs;
- j) that one of the basic requirements of global circulation is that the MS does not cause harmful interference in any country where it is taken;

* This Recommendation should be brought to the attention of Radiocommunication Study Group 1.

- k) that the harmonization of unwanted emission limits will facilitate global use and access to a global market;
- l) that unwanted emission limits are dependent on the transmitter emission characteristics in addition to depending on services operating in other bands;
- m) that the technology used by a system and its conformance with the recommended specifications and standards in Recommendation ITU-R M.2012 defines that system as IMT-Advanced regardless of the frequency band of operation;
- n) that harmonized frequency arrangements for the bands identified for IMT are addressed in Recommendation ITU-R M.1036, which also indicates that “some administrations may deploy IMT-Advanced systems in bands other than those identified in the RR”,

noting

- a) the work carried out by standardization bodies to define limits to protect other radio systems and services from interference and to enable coexistence between different technologies;
- b) that IMT-Advanced mobile stations must comply with local, regional, and international regulations for OoB and spurious emissions relevant to their operations, wherever such regulations apply;
- c) that the notes and annexes of this Recommendation – being based on the ongoing work in standardization bodies – in order to reflect the wide applicability of IMT-Advanced technologies and to maintain consistency with the technology specifications, may contain material which reflects information related to the technology applications in bands other than those identified for IMT,

recommends

- 1 that the unwanted emission characteristics of IMT-Advanced mobile stations should be based on the limits contained in the technology specific Annexes 1 and 2 which correspond to the terrestrial radio interface specifications referenced in *recommends* 1 of Recommendation ITU-R M.2012;
- 2 that the unwanted emission characteristics of IMT-Advanced mobile stations in Annexes 1 and 2 apply in Regions and countries in which corresponding bands are identified for IMT in the Radio regulations^{**}.

Annex 1 – LTE-Advanced¹

Annex 2 – WirelessMAN-Advanced²

^{**} In other cases the unwanted emission characteristics of IMT-Advanced mobile stations in Annexes 1 and 2 are provided for information. Administrations may choose to apply the unwanted characteristics in Annexes 1 and 2 for the bands not identified for IMT at their national level, bearing in mind global circulation aspects.

¹ Developed by 3GPP as LTE Release 10 and Beyond (LTE-Advanced).

² Developed by IEEE as the WirelessMAN-Advanced specification incorporated in IEEE Std 802.16 beginning with approval of IEEE Std 802.16m.

Annex 1 LTE-Advanced

The present Annex includes unwanted emission requirements from evolved Universal Mobile Telecommunications System (UMTS) terrestrial radio access (E-UTRA) carriers for E-UTRA Mobile Stations.

This Annex is divided into three parts:

- Chapter 1 specifies the Operating bands for which the requirements in the present Annex apply.
- Chapter 2 specifies Definitions, Symbols and Abbreviations.
- Chapters 3, 4 and 5 contains the E-UTRA MS unwanted emission requirements.

Values specified in the present Annex incorporate test tolerances defined in Recommendation ITU-R M.1545.

1 Operating bands

TABLE 1-1
E-UTRA operating bands

E-UTRA operating band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex mode
	$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
1	1 920 MHz – 1 980 MHz	2 110 MHz – 2 170 MHz	FDD
2	1 850 MHz – 1 910 MHz	1 930 MHz – 1 990 MHz	FDD
3	1 710 MHz – 1 785 MHz	1 805 MHz – 1 880 MHz	FDD
4	1 710 MHz – 1 755 MHz	2 110 MHz – 2 155 MHz	FDD
5	824 MHz – 849 MHz	869 MHz – 894 MHz	FDD
61	830 MHz – 840 MHz	875 MHz – 885 MHz	FDD
7	2 500 MHz – 2 570 MHz	2 620 MHz – 2 690 MHz	FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD
9	1 749.9 MHz – 1 784.9 MHz	1 844.9 MHz – 1 879.9 MHz	FDD
10	1 710 MHz – 1 770 MHz	2 110 MHz – 2 170 MHz	FDD
11#	1 427.9 MHz – 1 447.9 MHz	1 475.9 MHz – 1 495.9 MHz	FDD
12	699 MHz – 716 MHz	729 MHz – 746 MHz	FDD
13	777 MHz – 787 MHz	746 MHz – 756 MHz	FDD
14	788 MHz – 798 MHz	758 MHz – 768 MHz	FDD
15	Reserved	Reserved	FDD
16	Reserved	Reserved	FDD
17	704 MHz – 716 MHz	734 MHz – 746 MHz	FDD
18	815 MHz – 830 MHz	860 MHz – 875 MHz	FDD
19	830 MHz – 845 MHz	875 MHz – 890 MHz	FDD

TABLE 1-1 (*end*)

20	832 MHz – 862 MHz	791 MHz – 821 MHz	FDD
21#	1 447.9 MHz – 1 462.9 MHz	1 495.9 MHz – 1 510.9 MHz	FDD
22	3 410 MHz – 3 490 MHz	3 510 MHz – 3 590 MHz	FDD
23	2 000 MHz – 2 020 MHz	2 180 MHz – 2 200 MHz	FDD
24	1 626.5 MHz – 1 660.5 MHz	1 525 MHz – 1 559 MHz	FDD
25	1 850 MHz – 1 915 MHz	1 930 MHz – 1 995 MHz	FDD
26	814 MHz – 849 MHz	859 MHz – 894 MHz	FDD
27	807 MHz – 824 MHz	852 MHz – 869 MHz	FDD
28	703 MHz – 748 MHz	758 MHz – 803 MHz	FDD
29	N/A	717 MHz – 728 MHz	FDD ²
...			
33	1 900 MHz – 1 920 MHz	1 900 MHz – 1 920 MHz	TDD
34	2 010 MHz – 2 025 MHz	2 010 MHz – 2 025 MHz	TDD
35	1 850 MHz – 1 910 MHz	1 850 MHz – 1 910 MHz	TDD
36	1 930 MHz – 1 990 MHz	1 930 MHz – 1 990 MHz	TDD
37	1 910 MHz – 1 930 MHz	1 910 MHz – 1 930 MHz	TDD
38	2 570 MHz – 2 620 MHz	2 570 MHz – 2 620 MHz	TDD
39	1 880 MHz – 1 920 MHz	1 880 MHz – 1 920 MHz	TDD
40	2 300 MHz – 2 400 MHz	2 300 MHz – 2 400 MHz	TDD
41	2 496 MHz – 2 690 MHz	2 496 MHz – 2 690 MHz	TDD
42	3 400 MHz – 3 600 MHz	3 400 MHz – 3 600 MHz	TDD
43	3 600 MHz – 3 800 MHz	3 600 MHz – 3 800 MHz	TDD
44	703 MHz – 803 MHz	703 MHz – 803 MHz	TDD

NOTE 1 – Band 6 is not applicable.

NOTE 2 – Restricted to E-UTRA operation when carrier aggregation is configured. The downlink operating band is paired with the uplink operating band (external) of the (CA) configuration that is supporting the configured Primary Cell (Pcell) - Primary Cell: the cell, operating on the primary frequency, in which the UE either performs the initial connection establishment procedure or initiates the connection re-establishment procedure, or the cell indicated as the primary cell in the handover procedure.

NOTE 3 – All frequency bands or parts of the bands referenced in this Recommendation which are not identified for IMT in the ITU Radio Regulations have been marked with “#”.

The unwanted emission limits defined in the present Annex are for E-UTRA MS operating at least one of the intra-band contiguous CA arrangements in Table 1-2:

TABLE 1-2

E-UTRA Intra-band contiguous CA bands

E-UTRA CA band	E-UTRA band	Uplink (UL) operating band	Downlink (DL) operating band	Duplex mode
		BS receive / UE transmit	BS transmit / UE receive	
		$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
CA_1	1	1 920 MHz – 1 980 MHz	2 110 MHz – 2 170 MHz	FDD
CA_7	7	2 500 MHz – 2 570 MHz	2 620 MHz – 2 690 MHz	FDD
CA_38	38	2 570 MHz – 2 620 MHz	2 570 MHz – 2 620 MHz	TDD
CA_40	40	2 300 MHz – 2 400 MHz	2 300 MHz – 2 400 MHz	TDD
CA_41	41	2 496 MHz – 2 690 MHz	2 496 MHz – 2 690 MHz	TDD

The unwanted emission limits defined in the present Annex are for E-UTRA MS operating at least one of the intra-band non-contiguous CA arrangements in Table 1-3:

TABLE 1-3

E-UTRA Intra-band non-contiguous CA bands

E-UTRA CA band	E-UTRA band	Uplink (UL) operating band	Downlink (DL) operating band	Duplex mode
		BS receive / UE transmit	BS transmit / UE receive	
		$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
CA_25-25	25	1 850 MHz – 1 915 MHz	1 930 MHz – 1 995 MHz	FDD

The unwanted emission limits defined in the present Annex are for E-UTRA MS operating at least one of the inter-band CA combinations in Table 1-4:

TABLE 1-4

E-UTRA Inter-band CA bands

E-UTRA CA band	E-UTRA band	Uplink (UL) operating band	Downlink (DL) operating band	Duplex mode
		BS receive / UE transmit	BS transmit / UE receive	
		$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
CA_1-5	1	1 920 MHz – 1 980 MHz	2 110 MHz – 2 170 MHz	FDD
	5	824 MHz – 849 MHz	869 MHz – 894 MHz	
CA_1-18	1	1 920 MHz – 1 980 MHz	2 110 MHz – 2 170 MHz	FDD
	18	815 MHz – 830 MHz	860 MHz – 875 MHz	
CA_1-19	1	1 920 MHz – 1 980 MHz	2 110 MHz – 2 170 MHz	FDD
	19	830 MHz – 845 MHz	875 MHz – 890 MHz	
CA_1-21	1	1 920 MHz – 1 980 MHz	2 110 MHz – 2 170 MHz	FDD
	21	1 447.9 MHz – 1 462.9 MHz	1 495.9 MHz – 1 510.9 MHz	

TABLE 1-4 (end)

E-UTRA CA band	E-UTRA band	Uplink (UL) operating band	Downlink (DL) operating band	Duplex mode
		BS receive / UE transmit	BS transmit / UE receive	
		$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
CA_2-17	2	1 850 MHz – 1 910 MHz	1 930 MHz – 1 990 MHz	FDD
	17	704 MHz – 716 MHz	734 MHz – 746 MHz	
CA_2-29	2	1 850 MHz – 1 910 MHz	1 930 MHz – 1 990 MHz	FDD
	29	[N/A]	717 MHz – 728 MHz	
CA_3-5	3	1 710 MHz – 1 785 MHz	1 805 MHz – 1 880 MHz	FDD
	5	824 MHz – 849 MHz	869 MHz – 894 MHz	
CA_3-7	3	1 710 MHz – 1 785 MHz	1 805 MHz – 1 880 MHz	FDD
	7	2 500 MHz – 2 570 MHz	2 620 MHz – 2 690 MHz	
CA_3-8	3	1 710 MHz – 1 785 MHz	1 805 MHz – 1 880 MHz	FDD
	8	880 MHz – 915 MHz	925 MHz – 960 MHz	
CA_3-20	3	1 710 MHz – 1 785 MHz	1 805 MHz – 1 880 MHz	FDD
	20	832 MHz – 862 MHz	791 MHz – 821 MHz	
CA_4-5	4	1 710 MHz – 1 755 MHz	2 110 MHz – 2 155 MHz	FDD
	5	824 MHz – 849 MHz	869 MHz – 894 MHz	
CA_4-7	4	1 710 MHz – 1 755 MHz	2 110 MHz – 2 155 MHz	FDD
	7	2 500 MHz – 2 570 MHz	2 620 MHz – 2 690 MHz	
CA_4-12	4	1 710 MHz – 1 755 MHz	2 110 MHz – 2 155 MHz	FDD
	12	699 MHz – 716 MHz	729 MHz – 746 MHz	
CA_4-13	4	1 710 MHz – 1 755 MHz	2 110 MHz – 2 155 MHz	FDD
	13	777 MHz – 787 MHz	746 MHz – 756 MHz	
CA_4-17	4	1 710 MHz – 1 755 MHz	2 110 MHz – 2 155 MHz	FDD
	17	704 MHz – 716 MHz	734 MHz – 746 MHz	
CA_4-29	4	1 710 MHz – 1 755 MHz	2 110 MHz – 2 155 MHz	FDD
	29	[N/A]	717 MHz – 728 MHz	
CA_5-12	5	824 MHz – 849 MHz	869 MHz – 894 MHz	FDD
	12	699 MHz – 716 MHz	729 MHz – 746 MHz	
CA_5-17	5	824 MHz – 849 MHz	869 MHz – 894 MHz	FDD
	17	704 MHz – 716 MHz	734 MHz – 746 MHz	
CA_7-20	7	2 500 MHz – 2 570 MHz	2 620 MHz – 2 690 MHz	FDD
	20	832 MHz – 862 MHz	791 MHz – 821 MHz	
CA_8-20	8	880 MHz – 915 MHz	925 MHz – 960 MHz	FDD
	20	832 MHz – 862 MHz	791 MHz – 821 MHz	
CA_11-18	11	1 427.9 MHz – 1 447.9 MHz	1 475.9 MHz – 1 495.9 MHz	FDD
	18	815 MHz – 830 MHz	860 MHz – 875 MHz	

1.1 Channel bandwidth

Requirements in the present document are specified for the channel bandwidths listed in Table 1.1-1.

TABLE 1.1-1

Transmission bandwidth configuration N_{RB} in E-UTRA channel bandwidths

Channel bandwidth $BW_{Channel}$ (MHz)	1.4	3	5	10	15	20
Transmission bandwidth configuration N_{RB}	6	15	25	50	75	100

1.1.1 Channel bandwidths per operating band

TABLE 1.1.1-1

E-UTRA channel bandwidth

E-UTRA band / Channel bandwidth						
E-UTRA band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
1			Yes	Yes	Yes	Yes
2	Yes	Yes	Yes	Yes	Yes ¹	Yes ¹
3	Yes	Yes	Yes	Yes	Yes ¹	Yes ¹
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes ¹		
6			Yes	Yes ¹		
7			Yes	Yes	Yes ³	Yes ^{1,3}
8	Yes	Yes	Yes	Yes ¹		
9			Yes	Yes	Yes ¹	Yes ¹
10			Yes	Yes	Yes	Yes
11			Yes	Yes ¹		
12	Yes	Yes	Yes ¹	Yes ¹		
13			Yes ¹	Yes ¹		
14			Yes ¹	Yes ¹		
...						
17			Yes ¹	Yes ¹		
18			Yes	Yes ¹	Yes ¹	
19			Yes	Yes ¹	Yes ¹	
20			Yes	Yes ¹	Yes ¹	Yes ¹
21			Yes	Yes ¹	Yes ¹	
22			Yes	Yes	Yes ¹	Yes ¹
23	Yes	Yes	Yes	Yes	Yes ¹	Yes ¹
24			Yes	Yes		
25	Yes	Yes	Yes	Yes	Yes ¹	Yes ¹
26	Yes	Yes	Yes	Yes ¹	Yes ¹	
27	Yes	Yes	Yes	Yes ¹		
28		Yes	Yes	Yes ¹	Yes ¹	Yes ^{1,2}
...						
33			Yes	Yes	Yes	Yes

TABLE 1.1.1-1 (*end*)

E-UTRA band / Channel bandwidth						
E-UTRA band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
34			Yes	Yes	Yes	
35	Yes	Yes	Yes	Yes	Yes	Yes
36	Yes	Yes	Yes	Yes	Yes	Yes
37			Yes	Yes	Yes	Yes
38			Yes	Yes	Yes ³	Yes ³
39			Yes	Yes	Yes	Yes
40			Yes	Yes	Yes	Yes
41			Yes	Yes	Yes	Yes
42			Yes	Yes	Yes	Yes
43			Yes	Yes	Yes	Yes
44		Yes	Yes	Yes	Yes	Yes

NOTE 1 – Refers to the bandwidth for which a relaxation of the specified UE receiver sensitivity requirement is allowed.

NOTE 2 – For the 20 MHz bandwidth, the minimum requirements are specified for E-UTRA UL carrier frequencies confined to either 713-723 MHz or 728-738 MHz.

NOTE 3 – Refers to the bandwidth for which the uplink transmission bandwidth can be restricted by the network for some channel assignments in FDD/TDD co-existence scenarios in order to meet unwanted emissions requirements (Clause 4.3).

1.1.2 Channel bandwidths per operating band for CA

The requirements for CA in this specification are defined for CA configurations with associated bandwidth combination sets. For inter-band CA, a *CA configuration* is a combination of operating bands, each supporting a CA bandwidth class. For intra-band contiguous CA, a CA configuration is a single operating band supporting a CA bandwidth class.

For each CA configuration, requirements are specified for all bandwidth combinations contained in a *bandwidth combination set*, which is indicated per supported band combination in the UE radio access capability. A UE can indicate support of several bandwidth combination sets per band combination. Furthermore, if the UE indicates support of a bandwidth combination set that is a superset of another applicable bandwidth combination set, the latter is supported by the UE even if not indicated.

Requirements for intra-band contiguous CA are defined for the CA configurations and bandwidth combination sets specified in Table 1.1.2-1. Requirements for inter-band CA are defined for the CA configurations and bandwidth combination sets specified in Table 1.1.2-2.

The downlink component carrier combinations for a given CA configuration shall be symmetrical in relation to channel centre unless stated otherwise in Table 1.1.2-1 or Table 1.1.2-2.

TABLE 1.1.2-1

**E-UTRA CA configurations and bandwidth combination sets defined for
intra-band contiguous CA**

E-UTRA CA configuration / Bandwidth combination set						
E-UTRA CA configuration	50RB+100RB (10 MHz + 20 MHz)	75RB+75RB (15 MHz + 15 MHz)	75RB+100RB (15 MHz + 20 MHz)	100RB+100RB (20 MHz + 20 MHz)	Maximum aggregated bandwidth (MHz)	Bandwidth combination set
CA_1C		Yes		Yes	40	0
CA_7C		Yes		Yes	40	0
CA_38C		Yes		Yes	40	0
CA_40C	Yes	Yes		Yes	40	0
CA_41C	Yes	Yes	Yes	Yes	40	0

NOTE 1 – The CA Configuration refers to an operating band and a CA bandwidth class specified in Table 1.1.2-4 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.

NOTE 2 – For the supported CC bandwidth combinations, the CC downlink and uplink bandwidths are equal.

TABLE 1.1.2-2

E-UTRA CA configurations and bandwidth combination sets defined for inter-band CA

E-UTRA CA configuration / Bandwidth combination set									
E-UTRA CA configuration	E-UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth (MHz]	Bandwidth combination set
CA_1A-5A	1				Yes			20	0
	5				Yes				
CA_1A-18A	1			Yes	Yes	Yes	Yes	35	0
	18			Yes	Yes	Yes			
CA_1A-19A	1			Yes	Yes	Yes	Yes	35	0
	19			Yes	Yes	Yes			
CA_1A-21A	1			Yes	Yes	Yes	Yes	35	0
	21			Yes	Yes	Yes			
CA_2A-17A	2			Yes	Yes			20	0
	17			Yes	Yes				
CA_2A-29A	2			Yes	Yes			20	0
	29		Yes	Yes	Yes				
CA_3A-5A	3				Yes	Yes	Yes	30	0
	5			Yes	Yes				
	3				Yes			20	1
	5			Yes	Yes				
CA_3A-7A	3			Yes	Yes	Yes	Yes	40	0
	7				Yes	Yes	Yes		

TABLE 1.1.2-2 (end)

E-UTRA CA configuration / Bandwidth combination set									
E-UTRA CA configuration	E-UTRA Bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz	Maximum aggregated bandwidth (MHz)	Bandwidth combination set
CA_3A-8A	3				Yes	Yes	Yes	30	0
	8			Yes	Yes				
	3				Yes			20	1
	8			Yes	Yes				
CA_3A-20A	3			Yes	Yes	Yes	Yes	30	0
	20			Yes	Yes				
CA_4A-5A	4			Yes	Yes			20	0
	5			Yes	Yes				
CA_4A-7A	4			Yes	Yes			30	0
	7			Yes	Yes	Yes	Yes		
CA_4A-12A	4	Yes	Yes	Yes	Yes			20	0
	12			Yes	Yes				
CA_4A-13A	4			Yes	Yes	Yes	Yes	30	0
	13				Yes				
	4			Yes	Yes			20	1
	13				Yes				
CA_4A-17A	4			Yes	Yes			20	0
	17			Yes	Yes				
CA_4A-29A	4			Yes	Yes			20	0
	29		Yes	Yes	Yes				
CA_5A-12A	5			Yes	Yes			20	0
	12			Yes	Yes				
CA_5A-17A	5			Yes	Yes			20	0
	17			Yes	Yes				
CA_7A-20A	7				Yes	Yes	Yes	30	0
	20			Yes	Yes				
CA_8A-20A	8			Yes	Yes			20	0
	20			Yes	Yes				
CA_11A-18A	11			Yes	Yes			25	0
	18			Yes	Yes	Yes			

NOTE 1 – The CA Configuration refers to a combination of an operating band and a CA bandwidth class specified in Table 1.1.2-4 (the indexing letter). Absence of a CA bandwidth class for an operating band implies support of all classes.

NOTE 2 – For each band combination, all combinations of indicated bandwidths belong to the set.

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

TABLE 1.1.2-3

Supported E-UTRA bandwidths for intra-band non-contiguous CA

CA operating band / channel bandwidth							
E-UTRA CA band	E-UTRA bands	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
CA_25A-25A	25			Yes	Yes		

TABLE 1.1.2-4

CA bandwidth classes and corresponding nominal guard bands

CA bandwidth class	Aggregated transmission bandwidth configuration	Maximum number of CC	Nominal guard band BW_{GB}
A	$N_{RB,agg} \leq 100$	1	$0.05 BW_{Channel(1)}$
B	$N_{RB,agg} \leq 100$	2	Under discussion
C	$100 < N_{RB,agg} \leq 200$	2	$0.05 \max(BW_{Channel(1)}, BW_{Channel(2)})$
D	$200 < N_{RB,agg} \leq [300]$	FFS	Under discussion
E	$[300] < N_{RB,agg} \leq [400]$	FFS	Under discussion
F	$[400] < N_{RB,agg} \leq [500]$	FFS	Under discussion

NOTE 1 – $BW_{Channel(1)}$ and $BW_{Channel(2)}$ are channel bandwidths of two E-UTRA component carriers according to Table 1.1-1.

NOTE 2 – The guard bands in the table only apply to the uplink.

2 Definitions, symbols and abbreviations

2.1 Definitions

Aggregated channel bandwidth: The RF bandwidth in which a UE transmits and receives multiple contiguously aggregated carriers.

Aggregated transmission bandwidth configuration: The number of resource block allocated within the aggregated channel bandwidth.

Carrier aggregation: Aggregation of two or more component carriers in order to support wider transmission bandwidths.

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

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

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

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

Channel bandwidth: The RF bandwidth supporting a single E-UTRA RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell. The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

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

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.

Synchronized operation: Operation of TDD in two different systems, where no simultaneous uplink and downlink occur.

Unsynchronized operation: Operation of TDD in two different systems, where the conditions for synchronized operation.

2.2 Symbols

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

$BW_{Channel}$	Channel bandwidth
$BW_{Channel_CA}$	Aggregated channel bandwidth, expressed in MHz
BW_{GB}	Virtual guard band to facilitate transmitter (receiver) filtering above/below edge CCs
E_{RS}	Transmitted energy per RE for reference symbols during the useful part of the symbol, i.e. excluding the cyclic prefix, (average power normalized to the subcarrier spacing) at the eNode B transmit antenna connector
\hat{E}_s	The received energy per RE of the wanted signal during the useful part of the symbol, i.e. excluding the cyclic prefix, averaged across the allocated RB(s) (average power within the allocated RB(s), divided by the number of RE within this allocation, and normalized to the subcarrier spacing) at the UE antenna connector
F	Frequency
$F_{Interferer}$ (offset)	Frequency offset of the interferer
$F_{Interferer}$	Frequency of the interferer
F_C	Frequency of the carrier centre frequency
F_{CA_low}	The centre frequency of the <i>lowest carrier</i> (MHz)
F_{CA_high}	The centre frequency of the <i>highest carrier</i> (MHz)
F_{DL_low}	The lowest frequency of the downlink operating band
F_{DL_high}	The highest frequency of the downlink operating band
F_{UL_low}	The lowest frequency of the uplink operating band
F_{UL_high}	The highest frequency of the uplink operating band
F_{edge_low}	The <i>lower edge</i> of aggregated channel bandwidth (MHz)
F_{edge_high}	The <i>higher edge</i> of aggregated channel bandwidth (MHz)
F_{offset}	Frequency offset from F_{C_high} to the <i>higher edge</i> or F_{C_low} to the <i>lower edge</i>

I_o	The power spectral density of the total input signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector, including the own-cell downlink signal
I_{or}	The total transmitted power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the eNode B transmit antenna connector
\hat{I}_{or}	The total received power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector
I_{ot}	The received power spectral density of the total noise and interference for a certain RE (average power obtained within the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector
L_{CRB}	The length of a contiguous resource block allocation
N_{cp}	Cyclic prefix length
N_{DL}	Downlink EARFCN
N_{oc}	The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing), simulating interference from cells that are not defined in a test procedure, as measured at the UE antenna connector
N_{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 normalised to the subcarrier spacing), simulating interference in non-ABS subframe from cells that are not defined in a test procedure, as measured at the UE antenna connector
$N_{Offs-DL}$	Offset used for calculating downlink EARFCN
$N_{Offs-UL}$	Offset used for calculating uplink EARFCN
N_{otx}	The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing) simulating eNode B transmitter impairments as measured at the eNode B transmit antenna connector
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_{RB_alloc}	Total number of simultaneously transmitted resource blocks in aggregated channel bandwidth configuration
N_{UL}	Uplink EARFCN
R_{av}	Minimum average throughput per RB
P_{CMAX}	The configured maximum UE output power

$P_{CMAX,c}$	The configured maximum UE output power for serving cell c
P_{EMAX}	Maximum allowed UE output power signalled by higher layers
$P_{EMAX,c}$	Maximum allowed UE output power signalled by higher layers for serving cell c
$P_{Interferer}$	Modulated mean power of the interferer
$P_{PowerClass}$	Nominal UE power (i.e., no tolerance)
P_{UMAX}	The measured configured maximum UE output power
RB_{start}	Indicates the lowest RB index of transmitted resource blocks
Δf_{OoB}	Δ Frequency of out-of-band emission
$\Delta R_{IB,c}$	Allowed reference sensitivity relaxation due to support for inter-band CA operation, for serving cell c
$\Delta T_{IB,c}$	Allowed maximum configured output power relaxation due to support for inter-band CA operation, for serving cell c
ΔT_C	Allowed operating band edge transmission power relaxation
$\Delta T_{C,c}$	Allowed operating band edge transmission power relaxation for serving cell c

2.3 Abbreviations

ABS	Almost blank subframe
ACLR	Adjacent channel leakage ratio
ACS	Adjacent channel selectivity
A-MPR	Additional maximum power reduction
AWGN	Additive white gaussian noise
BS	Base station
CA	Carrier aggregation
CA_X	CA for band X where X is the applicable E-UTRA operating band
CA_X-Y	CA for band X and Band Y where X and Y are the applicable E-UTRA operating band
CC	Component carriers
CPE	Customer premise equipment
CPE_X	Customer premise equipment for E-UTRA operating band X
CW	Continuous wave
DL	Downlink
DIP	Dominant interferer proportion
eDL-MIMO	Down link multiple antenna transmission
EARFCN	E-UTRA absolute radio frequency channel number
EPRE	Energy per resource element
E-UTRA	Evolved UMTS terrestrial radio access
EUTRAN	Evolved UMTS terrestrial radio access network
EVM	Error vector magnitude
FDD	Frequency division duplex
FRC	Fixed reference channel
HD-FDD	Half-duplex FDD

MBW	Measurement bandwidth
MCS	Modulation and coding scheme
MOP	Maximum output power
MPR	Maximum power reduction
MSD	Maximum sensitivity degradation
OCNG	OFDMA channel noise generator
OFDMA	Orthogonal frequency division multiple access
OoB	Out-of-band
PA	Power amplifier
PCC	Primary component carrier
P-MPR	Power management maximum power reduction
PSS	Primary synchronization signal
PSS_RA	PSS-to-RS EPRE ratio for the channel PSS
RE	Resource element
REFSENS	Reference sensitivity power level
r.m.s	Root mean square
SCC	Secondary component carrier
SEM	Spectrum emission mask
SINR	Signal-to-interference-and-noise ratio
SNR	Signal-to-noise ratio
SSS	Secondary synchronization signal
SSS_RA	SSS-to-RS EPRE ratio for the channel SSS
TDD	Time division duplex
UE	User equipment
UL	Uplink
UL-MIMO	Up link multiple antenna transmission
UMTS	Universal mobile telecommunications system
UTRA	UMTS terrestrial radio access
UTRAN	UMTS terrestrial radio access network
xCH_RA	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols not containing RS
xCH_RB	xCH-to-RS EPRE ratio for the channel xCH in all transmitted OFDM symbols containing RS

3 Generic unwanted emission characteristics

TABLE 3-1

Additional emission requirements indicated by network signalling (NS) values

Network signalling value	Requirements (subclause)	E-UTRA Band	Channel bandwidth (MHz)
NS_01	N/A (Note 1)	Table 1-1	1.4, 3, 5, 10, 15, 20
NS_03	3.1.4.1	2, 4,10, 23, 25, 35, 36	3
			5
			10
			15
			20
NS_04	3.1.4.2	41	5
			10, 15, 20
NS_05	4.5.1	1	10,15,20
NS_06	3.1.4.3	12, 13, 14, 17	1.4, 3, 5, 10
NS_07	3.1.4.3	13	10
	4.5.2		
NS_08	4.5.3	19	10, 15
NS_09	4.5.4	21	10, 15
NS_10		20	15, 20
NS_11	3.1.4.1	23	1.4, 3, 5, 10, 15, 20
NS_12	4.5.5	26	1.4, 3, 5
NS_13	4.5.6	26	5
NS_14	4.5.7	26	10, 15
NS_15	4.5.8	26	1.4, 3, 5, 10, 15
NS_16	4.5.9	27	3, 5, 10
NS_17	4.5.10	28	5, 10
NS_18	4.5.11	28	5
			10, 15, 20
NS_19	4.5.12	44	10, 15, 20
NS_20	3.1.4.1	23	5, 10, 15, 20
...			
NS_32	-	-	-

NOTE – The signalling is for purposes other than additional emission requirements.

TABLE 3-2

Additional emission requirements for CA indicated by NS values

CA NS value	Requirements (sub-clause)	Uplink CA configuration
CA_NS_01	4.6.1	CA_1C
CA_NS_02	4.6.2	CA_1C
CA_NS_03	4.6.3	CA_1C
CA_NS_04	3.1.5.1	CA_41C
CA_NS_05	4.4	CA_38C
CA_NS_06	4.4	CA_7C

3.1 Spectrum emission mask

The output UE transmitter spectrum consists of the three components; the emission within the occupied bandwidth (channel bandwidth), the OoB emissions and the far-out spurious emission domain.

The spectrum emission mask of the MS applies to frequencies (Δf_{OoB}) starting from the \pm edges of the assigned E-UTRA channel bandwidth. For frequencies greater than (Δf_{OoB}) as specified in Tables 3.1.1-1 and 3.1.1-2 the spurious requirements in clause 4 are applicable.

3.1.1 General spectrum emission mask

The power of any MS emission shall not exceed the levels specified in Table 3.1.1-1 or Table 3.1.1-2 for the specified channel bandwidths.

TABLE 3.1.1-1

E-UTRA spectrum emission mask, E-UTRA bands \leq 3 GHz

Δf_{OoB} (MHz)	Spectrum emission limit (dBm)/channel bandwidth						
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	MBW
$\pm 0-1$	-8.5	-11.5	-13.5	-16.5	-18.5	-19.5	30 kHz
$\pm 1-2.5$	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	1 MHz
$\pm 2.5-2.8$	-23.5	-8.5	-8.5	-8.5	-8.5	-8.5	1 MHz
$\pm 2.8-5$		-8.5	-8.5	-8.5	-8.5	-8.5	1 MHz
$\pm 5-6$		-23.5	-11.5	-11.5	-11.5	-11.5	1 MHz
$\pm 6-10$			-23.5	-11.5	-11.5	-11.5	1 MHz
$\pm 10-15$				-23.5	-11.5	-11.5	1 MHz
$\pm 15-20$					-23.5	-11.5	1 MHz
$\pm 20-25$						-23.5	1 MHz

MBW – measurement bandwidth

TABLE 3.1.1-2

E-UTRA spectrum emission mask, 3 GHz < E-UTRA bands ≤ 4.2 GHz

Δf_{oB} (MHz)	Spectrum emission limit (dBm)/Channel bandwidth						
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	MBW
±0-1	-8.2	-11.2	-13.2	-16.2	-18.2	-19.2	30 kHz
±1-2.5	-8.2	-8.2	-8.2	-8.2	-8.2	-8.2	1 MHz
±2.5-2.8	-23.2	-8.2	-8.2	-8.2	-8.2	-8.2	1 MHz
±2.8-5		-8.2	-8.2	-8.2	-8.2	-8.2	1 MHz
±5-6		-23.2	-11.2	-11.2	-11.2	-11.2	1 MHz
±6-10			-23.2	-11.2	-11.2	-11.2	1 MHz
±10-15				-23.2	-11.2	-11.2	1 MHz
±15-20					-23.2	-11.2	1 MHz
±20-25						-23.2	1 MHz

NOTE – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the MBW. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the MBW. When the resolution bandwidth is smaller than the MBW, the result should be integrated over the MBW in order to obtain the equivalent noise bandwidth of the MBW.

3.1.2 Spectrum emission mask for CA

For inter-band carrier aggregation with uplink assigned to one E-UTRA band, the power of any UE emission shall not exceed the levels specified in Table 3.1.2-1 or Table 3.1.2-2.

For intra-band contiguous carrier aggregation the spectrum emission mask of the UE applies to frequencies (Δf_{oB}) starting from the ± edge of the aggregated channel bandwidth (Table 1.1.2-4) For intra-band contiguous carrier aggregation the bandwidth class C (Table 1.1.2-4), the power of any UE emission shall not exceed the levels specified in Table 3.1.2-1 or Table 3.1.2-2 for the specified channel bandwidth.

TABLE 3.1.2-1

General E-UTRA spectrum emission mask CA BW Class C, E UTRA bands ≤ 3 GHz

Spectrum emission limit (dBm)/ $BW_{Channel_CA}$					
Δf_{oB} (MHz)	50RB+100RB (29.9 MHz)	75RB+75RB (30 MHz)	75RB+100RB (34.85 MHz)	100RB+100RB (39.8 MHz)	MBW
± 0-1	-21	-21	-22	-22.5	30 kHz
± 1-5	-8.5	-8.5	-8.5	-8.5	1 MHz
± 5-29.9	-11.5	-11.5	-11.5	-11.5	1 MHz
± 29.9-30	-23.5	-23.5	-23.5	-23.5	1 MHz
± 30-34.85					1 MHz
± 34.85-34.9					1 MHz
± 34.9-35					1 MHz
± 35-39.8					1 MHz

TABLE 3.1.2-1 (end)

Spectrum emission limit (dBm)/ $BW_{Channel_CA}$					
Δf_{oB} (MHz)	50RB+100RB (29.9 MHz)	75RB+75RB (30 MHz)	75RB+100RB (34.85 MHz)	100RB+100RB (39.8 MHz)	MBW
±39.8-39.85				-23.5	1 MHz
±39.85-44.8					1 MHz

TABLE 3.1.2-2

General E-UTRA spectrum emission mask CA BW Class C, 3GHz < E-UTRA bands ≤ 4.2 GHz

Spectrum emission limit (dBm)/ $BW_{Channel_CA}$					
Δf_{oB} (MHz)	50RB+100RB (29.9 MHz)	75RB+75RB (30 MHz)	75RB+100RB (34.85 MHz)	100RB+100RB (39.8 MHz)	MBW
± 0-1	-20.7	-20.7	-21.7	-22.2	30 kHz
± 1-5	-8.2	-8.2	-8.2	-8.2	1 MHz
± 5-29.9	-11.2	-11.2	-11.2	-11.2	1 MHz
± 29.9-30	-23.2				1 MHz
± 30-34.85		-23.2	1 MHz		
± 34.85-34.9		-23.2	1 MHz		
± 34.9-35			1 MHz		
± 35-39.8			1 MHz		
±39.8-39.85				-23.2	1 MHz
± 39.85-44.8					1 MHz

TABLE 3.1.2-3

UL-MIMO configuration in closed-loop spatial multiplexing scheme

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

3.1.3 Additional spectrum emission mask

Additional spectrum emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message. See Table 3-1.

3.1.3.1 Additional E-UTRAN spectrum emission with NS value of “NS_03”, “NS_11” and “NS_20”

When “NS_03” or “NS_11” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Tables 3.1.3.1-1 and 3.1.3.1-2.

TABLE 3.1.3.1-1

Additional requirements, E-UTRA bands ≤ 3 GHz

Spectrum emission limit (dBm)/Channel bandwidth								
Δf_{oB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	MBW	
0-1	-8.5	-11.5	-13.5	-16.5	-18.5	-19.5	30 kHz	
1-2.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	1 MHz	
2.5-2.8	-23.5						1 MHz	
2.8-5							1 MHz	
5-6							-23.5	1 MHz
6-10								-23.5
10-15				-23.5			1 MHz	
15-20					-23.5		1 MHz	
20-25						-23.5	1 MHz	

NOTE 1 – The first and last measurement position with a 30 kHz filter is at Δf_{oB} 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 -0.5MHz, respectively.

NOTE 3 – The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4 – Above spectrum emission mask (SEM) requirement applies to bands corresponding to NS value NS_03 as defined in Table 3-1.

NOTE 5 – For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at Δf_{oB} equals to 3 MHz.

TABLE 3.1.3.1-2

Additional requirements, 3 GHz < E-UTRA bands ≤ 4.2 GHz

Spectrum emission limit (dBm)/Channel bandwidth								
Δf_{oB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	MBW	
0-1	-8.2	-11.2	-13.2	-16.2	-18.2	-19.2	30 kHz	
1-2.5	-11.2	-11.2	-11.2	-11.2	-11.2	-11.2	1 MHz	
2.5-2.8	-23.2						1 MHz	
2.8-5							1 MHz	
5-6							-23.2	1 MHz
6-10								-23.2
10-15				-23.2			1 MHz	
15-20					-23.2		1 MHz	

TABLE 3.1.3.1-2 (*end*)

Spectrum emission limit (dBm)/Channel bandwidth							
Δf_{oB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	MBW
20-25						-23.2	1 MHz

NOTE 1 – The first and last measurement position with a 30 kHz filter is at Δf_{oB} 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 +0.5MHz and -0.5MHz, respectively.

NOTE 3 – The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4 – Above SEM requirement applies to bands corresponding to NS value NS_03 as defined in Table 3-1.

NOTE 5 – For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at Δf_{oB} equals to 3 MHz.

NOTE – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the MBW. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the MBW. When the resolution bandwidth is smaller than the MBW, the result should be integrated over the MBW in order to obtain the equivalent noise bandwidth of the MBW.

3.1.3.2 Additional E-UTRAN spectrum emission with NS value of “NS_04”

When “NS_04” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Tables 3.1.3.2-1 and 3.1.3.2-2.

TABLE 3.1.3.2-1

Additional requirements, E-UTRA bands ≤ 3 GHz

Spectrum emission limit (dBm)/Channel bandwidth							
Δf_{oB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	MBW
0-1	-8.5	-11.5	-13.5	-16.5	-18.5	-19.5	30 kHz
1-2.5	-11.5	-11.5	-11.5	-11.5	-11.5	-11.5	1 MHz
2.5-2.8	-23.5						1 MHz
2.8-5							1 MHz
5-6		-23.5	-23.5	-23.5	-23.5	-23.5	1 MHz
6-10							1 MHz
10-15							1 MHz
15-20							1 MHz
20-25							1 MHz

NOTE 1 – The first and last measurement position with a 30 kHz filter is at Δf_{oB} 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 are to be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4 – Above SEM requirement applies to bands corresponding to NS value NS_04 as defined in Table 3-1.

NOTE 5 – For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at Δf_{oB} equals to 3 MHz.

TABLE 3.1.3.2-2

Additional requirements, 3 GHz < E-UTRA bands ≤ 4.2 GHz

Spectrum emission limit (dBm)/Channel bandwidth							
Δf_{oB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	MBW
0-1	-8.2	-11.2	-13.2	-16.2	-18.2	-19.2	30 kHz
1-2.5	-11.2	-11.2	-11.2	-11.2	-11.2	-11.2	1 MHz
2.5-2.8	-23.2						1 MHz
2.8-5							1 MHz
5-6		-23.2	-23.2	-23.2	-23.2	-23.2	1 MHz
6-10							1 MHz
10-15							1 MHz
15-20							1 MHz
20-25							1 MHz

NOTE 1 – The first and last measurement position with a 30 kHz filter is at Δf_{oB} 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 are to be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4 – Above SEM requirement applies to bands corresponding to NS value NS_04 as defined in Table 3-1.

NOTE 5 – For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at Δf_{oB} equals to 3 MHz.

NOTE – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the MBW. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the MBW. When the resolution bandwidth is smaller than the MBW, the result should be integrated over the MBW in order to obtain the equivalent noise bandwidth of the MBW.

3.1.3.3 Additional E-UTRAN spectrum emission with NS value of “NS_06” or “NS_07”

When “NS_06” or “NS_07” are indicated in the cell, the power of any UE emission shall not exceed the levels specified in Tables 3.1.3.3-1 and 3.1.3.3-2.

TABLE 3.1.3.3-1

Additional requirements, E-UTRA bands ≤ 3 GHz

Spectrum emission limit (dBm)/Channel bandwidth					
Δf_{oB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	MBW
0-0.1	-11.5	-11.5	-13.5	-16.5	30 kHz
0.1-1	-11.5	-11.5	-11.5	-11.5	100 kHz
1-2.5	-11.5	-11.5	-11.5	-11.5	1 MHz
2.5-2.8	-23.5				1 MHz
2.8-5					1 MHz
5-6	-23.5				1 MHz
6-10			-23.5		1 MHz
10-15				-23.5	1 MHz

NOTE 1 – The first and last measurement position with a 30 kHz filter is at Δf_{oB} equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at Δf_{oB} equals to 0.15 MHz and 0.95 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 +0.5MHz and -0.5 MHz, respectively.

NOTE 3 – The measurements are to be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4 – Above SEM requirement applies to bands corresponding to NS value NS_06 and NS_07 as defined in Table 3-1.

NOTE 5 – For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at Δf_{oB} equals to 3 MHz.

TABLE 3.1.3.3-2

Additional requirements, 3GHz < E-UTRA bands ≤ 4.2 GHz

Spectrum emission limit (dBm)/Channel bandwidth					
Δf_{oB} (MHz)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	MBW
0-0.1	-11.2	-11.2	-13.2	-16.2	30 kHz
0.1-1	-11.2	-11.2	-11.2	-11.2	100 kHz
1-2.5	-11.2	-11.2	-11.2	-11.2	1 MHz
2.5-2.8	-23.2				1 MHz
2.8-5					1 MHz
5-6	-23.2				1 MHz
6-10			-23.2		1 MHz
10-15				-23.2	1 MHz

NOTE 1 – The first and last measurement position with a 30 kHz filter is at Δf_{oB} equals to 0.015 MHz and 0.085 MHz. The first and last measurement position with a 100 kHz filter is at Δf_{oB} equals to 0.15 MHz and 0.95 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 are to be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4 – Above SEM requirement applies to bands corresponding to NS value NS_06 and NS_07 as defined in Table 3-1.

NOTE 5 – For the 2.5-2.8 MHz offset range with 1.4 MHz channel bandwidth, the measurement position is at Δf_{oB} equals to 3 MHz.

NOTE – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the MBW. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the MBW. When the resolution bandwidth is smaller than the MBW, the result should be integrated over the MBW in order to obtain the equivalent noise bandwidth of the MBW.

3.1.4 Additional spectrum emission mask for CA

Additional spectrum emission requirements for CA are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message. See Table 3-2.

3.1.4.1 Additional E-UTRAN spectrum emission mask for CA with NS value of “CA_NS_04”

When “CA_NS_04” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 3.1.4.1-1.

TABLE 3.1.4.1-1
Additional requirements

Spectrum emission limit (dBm)/ $BW_{Channel_CA}$					
Δf_{oob} (MHz)	50+100RB (29.9 MHz)	75+75B (30 MHz)	75+100RB (34.85 MHz)	100+100RB (39.8 MHz)	MBW
± 0-1	-21	-21	-22	-22.5	30 kHz
± 1-5.5	-11.5	-11.5	-11.5	-11.5	1 MHz
± 5.5-34.9	-23.5	-23.5	-23.5	-23.5	1 MHz
± 34.9-35		-23.5	-23.5	-23.5	1 MHz
± 35-39.85			-23.5	-23.5	1 MHz
± 39.85-44.8				-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 – 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 are to be performed above the upper edge of the channel and below the lower edge of the channel.

NOTE 4 – Above SEM requirement applies to bands corresponding to NS value CA_NS_04 as defined in Table 3-2.

NOTE – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the MBW. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the MBW. When the resolution bandwidth is smaller than the MBW, the result should be integrated over the MBW in order to obtain the equivalent noise bandwidth of the MBW.

3.2 Adjacent channel leakage ratio

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

3.2.1 E-UTRA ACLR

E-UTRA adjacent channel leakage power ratio ($E-UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. The assigned E-UTRA channel power and adjacent E-UTRA channel power are measured with rectangular filters with MBW specified in Table 3.2.1-1 and Table 3.2.1-2. If the measured adjacent channel power is greater than -50 dBm then the $E-UTRA_{ACLR}$ shall be higher than the value specified in Table 3.2.1-1 and Table 3.2.1-2.

TABLE 3.2.1-1

General requirements for $E\text{-UTRA}_{ACLR}$ for UE's with 23 dBm output power

Channel bandwidth / $E\text{-UTRA}_{ACLR1}$ / MBW						
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
$E\text{-UTRA}_{ACLR1}$	29.2 dB	29.2 dB	29.2 dB	29.2 dB	29.2 dB	29.2 dB
E-UTRA channel MBW	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 -15MHz	+20 MHz or -20 MHz

TABLE 3.2.1-2

Additional $E\text{-UTRA}_{ACLR}$ requirements UE's with 31dBm output power
(applicable for operating band 14 only)

	Channel bandwidth / $E\text{-UTRA}_{ACLR1}$ / MBW					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
$E\text{-UTRA}_{ACLR1}$			37 dB	37 dB		
E-UTRA channel MBW			4.5 MHz	9.0 MHz		
Adjacent channel centre frequency offset (MHz)			+5/-5	+10/-10		

NOTE – $E\text{-UTRA}_{ACLR1}$ shall be applicable for >23 dBm.

3.2.2 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(s) 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 Radio resource Control (RRC) bandwidth filter with roll-off factor $\alpha = 0.22$. The assigned E-UTRA channel power is measured with a rectangular filter with MBW specified in Table 3.1.1-1. If the measured UTRA channel power is greater than -50dBm then the $UTRA_{ACLR}$ shall be higher than the value specified in Table 3.2.2-1.

TABLE 3.2.2-1

General requirements for $UTRA_{ACLR1/2}$

	Channel bandwidth / $UTRA_{ACLR1/2}$ / MBW					
	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 (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 (MHz)	–	–	$2.5+3*BW_{UTRA}/2$ / $-2.5-3*BW_{UTRA}/2$	$5+3*BW_{UTRA}/2$ / $-5-3*BW_{UTRA}/2$	$7.5+3*BW_{UTRA}/2$ / $-7.5-3*BW_{UTRA}/2$	$10+3*BW_{UTRA}/2$ / $-10-3*BW_{UTRA}/2$
E-UTRA channel MBW	1.08 MHz	2.7 MHz	4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
UTRA 5MHz channel MBW ¹	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz
UTRA 1.6MHz channel MBW ²	1.28 MHz	1.28 MHz	1.28 MHz	1.28 MHz	1.28 MHz	1.28 MHz

NOTE 1 – Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.

NOTE 2 – Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.

NOTE 3 – BW_{UTRA} for UTRA FDD is 5MHz and for UTRA TDD is 1.6 MHz.

3.2.3 UTRA ACLR for CA

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

$UTRA_{ACLR}$ 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 aggregated channel bandwidth power is measured with a rectangular filter with MBW specified in Table 3.2.3-1. If the measured UTRA channel power is greater than -50 dBm then the $UTRA_{ACLR}$ shall be higher than the value specified in Table 3.2.3-1.

TABLE 3.2.3-1

General requirements for $UTRA_{ACLR1/2}$

	CA bandwidth class / $UTRA_{ACLR1/2}$ / MBW
	CA bandwidth class C (Table 1.1.2-4)
$UTRA_{ACLR1}$	32.2 dB
Adjacent channel centre frequency offset (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 (MHz)	$\frac{+ BW_{Channel_CA} / 2 + 3 * BW_{UTRA} / 2}{- W_{Channel_CA} / 2 - 3 * BW_{UTRA} / 2}$
CA E-UTRA channel MBW	$BW_{Channel_CA} - 2 * BW_{GB}$
UTRA 5 MHz channel MBW (Note 1)	3.84 MHz
UTRA 1.6 MHz channel MBW (Note 2)	1.28 MHz

NOTE 1 – Applicable for E-UTRA FDD co-existence with UTRA FDD in paired spectrum.

NOTE 2 – Applicable for E-UTRA TDD co-existence with UTRA TDD in unpaired spectrum.

3.2.4 CA E- $UTRA_{ACLR}$

For intra-band contiguous carrier aggregation the carrier aggregation E-UTRA (CA E- $UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent aggregated channel bandwidth at nominal channel spacing. The assigned aggregated channel bandwidth power and adjacent aggregated channel bandwidth power are measured with rectangular filters with MBW specified in Table 3.2.4-1. If the measured adjacent channel power is greater than -50 dBm then the E- $UTRA_{ACLR}$ shall be higher than the value specified in Table 3.2.4-1.

TABLE 3.2.4-1

General requirements for CA E- $UTRA_{ACLR}$

	CA bandwidth class / CA E- $UTRA_{ACLR}$ / MBW
	CA bandwidth class C (Table 1.1.2-4)
CA E- $UTRA_{ACLR}$	29.2 dB
CA E-UTRA channel MBW	$BW_{Channel_CA} - 2 * BW_{GB}$
Adjacent channel centre frequency offset (MHz)	$\frac{+ BW_{Channel_CA}}{- BW_{Channel_CA}}$

3.3 Out of band emission mask for UL-MIMO

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

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in § 3 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 3.1.3-1.

For single-antenna port scheme, the requirements in § 3 apply.

4 Transmitter spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products, but exclude OoB emissions unless otherwise stated. The spurious emission limits are specified in terms of general requirements in line with Recommendation ITU-R SM.329 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 MBW. When the resolution bandwidth is smaller than the MBW, the result should be integrated over the MBW in order to obtain the equivalent noise bandwidth of the MBW.

4.1 General spurious emissions requirements

Unless otherwise stated, the spurious emission limits apply for the frequency ranges that are more than Δf_{OoB} (MHz) in Table 4.1-1 from the edge of the channel bandwidth. The spurious emission limits in Table 4.1-2 apply for all transmitter band configurations, N_{RB} , and channel bandwidths.

TABLE 4.1-1

Boundary between E-UTRA Δf_{OoB} 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 – In order that the measurement of spurious emissions falls within the frequency ranges that are more than Δf_{OoB} (MHz) from the edge of the channel bandwidth, the minimum offset of the measurement frequency from each edge of the channel should be $\Delta f_{OoB} + MBW/2$. MBW denotes the MBW defined in Table 4.1-2.

TABLE 4.1-2

Spurious emissions limits

Frequency range	Maximum level	MBW	Notes
$9 \text{ kHz} \leq f < 150 \text{ kHz}$	−36 dBm	1 kHz	
$150 \text{ kHz} \leq f < 30 \text{ MHz}$	−36 dBm	10 kHz	
$30 \text{ MHz} \leq f < 1 \text{ 000 MHz}$	−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	Note 1

NOTE – Applies for Band 22, Band 42 and Band 43.

4.2 Spurious emissions requirements for CA

For intra-band contiguous carrier aggregation the spurious emission limits apply for the frequency ranges that are more than Δf_{oB} (MHz) in Table 4.2-1 from the \pm edge of the aggregated channel bandwidth. For frequencies Δf_{oB} greater than F_{oB} as specified in Table 4.2-1 the spurious requirements in Table 4-2 are applicable.

TABLE 4.2-1

Boundary between E-UTRA Δf_{oB} and spurious emission domain for intra-band contiguous carrier aggregation

CA bandwidth class	OoB boundary F_{oB} (MHz)
A	Table 4-1
B	Under discussion
C	$BW_{\text{Channel_CA}} + 5$

NOTE: See Table 1.1.2-4 for CA bandwidth class definitions.

4.3 Spurious emission band UE co-existence

This clause specifies the requirements for the specified E-UTRA band, for coexistence with protected bands.

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

TABLE 4.3-1

Spurious emissions band UE co-existence limits

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
1	E-UTRA Band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 38, 40, 41, 42, 43, 44	F_{DL_low}	–	F_{DL_high}	–50	1	
	E-UTRA Band 3, 34	F_{DL_low}	–	F_{DL_high}	–50	1	15
	Frequency range	1 880		1 895	–40	1	15,27
	Frequency range	1 895		1 915	–15.5	5	15, 26, 27
	Frequency range	1 915		1 920	+1.6	5	15, 26, 27
	Frequency range	1 884.5	–	1 915.7	–41	0.3	6, 8, 15
	Frequency range	1 839.9	–	1 879.9	–50	1	15
2	E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 26, 27, 28, 29, 41, 42	F_{DL_low}	–	F_{DL_high}	–50	1	
	E-UTRA Band 2, 25	F_{DL_low}	–	F_{DL_high}	–50	1	15
	E-UTRA Band 43	F_{DL_low}	–	F_{DL_high}	–50	1	2

TABLE 4.3-1 (cont.)

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
3	E-UTRA Band 1, 7, 8, 20, 26, 27, 28, 33, 34, 38, 41, 43, 44	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 3	F _{DL_low}	–	F _{DL_high}	–50	1	15
	E-UTRA Band 11, 18, 19, 21	F _{DL_low}	–	F _{DL_high}	–50	1	13
	E-UTRA Band 22, 42	F _{DL_low}	–	F _{DL_high}	–50	1	2
	Frequency range	1 884.5	–	1 915.7	–41	0.3	13
4	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 26, 27, 28, 29, 41, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 42	F _{DL_low}	–	F _{DL_high}	–50	1	2
5	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 25, 28, 29, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 41	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA Band 26	859	–	869	–27	1	
6	E-UTRA Band 1, 9, 11, 34	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	860	–	875	–37	1	
	Frequency range	875	–	895	–50	1	
	Frequency range	1 884.5	–	1 919.6	–41	0.3	7
		1 884.5	–	1 915.7			8
7	E-UTRA Band 1, 3, 7, 8, 20, 22, 27, 28, 29, 33, 34, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	2 570	–	2 575	+1.6	5	15, 21, 26
	Frequency range	2 575	–	2 595	–15.5	5	15, 21, 26
	Frequency range	2 595	–	2 620	–40	1	15, 21
8	E-UTRA Band 1, 20, 28, 33, 34, 38, 39, 40	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 3	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA band 7	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA Band 8	F _{DL_low}	–	F _{DL_high}	–50	1	15
	E-UTRA Band 22, 41, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA Band 11, 21	F _{DL_low}	–	F _{DL_high}	–50	1	23
	Frequency range	860	–	890	–40	1	15, 23
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8, 23
9	E-UTRA Band 1, 11, 18, 19, 21, 26, 28, 34	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8
	Frequency range	945	–	960	–50	1	
	Frequency range	1 839.9	–	1 879.9	–50	1	
	Frequency range	2 545	–	2 575	–50	1	

TABLE 4.3-1 (cont.)

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
10	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 41, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 22, 42	F _{DL_low}	–	F _{DL_high}	–50	1	2
11	E-UTRA Band 1, 11, 18, 19, 21, 28, 34	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8
	Frequency range	945	–	960	–50	1	
	Frequency range	1 839.9	–	1 879.9	–50	1	
	Frequency range	2 545	–	2 575	–50	1	
12	E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 41	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 4, 10	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA Band 12	F _{DL_low}	–	F _{DL_high}	–50	1	15
13	E-UTRA Band 2, 4, 5, 10, 12, 13, 17, 23, 25, 26, 27, 29, 41	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	769	–	775	–35	0.00625	15
	Frequency range	799	–	805	–35	0.00625	11, 15
	E-UTRA Band 14	F _{DL_low}	–	F _{DL_high}	–50	1	15
	E-UTRA Band 24	F _{DL_low}	–	F _{DL_high}	–50	1	2
14	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 41	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	769	–	775	–35	0.00625	12, 15
	Frequency range	799	–	805	–35	0.00625	11, 12, 15
17	E-UTRA Band 2, 5, 13, 14, 17, 23, 24, 25, 26, 27, 41	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 4, 10	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA Band 12	F _{DL_low}	–	F _{DL_high}	–50	1	15
18	E-UTRA Band 1, 11, 21, 34	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	860	–	890	–40	1	
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8
	Frequency range	758	–	799	–50	1	
	Frequency range	799	–	803	–40	1	15
	Frequency range	945	–	960	–50	1	
	Frequency range	1 839.9	–	1 879.9	–50	1	
	Frequency range	2 545	–	2 575	–50	1	

TABLE 4.3-1 (cont.)

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
19	E-UTRA Band 1, 11, 21, 28, 34	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	860	–	890	–40	1	9, 15
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8
	Frequency range	945	–	960	–50	1	
	Frequency range	1 839.9	–	1 879.9	–50	1	
	Frequency range	2 545	–	2 575	–50	1	
20	E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 20	F _{DL_low}	–	F _{DL_high}	–50	1	15
	E-UTRA Band 38, 42	F _{DL_low}	–	F _{DL_high}	–50	1	2
21	E-UTRA Band 11	F _{DL_low}	–	F _{DL_high}	–35	1	10, 15
	E-UTRA Band 1, 18, 19, 28, 34	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 21	F _{DL_low}	–	F _{DL_high}	–50	1	10
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8
	Frequency range	945	–	960	–50	1	
	Frequency range	1 839.9	–	1 879.9	–50	1	
	Frequency range	2 545	–	2 575	–50	1	
22	E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 33, 34, 38, 39, 40, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	3 510	–	3 525	–40	1	15
	Frequency range	3 525	–	3 590	–50	1	
23	E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 23, 24, 26, 27, 29, 41	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 2	F _{DL_low}	–	F _{DL_high}	–50	1	14, 15
	Frequency range	1 998	–	1 999	–21	1	14, 15
	Frequency range	1 997	–	1 998	–27	1	14, 15
	Frequency range	1 996	–	1 997	–32	1	14, 15
	Frequency range	1 995	–	1 996	–37	1	14, 15
	Frequency range	1 990	–	1 995	–40	1	14, 15
	Frequency range	1 990		1 999	–40	1	15, 28
	Frequency range	1 999		2 000	–40	Note 29	15, 28
24	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 23, 24, 25, 26, 29, 41	F _{DL_low}	–	F _{DL_high}	–50	1	
25	E-UTRA Band 4, 5, 10, 12, 13, 14, 17, 22, 23, 24, 26, 27, 28, 29, 41, 42	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 2	F _{DL_low}	–	F _{DL_high}	–50	1	15
	E-UTRA Band 25	F _{DL_low}	–	F _{DL_high}	–50	1	15
	E-UTRA Band 43	F _{DL_low}	–	F _{DL_high}	–50	1	2

TABLE 4.3-1 (cont.)

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
26	E-UTRA Band 1, 2, 3, 4, 5, 10, 11, 12, 13, 14, 17, 18,19, 21, 22, 23, 24, 25, 26, 29, 34, 40, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 41	F _{DL_low}	–	F _{DL_high}	–50	1	2
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8
	Frequency range	703	–	799	–50	1	
		799	–	803	–40	1	15
	Frequency range	851	–	859	–53	0.00625	20
	E-UTRA Band 27	F _{DL_low}	–	859	–32	1	20
	Frequency range	945	–	960	–50	1	
Frequency range	1 839.9	–	1 879.9	–50	1		
27	E-UTRA Band 1, 2, 3, 4, 5, 7, 10, 12, 13, 14, 17, 22, 23, 25, 26, 27, 29, 41, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	799	–	805	–35	0.00625	
	E-UTRA Band 28	790	–	F _{DL_high}	–32	1	16
		F _{DL_low}	–	790	–50	1	
28	E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 25, 26, 27, 34, 38, 41	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 1, 4, 10, 22, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA Band 11, 21	F _{DL_low}	–	F _{DL_high}	–50	1	19, 24
	E-UTRA Band 1	F _{DL_low}	–	F _{DL_high}	–50	1	19, 25
	Frequency range	758	–	773	–32	1	15
	Frequency range	773	–	803	–50	1	
	Frequency range	662	–	694	–26.2	6	15
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8, 19
Frequency range	1 839.9	–	1 879.9	–50	1		
...							
33	E-UTRA Band 1, 7, 8, 20, 22, 34, 38, 39, 40, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	5
	E-UTRA Band 3	F _{DL_low}	–	F _{DL_high}	–50	1	15
34	E-UTRA Band 1, 3, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 33, 38,39, 40, 41, 42, 43, 44	F _{DL_low}	–	F _{DL_high}	–50	1	5
	Frequency range	1 884.5	–	1 915.7	–41	0.3	8
	Frequency range	1 839.9	–	1 879.9	–50	1	5
35							
36							
37			–				
38	E-UTRA Band 1,3, 8, 20, 22, 28, 29, 33, 34, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	

TABLE 4.3-1 (*end*)

E-UTRA Band	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
	Frequency range	2 620	–	2 645	–15.5	5	15, 22, 26
	Frequency range	2 645	–	2 690	–40	1	15, 22
39	E-UTRA Band 22, 34, 40, 41, 42, 44	F _{DL_low}	–	F _{DL_high}	–50	1	
40	E-UTRA Band 1, 3, 22, 26, 27, 33, 34, 39, 41, 42, 43, 44	F _{DL_low}	–	F _{DL_high}	–50	1	
41	E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 23, 24, 25, 26, 27, 28, 29, 34, 39, 40, 42, 44	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 9, 11, 18, 19, 21	F _{DL_low}	–	F _{DL_high}	–50	1	30
	Frequency range	1 839.9		1 879.9	–50	1	30
	Frequency range	1 884.5		1 915.7	–41	0.3	8, 30
42	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 33, 34, 38, 40, 41, 44	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 43	F _{DL_low}	–	F _{DL_high}	–50	1	3
43	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 10, 20, 25, 26, 27, 28, 33, 34, 38, 40	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 42	F _{DL_low}	–	F _{DL_high}	–50	1	3
	E-UTRA Band 22	F _{DL_low}	–	F _{DL_high}	[–50]	[1]	3
44	E-UTRA Band 3, 5, 8, 34, 39, 41	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA Band 1, 40, 42	F _{DL_low}	–	F _{DL_high}		–50	2

NOTE 1 – F_{DL_low} and F_{DL_high} refer to each E-UTRA frequency band specified.

NOTE 2 – As exceptions, measurements with a level up to the applicable requirements defined in Table 4-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th (or 5th) harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth for which the 2nd, 3rd or 4th harmonic totally or partially overlaps the MBW.

NOTE 3 – To meet these requirements some restriction will be needed for either the operating band or protected band.

NOTE 4 – N/A

NOTE 5 – For non-synchronized TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band.

NOTE 6 – Applicable when NS_05 in section 4.5.1 is signalled by the network.

NOTE 7 – Applicable when co-existence with personal handyphone system (PHS) system operating in 1 884.5–1 919.6 MHz.

NOTE 8 – Applicable when co-existence with PHS system operating in 1 884.5–1 915.7 MHz.

NOTE 9 – Applicable when NS_08 in section 4.5.3 is signalled by the network.

NOTE 10 – Applicable when NS_09 in section 4.5.4 is signalled by the network.

NOTE 11 – Whether the applicable frequency range should be 793-805 MHz instead of 799-805 MHz is to be defined.

NOTE 12 – The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.

NOTE 13 – This requirement applies for 5, 10, 15 and 20 MHz E-UTRA channel bandwidth allocated within 1 744.9 MHz. and 1 784.9 MHz.

NOTE 14 – To meet this requirement NS_11 value shall be signalled when operating in 2 000–2 020 MHz.

NOTE 15 – These requirements also apply for the frequency ranges that are less than F_{oB} (MHz) in Table 4-1 and Table 4.2-1 from the edge of the channel bandwidth.

NOTE 16 – Applicable when NS_16 in section 4.5.9 is signalled by the network.

NOTE 17 – N/A

NOTE 18 – N/A

NOTE 19 – Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

NOTE 20 – Applicable when NS_15 in section 4.5.8 is signalled by the network.

NOTE 21 – This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier center frequency is within the range 2 560.5-2 562.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 2 552-2 560 MHz. No other restrictions apply for carriers with bandwidths confined in 2 500-2 570 MHz.

NOTE 22 – This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier center frequency is within the range 2 605.5-2 607.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 2 597-2 605 MHz. No other restrictions apply for carriers with bandwidths 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 +20 dBm in the IE *P-Max*.

NOTE 23 – For carriers of 5 MHz channel bandwidth with carrier center frequencies (F_c) in the range $902.5\text{MHz} \leq F_c < 907.5\text{ MHz}$, the requirement applies for uplink transmission bandwidths less than or equal to 20 RB. No restrictions apply in the range $907.5\text{ MHz} \leq F_c \leq 912.5\text{ MHz}$. For carriers of 10 MHz channel bandwidth, the requirement only applies for $F_c = 910\text{ MHz}$ and uplink transmission bandwidths less than or equal to 32 RB with $RB_{start} > 3$.

NOTE 24 – As exceptions, measurements with a level up to the applicable requirement of –38 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 2nd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth for which the 2nd harmonic totally or partially overlaps the MBW.

NOTE 25 – As exceptions, measurements with a level up to the applicable requirement of –36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RB within the transmission bandwidth for which the 3rd harmonic totally or partially overlaps the MBW.

NOTE 26 – For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 27 – This requirement is applicable for an uplink transmission bandwidth less than or equal to 54 RB for carriers of 15 MHz bandwidth when carrier center frequency is within the range 1 927.5-1 929.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1 930-1 938 MHz. This requirement is applicable without any other uplink transmission bandwidth restriction for channel bandwidths within the range 1 920-1 980 MHz.

NOTE 28 – Applicable when NS_20 is signalled by the network.

NOTE 29 – The MB is 1% of the applicable E-UTRA channel bandwidth.

NOTE 30 – This requirement applies when the E-UTRA carrier is confined within 2 545-2 575 MHz and the channel bandwidth is 10 or 20 MHz.

4.4 Spurious emission band UE co-existence for CA

This clause specifies the requirements for the specified CA configurations for coexistence with protected bands.

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

TABLE 4.4-1

Spurious emissions band UE co-existence limits

E-UTRA CA Configuration	Spurious emission						
	Protected band	Frequency range (MHz)			Maximum level (dBm)	MBW (MHz)	Note
CA_1C	E-UTRA Band 1, 3, 7, 8, 9, 11, 18, 19, 20, 21, 22, 38, 40, 41, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 34	F _{DL_low}	–	F _{DL_high}	–50	1	4,6,7
	Frequency range	1 900		1 915	–15.5	5	6,10,12
	Frequency range	1 915		1 920	+1.6	5	6,7,10,12
	Frequency range	1 880		1 895	–40	1	7,10
	Frequency range	1 895		1 915	–15.5	5	7,10
	Frequency range	1 884.5	–	1 915.7	–41	0.3	4, 5
CA_7C	E-UTRA Band 1, 3, 7, 8, 20, 22, 33, 34, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	2 570	–	2 575	+1.6	5	12
	Frequency range	2 575	–	2 595	–15.5	5	8, 12
	Frequency range	2 595	–	2 620	–40	1	8
CA_38C	E-UTRA Band 1,3, 8, 20, 22, 33, 34, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	2 620	–	2 645	–15.5	5	9, 10, 11, 12
	Frequency range	2 645	–	2 690	–40	1	9, 10, 11
CA_40C	E-UTRA Band 1, 3, 33, 34, 39, 41, 42, 43	F _{DL_low}	–	F _{DL_high}	–50	1	
CA_41C	E-UTRA Band 1, 2, 3, 4, 5, 8, 10, 12, 13, 14, 17, 23, 24, 25, 26, 34, 39, 40, 42, 44	F _{DL_low}	–	F _{DL_high}	–50	1	

NOTE 1 – FDL_low and FDL_high refer to each E-UTRA frequency band specified.

NOTE 2 – As exceptions, measurements with a level up to the applicable requirements defined in Table 4-2 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd or 3rd harmonic spurious emissions. An exception is allowed if there is at least one individual RE within the transmission bandwidth for which the 2nd or 3rd harmonic, i.e. the frequency equal to two or three times the frequency of that RE, is within the MBW.

NOTE 3 – To meet these requirements some restriction will be needed for either the operating band or protected band.

NOTE 4 – Applicable when CA_NS_01 in section 4.6.1 is signalled by the network.

NOTE 5 – Applicable when co-existence with PHS system operating in 1 884.5-1 915.7 MHz.

NOTE 6 – Applicable when CA_NS_02 in section 4.6.2 is signalled by the network.

NOTE 7 – Applicable when CA_NS_03 in section 4.6.3 is signalled by the network.

NOTE 8 – Applicable when CA_NS_06 in section 4.6.3 is signalled by the network.

NOTE 9 – Applicable when CA_NS_05 in section 4.6.3 is signalled by the network.

NOTE 10 – The requirement also applies for the frequency ranges that are less than F_{oB} (MHz) in Table 4-1 and Table 4.2-1 from the edge of the channel bandwidth.

NOTE 11 – This requirement is applicable for carriers with bandwidths 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 +20 dBm in the IE *P-Max*.

NOTE 12 – For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

4.5 Additional spurious emissions

These requirements are specified in terms of an additional spectrum emission requirement. Additional spurious emission requirements are signalled by the network to indicate that the UE shall meet an additional requirement for a specific deployment scenario as part of the cell handover/broadcast message. See Table 3-1 above.

4.5.1 Requirement (network signalled value “NS_05”)

When “NS_05” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.1-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.1-1

Additional requirements (PHS)

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)				MBW	Note
	5 MHz	10 MHz	15 MHz	20 MHz		
$1\ 884.5 \leq f \leq 1\ 915.7$	-41	-41	-41	-41	300 KHz	1

NOTE 1 – Applicable when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is larger than or equal to the upper edge of PHS band (1 915.7 MHz) + 4 MHz + the channel BW assigned, where channel BW is as defined in section 1.1. Additional restrictions apply for operations below this point.

TABLE 4.5.1-2

RB restrictions for additional requirement (PHS)

15 MHz channel bandwidth with $f_c = 1\ 932.5$ MHz			
RB_{start}	0-7	8-66	67-74
L_{CRB}	N/A	$\leq \text{MIN}(30, 67 - RB_{start})$	N/A
20 MHz channel bandwidth with $f_c = 1\ 930$ MHz			
RB_{start}	0-23	24-75	76-99
L_{CRB}	N/A	$\leq \text{MIN}(24, 76 - RB_{start})$	N/A

NOTE – For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range plus MBW/2. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus MBW/2. MBW denotes the MB (300 kHz).

4.5.2 Requirement (network signalled value “NS_07”)

When “NS_07” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.2-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.2-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)		MBW
	10 MHz		
$769 \leq f \leq 775$	-57		6.25 kHz

NOTE – The emissions measurement shall be sufficiently power averaged to ensure standard deviation < 0.5 dB.

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 MB (6.25 kHz).

4.5.3 Requirement (network signalled value “NS_08”)

When “NS_08” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.3-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.3-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)			MBW
	5 MHz	10 MHz	15 MHz	
$860 \leq f \leq 895$	-40	-40	-40	1 MHz

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 MBW (1 MHz).

4.5.4 Requirement (network signalled value “NS_09”)

When “NS_09” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.4-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.4-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)			MBW
	5 MHz	10 MHz	15 MHz	
$1\,475.9 \leq f \leq 1\,510.9$	-35	-35	-35	1 MHz

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 MBW (1 MHz).

4.5.5 Requirement (network signalled value “NS_12”)

When “NS 12” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.4-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.5-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW	Note
	1.4, 3, 5 MHz		
$806 \leq f \leq 813.5$	-42	6.25 kHz	1

NOTE 1 – The emission limit applies at an offset of greater than or equal to 0.7 MHz below the E-UTRA channel edge.

4.5.6 Requirement (network signalled value “NS_13”)

When “NS 13” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.6-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.6-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW	Note
	5 MHz		
$806 \leq f \leq 816$	-42	6.25 kHz	1

NOTE 1 – The emission limit applies at an offset of greater than or equal to 3 MHz below the E-UTRA channel edge.

4.5.7 Requirement (network signalled value “NS_14”)

When “NS 14” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.7-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.7-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW	Note
	10, 15 MHz		
$806 \leq f \leq 816$	-42	6.25 kHz	1

NOTE 1 – The emission limit applies at an offset of greater than or equal 8 MHz below the of E-UTRA channel edge.

4.5.8 Requirement (network signalled value “NS_15”)

When “NS 15” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.8-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.8-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW	Note
	1.4, 3, 5, 10, 15 MHz		
$851 \leq f \leq 859$	-53	6.25 kHz	

NOTE – The emissions measurement shall be sufficiently power averaged to ensure standard deviation < 0.5 dB.

4.5.9 Requirement (network signalled value “NS_16”)

When “NS 16” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.9-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.9-1

Additional requirements

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

4.5.10 Requirement (network signalled value “NS_17”)

When “NS 17” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.10-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.10-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW	Note
	5, 10 MHz		
$470 \leq f \leq 710$	-26.2	6 MHz	1

NOTE 1 – Applicable when the assigned E-UTRA carrier is confined within 718 MHz and 748 MHz and when the channel bandwidth used is 5 or 10 MHz.

4.5.11 Requirement (network signalled value “NS_18”)

When “NS 18” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.11-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

TABLE 4.5.11-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW	Note
	5, 10, 15, 20 MHz		
692–698	-26.2	6 MHz	

4.5.12 Requirement (network signalled value “NS_19”)

When “NS 19” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.5.12-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the channel bandwidth.

Table 4.5.12-1

Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW	Note
	3, 5, 10, 15, 20 MHz		
$662 \leq f \leq 694$	-25	8 MHz	

4.6 Additional spurious emissions for CA

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

4.6.1 Requirement for CA_1C (network signalled value “CA_NS_01”)

When “CA_NS_01” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.6.1-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the aggregated channel bandwidth.

TABLE 4.6.1-1

Additional requirements (PHS)

Protected band	Frequency range (MHz)			Maximum level (dBm)	MBW (MHz)	Note
E-UTRA band 34	F _{DL_low}	–	F _{DL_high}	–50	1	
Frequency range	1 884.5	–	1 919.6	–41	0.3	1

NOTE 1 – Applicable when the aggregated channel bandwidth is confined within frequency range 1 940-1 980 MHz.

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 MBW (300 kHz).

4.6.2 Requirement for CA_1C (network signalled value “CA_NS_02”)

When “CA_NS_02” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.6.2-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the aggregated channel bandwidth.

TABLE 4.6.2-1

Additional requirements

Protected band	Frequency range (MHz)			Maximum level (dBm)	MBW (MHz)
E-UTRA band 34	F _{DL_low}	–	F _{DL_high}	–50	1
Frequency range	1 900	–	1 915	–15.5	5
Frequency range	1 915	–	1 920	+1.6	5

4.6.3 Requirement for CA_1C (network signalled value “CA_NS_03”)

When “CA_NS_03” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table 4.6.3-1. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table 4-1 from the edge of the aggregated channel bandwidth.

TABLE 4.6.3-1

Additional requirements

Protected band	Frequency range (MHz)			Maximum level (dBm)	MBW (MHz)
	F _{DL_low}	–	F _{DL_high}		
E-UTRA band 34	F _{DL_low}	–	F _{DL_high}	–50	1
Frequency range	1 880	–	1 895	–40	1
Frequency range	1 895	–	1 915	–15.5	5
Frequency range	1 915	–	1 920	+1.6	5

4.7 Spurious emission for UL-MIMO

For UE with multiple transmit antenna connectors, the requirements for spurious emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emissions, intermodulation products and frequency conversion products are specified at each transmit antenna connector.

For UEs with two transmit antenna connectors in closed-loop spatial multiplexing scheme, the requirements in § 3 apply to each transmit antenna connector. The requirements shall be met with the UL-MIMO configurations specified in Table 3.1.3-1.

For single-antenna port scheme, the requirements in § 3 apply.

5 Receiver spurious emissions

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

The power of any narrow band CW spurious emission shall not exceed the maximum level specified in Table 5-1.

TABLE 5-1

General receiver spurious emission requirements

Frequency band	MBW	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	1

NOTE 1 – Applies only for Band 22, Band 42 and Band 43.

Appendix 1

Definition of test tolerance

Test tolerance

With reference to Recommendation ITU-R M.1545, “test tolerance” is the relaxation value referred to in *recommends* 2 of Recommendation ITU-R M.1545, i.e. the difference between the core specification value and the test limit, evaluated applying the shared risk principle as per Figs 2 and 3 of Annex 1 of Recommendation ITU-R M.1545. In case the core specification value is equal to the test limit (Fig. 3 of Annex 1 of Recommendation ITU-R M.1545) the “test tolerances” are equal to 0.

Annex 2

WirelessMAN-Advanced

Out of band and spurious emission regions

The default OoB emission, where channel spectral mask specifications is applicable, is the absolute value of $\pm 250\%$ of channel bandwidth size from channel center frequency or lower and upper bound of the target band whichever is smaller. For frequencies beyond OoB region, the spurious emission specifications are applicable

1 Default specifications

1.1 Default channel spectral mask

Unless otherwise specified in other sub sections of this Annex, the spectrum masks of Table 1 and Table 2 are applicable.

TABLE 1
Channel mask for 5 MHz bandwidth

No.	Δf , offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$2.5 \leq \Delta f < 3.5$	50	-13
2	$3.5 \leq \Delta f < 7.5$	1 000	-10
3	$7.5 \leq \Delta f < 8.5$	1 000	-13
4	$8.5 \leq \Delta f < 12.5$	1 000	-25

NOTE – The first measurement position with a 50 kHz filter is at Δf equals to 2.525 MHz; the last is at Δf equals to 3.475 MHz. The first measurement position with a 1 MHz filter is at Δf equals to 4.0 MHz; the last is at Δf equals to 12.0 MHz.

TABLE 2
Channel mask for 10 MHz bandwidth

No.	Offset from channel center (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \leq \Delta f < 6$	100	-13
2	$6 \leq \Delta f < 10$	1 000	-10
3	$10 \leq \Delta f < 15$	1 000	-13
4	$15 \leq \Delta f < 25$	1 000	-25

NOTE – The first measurement position with a 100 kHz filter is at Δf equals to 5.050 MHz; the last is at Δf equals to 5.950 MHz. The first measurement position with a 1 MHz filter is at Δf equals to 6.5 MHz; the last is at Δf equals to 24.5 MHz.

TABLE 3
Channel Mask for 20 MHz bandwidth

No	Offset from channel center (MHz)	Integration bandwidth (kHz)	maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$10 \leq \Delta f < 11$	200	-13
2	$11 \leq \Delta f < 15$	1 000	-10
3	$15 \leq \Delta f < 30$	1 000	-13
4	$30 \leq \Delta f < 50$	1 000	-25

NOTE – The first measurement position with a 100 kHz filter is at Δf equals to 10.050 MHz; the last is at Δf equals to 10.950 MHz. The first measurement position with a 1 MHz filter is at Δf equals to 11.5 MHz; the last is at Δf equals to 49.5 MHz.

1.2 Default spurious emission

Unless otherwise specified in other sub sections of this Annex, the default spurious emission specifications of Table 4 are applicable.

TABLE 4
Default spurious emissions; Relevant to $F_{UL-le} + \text{ChBW}/2 \leq fc \leq F_{UL-ue} - \text{ChBW}/2$

No	Spurious frequency (f) range	MBW	Maximum emission level (dBm)
1	$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-36
2	$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-36
3	$30 \text{ MHz} \leq f < 1\,000 \text{ MHz}$	100 kHz	-36
4	$1 \text{ GHz} \leq f < 5 \times F_{ue}$	30 kHz If $2.5 \times \text{ChBW} \leq \Delta f < 10 \times \text{ChBW}$ 300 kHz If $10 \times \text{ChBW} \text{ MHz} \leq \Delta f < 12 \times \text{ChBW}$ 1 MHz If $12 \times \text{ChBW} \leq \Delta f$	-30

2 Band Class 1

2.1 Band Class Group 1.C

2.1.1 Channel spectral mask

The channel mask for 5 MHz bandwidth is specified in Table 5.

TABLE 5
Channel mask for 5 MHz bandwidth (BCG 1.C)

No	Δf offset from channel centre (MHz)	Integration bandwidth (kHz)	Allowed emission level (dBm/integration BW) at the antenna port
1	$2.5 \leq \Delta f < 3.5$	50	-13
2	$3.5 \leq \Delta f < 7.5$	1 000	-13
3	$7.5 \leq \Delta f < 8$	500	-16
4	$8 \leq \Delta f < 10.4$	1 000	-25
5	$10.4 \leq \Delta f < 12.5$	1 000	-25

The channel mask for 10 MHz bandwidth is specified in Table 6.

TABLE 6
Channel mask for 10 MHz bandwidth (BCG 1.C)

No	Δf offset from channel centre (MHz)	Integration bandwidth (kHz)	Allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \leq \Delta f < 6$	100	-13
2	$6 \leq \Delta f < 10$	1 000	-13
3	$10 \leq \Delta f < 11$	1 000	$-13-12(\Delta f-10)$
4	$11 \leq \Delta f < 15$	1 000	-25
5	$15 \leq \Delta f < 20$	1 000	-25
6	$20 \leq \Delta f \leq 25$	1 000	-25

2.1.2 Spurious emission specification

TABLE 7
Additional spurious emissions for 5 MHz channel size (BCG 1.C)

No	Spurious frequency (f) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
1	$2\ 110 \leq f < 2\ 170$	1	-50
2	$1\ 805 \leq f < 1\ 880$	1	-50
3	$2\ 496 \leq f < 2\ 690$	1	-50

TABLE 7 (end)

No	Spurious frequency (f) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
4	$925 \leq f < 960$	1	-50
5	$1\,900 \leq f < 1\,920$	1	-50
6	$2\,010 \leq f < 2\,025$	1	-50
7	$2\,570 \leq f < 2\,620$	1	-50
8	$791 \leq f < 821$	1	-50

3 Band Class 3

3.1 Band Class Group 3.C

3.1.1 Channel spectral mask

The channel mask for 5 MHz, 10 MHz and 20 MHz channel bandwidths are specified in Table 8 through Table 10.

In this section, the unwanted emission requirements for the first adjacent channel, specified as maximum allowed adjacent channel power, are captured as a single point measurement for the first segment of the mask.

TABLE 8

Channel mask for 5 MHz bandwidth (BCG 3.C)

No	Offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$\Delta f = 5$	4 800	-1
2	$7.5 \leq \Delta f < 8$	1 000	$-23 - 2.28(\Delta f - 7.5)$
3	$8 \leq \Delta f < 17.5$	1 000	$-24 - 1.68(\Delta f - 8)$
4	$17.5 \leq \Delta f < 22.5$	1 000	-40

TABLE 9

Channel mask for 10 MHz bandwidth (BCG 3.C)

No	Offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$\Delta f = 10$	9 500	-3
2	$15 \leq \Delta f < 20$	1 000	$-24 - 32(\Delta f - 10.5)/19$
3	$20 \leq \Delta f < 25$	1 000	-40

TABLE 10

Channel mask for 20 MHz bandwidth (BCG 3.C)

No	Offset from channel center (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$\Delta f = 20$	19 500	-3
2	$30 \leq \Delta f < 35$	1 000	-25
3	$35 \leq \Delta f < 50$	1 000	-30

3.1.2 Transmitter spurious emission

In addition to the default spurious emission specifications, the requirements of Table 11 through Table 15 are applicable.

TABLE 11

Additional spurious emissions for 5 MHz channel size (BCG 3.C)

No	Spurious frequency (f) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
1	$2\ 505 \leq f < 2\ 530$	1	-37
2	$2\ 530 \leq f < 2\ 535$	1	$1.7f - 4338$
3	$2\ 535 \leq f < 2\ 630$	1	-21 - 1.68(Δf - 8) $12.5\ \text{MHz} < \Delta f < 17.5\ \text{MHz}$ -37 $17.5\ \text{MHz} < \Delta f < 22.5\ \text{MHz}$ -18 $22.5\ \text{MHz} < \Delta f$
4	$2\ 630 \leq f < 2\ 630$	1	$-13 - 8(f - 2\ 627)/3.5$
5	$2\ 630.5 \leq f < 2\ 640$	1	$-21 - 16(f - 2\ 630.5)/9.5$
6	$2\ 640 \leq f < 2\ 655$	1	-37

TABLE 12

Additional spurious emissions for 5 MHz channel size (BCG 3.C)

No	Spurious frequency (f) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
1	$2\ 620 \leq f < 2\ 690$	1	-40

NOTE – With respect to Table 12, for each RF channel used, up to five measurements in 2 620-2 635.84 and 2 655-2 690 MHz are exempt from the -40 dBm specification of Row 1 where a relaxed level of -30 dBm of Row 4 of Table 4 is applicable.

TABLE 13

Additional spurious emissions for 10 MHz channel size (BCG 3.C)

No	Spurious frequency (f) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
1	$2\ 505 \leq f < 2\ 530$	1	-37
2	$2\ 530 \leq f < 2\ 535$	1	$1.7f - 4338$
3	$2\ 535 \leq f < 2\ 630$	1	-18 $25\ \text{MHz} < \Delta f$
4	$2\ 630 \leq f < 2\ 630.5$	1	$-13 - 8(f - 2\ 627)/3.5$
5	$2\ 630.5 \leq f < 2\ 640$	1	$-21 - 16(f - 2\ 630.5)/9.5$
6	$2\ 640 \leq f < 2\ 655$	1	-37

TABLE 14

Spurious emissions for 10 MHz channel size (BCG 3.C)

No	Spurious frequency (f) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
1	$2\ 620 \leq f < 2\ 690$	1	-40

NOTE – With respect to Table 13, for each RF channel used, up to five measurements in 2 620-2 635.84 and 2 655-2 690 MHz are exempt from the -40 dBm specification of Row 1 where a relaxed level of -30 dBm of Row 4 of Table 4 is applicable.

TABLE 15

Mobile station spurious emission limit, Japan (BCG 3.C)

No	Frequency bandwidth	MBW	Allowed emission level (dBm)
1	$9\ \text{kHz} \leq f < 150\ \text{kHz}$	1 kHz	-16
2	$150\ \text{kHz} \leq f < 30\ \text{MHz}$	10 kHz	-16
3	$30\ \text{MHz} \leq f < 1\ 000\ \text{MHz}$	100 kHz	-16
4	$1\ 000\ \text{MHz} \leq f < 2\ 505\ \text{MHz}$	1 MHz	-16
5	$2\ 505\ \text{MHz} \leq f < 2\ 530\ \text{MHz}$	1 MHz	-40
6	$2\ 530\ \text{MHz} \leq f < 2\ 535\ \text{MHz}$	1 MHz	$1.7f - 4341$
7	$2\ 535\ \text{MHz} \leq f < 2\ 655\ \text{MHz}$	1 MHz	-21
8	$2\ 655\ \text{MHz} \leq f$	1 MHz	-16

NOTE – The allowed emission level for the frequency band between 2 535 MHz and 2 655 MHz shall be applied for the frequency range greater than 2.5 times the channel size away from the centre frequency.

3.2 Band Class Group 3.D

3.2.1 Channel spectral mask

The channel mask for 10 MHz bandwidth is specified in Table 16.

TABLE 16

Channel mask for 10 MHz bandwidth (BCG 3.D)

No	Offset from channel center (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \leq \Delta f < 6$	100	-13
2	$6 \leq \Delta f < 10$	1 000	-13
3	$10 \leq \Delta f < 11$	1 000	$-13 - 12(\Delta f - 10)$
4	$11 \leq \Delta f < 15$	1 000	-25
5	$15 \leq \Delta f < 20$	1 000	-25
6	$20 \leq \Delta f \leq 25$	1 000	-25

The channel mask for 5 MHz bandwidth is specified in Table 17.

TABLE 17

Channel mask for 5 MHz bandwidth (BCG 3.D)

No	Offset from channel center (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration BW) at the antenna port
1	$2.5 \leq \Delta f < 3.5$	50	-13
2	$3.5 \leq \Delta f < 7.5$	1 000	-13
3	$7.5 \leq \Delta f < 8$	500	-16
4	$8 \leq \Delta f < 10.4$	1 000	-25
5	$10.4 \leq \Delta f < 12.5$	1 000	-25

3.2.2 Transmitter spurious emission

In addition to the default spurious emission specifications, the requirements of Table 18 are applicable.

TABLE 18

Additional spurious emissions (BCG 3.D)

No	Spurious frequency (<i>f</i>) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
1	2 110-2 170	1	-50
2	1 805-1 880	1	-50
3	2 620-2 690	1	-50

TABLE 18 (*end*)

No	Spurious frequency (<i>f</i>) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
4	925-960	1	-50
5	1 900-1 920	1	-50
6	2 010-2 025	1	-50
7	2 570-2 620	1	-50

4 Band Class 5

4.1 Band Class Group 5L.E

4.1.1 Channel spectral mask

TABLE 19

**Channel mask for 5 MHz channel bandwidth
(BCG 5L.E)**

No	Frequency offset Δf (MHz)	Maximum emission level (dBc)	MBW
1	$2.5 \leq \Delta f < 3.5$	$-33.5 - 15(\Delta f - 2.5)$	30 kHz
2	$3.5 \leq \Delta f < 7.5$	$-33.5 - 1(\Delta f - 3.5)$	1 MHz
3	$7.5 \leq \Delta f < 8.5$	$-37.5 - 10(\Delta f - 7.5)$	1 MHz
4	$8.5 \leq \Delta f \leq 12.5$	-47.5	1 MHz

NOTE 1 – The out-of-channel emission is specified as power level measured over the specified MBW relative to the total mean power of the MS carrier measured in the 5 MHz channel.

NOTE 2 – The MS emission shall not exceed the levels specified in Table 19. Assuming specific power classes, relative specifications of Table 19 can be converted to absolute values for testing purposes.

NOTE 3 – In additions, for centre carrier frequencies within 3 650-3 700 MHz range, all emission levels shall not exceed -13 dBm/MHz.

NOTE 4 – The first measurement position with a 30 kHz filter is at Δf equals to 2.515 MHz; the last is at Δf equals to 3.485 MHz.

NOTE 5 – The first measurement position with a 1 MHz filter is at Δf equals to 4 MHz; the last is at Δf equals to 12 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the MBW. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the MBW. When the resolution bandwidth is smaller than the MBW, the result should be integrated over the MBW in order to obtain the equivalent noise bandwidth of the MBW.

NOTE 6 – Note that equivalent PSD type mask can be derived by applying $10 \cdot \log((5 \text{ MHz})/(30 \text{ kHz})) = 22.2 \text{ dB}$ and $10 \cdot \log((5 \text{ MHz})/(1 \text{ MHz})) = 7 \text{ dB}$ scaling factor for 30 kHz and 1 MHz MBW respectively.

TABLE 20
**Channel mask for 10 MHz channel bandwidth
 (BCG 5L.E)**

No	Frequency offset Δf (MHz)	Maximum emission level (dBc)	MBW
1	$5.0 \leq \Delta f < 7.0$	$-33.5 - 9(\Delta f - 5.0)$	30 kHz
2	$7.0 \leq \Delta f < 15.0$	$-36.5 - 0.5(\Delta f - 7.0)$	1 MHz
3	$15.0 \leq \Delta f < 17.0$	$-40.5 - 5(\Delta f - 15.0)$	1 MHz
4	$17.0 \leq \Delta f \leq 25.0$	-50.5	1 MHz

NOTE 1 – The spectrum emission mask of the MS applies to frequency offsets between 5.0 MHz and 25.0 MHz on both sides of the MS center carrier frequency. The out-of-channel emission is specified as power level measured over the specified MBW relative to the total mean power of the MS carrier measured in the 10 MHz channel.

NOTE 2 – The MS emission shall not exceed the levels specified in Table 20. Assuming specific power classes, relative specifications of Table 20 can be converted to absolute values for testing purposes.

NOTE 3 – In addition, for center carrier frequencies within 3 650-3 700 MHz range, all emission levels shall not exceed -13 dBm/MHz.

NOTE 4 – The first measurement position with a 30 kHz filter is at Δf equals to 510.015 MHz; the last is at Δf equals to 6.985 MHz.

NOTE 5 – The first measurement position with a 1 MHz filter is at Δf equals to 7.5 MHz; the last is at Δf equals to 24.5 MHz. As a general rule, the resolution bandwidth of the measuring equipment should be equal to the MBW. To improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be different from the MBW. When the resolution bandwidth is smaller than the MBW, the result should be integrated over the MBW in order to obtain the equivalent noise bandwidth of the MBW.

NOTE 6 – Equivalent PSD type mask can be derived by applying $10 \cdot \log((10 \text{ MHz})/(30 \text{ kHz})) = 25.2 \text{ dB}$ and $10 \cdot \log((10 \text{ MHz})/(1 \text{ MHz})) = 10 \text{ dB}$ scaling factor for 30 kHz and 1 MHz MBW respectively.

5 Band Class 6

5.1 Band Class Group 6.D

5.1.1 Channel spectral mask

Table 21 and Table 22 specify the spectrum emission for FDD Mobile Stations with 5 and 10 MHz channel bandwidths.

TABLE 21
Channel mask for 5 MHz bandwidth (BCG 6.D)

No	Offset from channel center (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration BW) at the antenna port
1	$2.5 \leq \Delta f < 3.5$	50	-13
2	$3.5 \leq \Delta f \leq 12.5$	1 000	-13

TABLE 22

Channel mask for 10 MHz bandwidth (BCG 6.D)

No	Offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \leq \Delta f < 6$	100	-13
2	$6 \leq \Delta f \leq 25$	1 000	-13

5.1.2 Spurious emission specifications

In addition to the default spurious emission specifications, the requirements of Table 23 are applicable.

TABLE 23

Spurious emissions (BCG 6.D)

No	Measurement frequency range	MBW (MHz)	Maximum emission level (dBm)
1	$30 \text{ MHz} \leq f < 8.850 \text{ GHz}$	1	-13

5.2 Band Class Group 6.E

5.2.1 Transmitter spurious emission specification

Table 24 and Table 25 specify the additional spurious emission limits.

TABLE 24

Spurious emissions (BCG 6.E)

No	Measurement frequency range	MBW	Maximum emission level (dBm)
1	$9 \text{ kHz} \leq f < 150 \text{ kHz}$	1 kHz	-36
2	$150 \text{ kHz} \leq f < 30 \text{ MHz}$	10 kHz	-36
3	$30 \text{ MHz} \leq f < 1\,000 \text{ GHz}$	100 kHz	-36
4	$1 \text{ GHz} \leq f < 9.900 \text{ GHz}$	1 MHz	-30

TABLE 25

Additional spurious emissions (BCG 6.E)

No	Spurious frequency (f) range (MHz)	MBW	Maximum emission level (dBm)
1	2 110-2 170	1 MHz	-50
2	1 805-1 880	1 MHz	-50
3	2 620-2 690	1 MHz	-50

TABLE 25 (*end*)

No	Spurious frequency (<i>f</i>) range (MHz)	MBW	Maximum emission level (dBm)
4	925-960	1 MHz	-50
5	1 844.9-1 879.9	1 MHz	-50
6	1 475.9-1 500.9	1 MHz	-50
7	1 900-1 920	1 MHz	-50
8	2 010-2 025	1 MHz	-50
9	2 570-2 620	1 MHz	-50
11	1 880-1 920	1 MHz	-50
12	2 300-2 400	1 MHz	-50
13	860-895	1 MHz	-50
14	1 884.5-1 919.6	300 KHz	-41

5.3 Band Class Group 6.F

5.3.1 Transmitter spurious emission specification

Table 26 specifies the additional spurious emission limits.

TABLE 26

Additional spurious emission (BCG 6.F)

No	Transmitter centre frequency (<i>f</i> _c) (MHz)	Spurious frequency (<i>f</i>) range (MHz)	MBW (MHz)	Maximum emission level (dBm)
1	1 710-1 785	925-960	1	-50
2	1 710-1 785	1 475.9-1 500.9	1	-50
3	1 710-1 785	1 805-1 880	1	-50
4	1 710-1 785	1 844.9-1 879.9	1	-50
5	1 710-1 785	1 900-1 920	1	-50
6	1 710-1 785	2 010-2 025	1	-50
7	1 710-1 785	2 110-2 170	1	-50
8	1 710-1 785	2 570-2 620	1	-50
9	1 710-1 785	2 620-2 690	1	-50
10	1 710-1 785	2 300-2 400	1	-50
11	1 710-1 785	791-821	1	-50

5.4 Band Class Group 6.G

5.4.1 Channel spectral mask

Table 27 and Table 28 specify the spectrum emission for FDD Mobile Stations with 5 and 10 MHz channel bandwidths.

TABLE 27

Channel mask for 5 MHz bandwidth (BCG 6.G)

No	Offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration BW) at the antenna port
1	$2.5 \leq \Delta f < 3.5$	50	-13
2	$3.5 \leq \Delta f \leq 12.5$	1 000	-13

TABLE 28

Channel mask for 10 MHz bandwidth (BCG 6.G)

No	Offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/Integration Bandwidth) as measured at the antenna port
1	$5 \leq \Delta f < 6$	100	-13
2	$6 \leq \Delta f \leq 25$	1 000	-13

5.4.2 Spurious emission specifications

In addition to the default spurious emission specifications, the requirements of Table 29 are applicable.

TABLE 29

Spurious emissions (BCG 6.G)

No	Measurement frequency range	MBW (MHz)	Maximum emission level (dBm)
1	$30 \text{ MHz} \leq f < 8.775 \text{ GHz}$	1	-13

5.5 Band Class Group 6.H**5.5.1 Channel spectral mask**

Table 30 and Table 31 specify the spectrum emission for FDD Mobile Stations with 5 and 10 MHz channel bandwidths.

TABLE 30

Channel mask for 5 MHz bandwidth (BCG 6.H)

No	Offset from channel center (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration BW) at the antenna port
1	$2.5 \leq \Delta f < 3.5$	50	-13
2	$3.5 \leq \Delta f \leq 12.5$	1 000	-13

TABLE 31

Channel mask for 10 MHz bandwidth (BCG 6.H)

No	Offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \leq \Delta f < 6$	100	-13
2	$6 \leq \Delta f \leq 25$	1 000	-13

5.5.2 Spurious emission specifications

In addition to the default spurious emission specifications, the requirements of Table 32 are applicable.

TABLE 32

Spurious emissions (BCG 6.G)

No	Measurement frequency range	MBW (MHz)	Maximum emission level (dBm)
1	$30 \text{ MHz} \leq f < 9.550 \text{ GHz}$	1	-13

5.6 Band Class Group 6.J**5.6.1 Channel spectral mask**

Table 33 and Table 34 specify the spectrum emission for FDD Mobile Stations with 5 and 10 MHz channel bandwidths.

TABLE 33

Channel mask for 5 MHz bandwidth (BCG 6.J)

No	Offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration BW) at the antenna port
1	$2.5 \leq \Delta f < 3.5$	50	-13
2	$3.5 \leq \Delta f \leq 12.5$	1 000	-13

TABLE 34

Channel mask for 10 MHz bandwidth (BCG 6.J)

No	Offset from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \leq \Delta f < 6$	100	-13
2	$6 \leq \Delta f \leq 25$	1 000	-13

5.6.2 Spurious emission specifications

In addition to the default spurious emission specifications, the requirements of Table 35 are applicable.

TABLE 35
Spurious emissions (BCG 6.J)

No	Measurement frequency range	MBW (MHz)	Maximum emission level (dBm)
1	$30 \text{ MHz} \leq f < 9.550 \text{ GHz}$	1	-13

6 Band Class 7

6.1 Band Class Group 7.H

6.1.1 Channel spectral mask

Table 36 and Table 37 specify the spectrum emission mask with 5 MHz channel bandwidths.

TABLE 36
Channel mask for 5 MHz bandwidth: $700.5 \leq f_c \leq 795.5$ (BCG 7.H)

No	Frequency offset Δf from channel center (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$2.5 \leq \Delta f < 2.6$	30	-13
2	$2.6 \leq \Delta f < 12.5$	100	-13

NOTE – The first measurement position with a 30 kHz filter is at Δf equals to 2.515 MHz; the last is at Δf equals to 2.585 MHz. The first measurement position with a 100 kHz filter is at Δf equals to 2.650 MHz; the last is at Δf equals to 12.450 MHz.

TABLE 37
Channel mask for 5 MHz bandwidth: $799.5 \leq f_c \leq 859.5$ (BCG 7.H)

No	Frequency offset Δf from channel center (MHz)	Integration bandwidth (MHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$2.5 \leq \Delta f < 7.5$	5	1.6
2	$7.5 \leq \Delta f < 12.5$	2	-10

NOTE – The measurement position with a 5 MHz filter is at Δf equals to 5 MHz. The first measurement position with a 2 MHz filter is at Δf equals to 8.5 MHz; the last is at Δf equals to 11.5 MHz.

Table 38 and Table 39 specify the spectrum emission mask with 10 MHz channel bandwidths.

TABLE 38

Channel mask for 10 MHz bandwidth: $703 \leq fc \leq 793$ (BCG 7.H)

No	Frequency offset Δf from channel center (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5.0 \leq \Delta f < 5.1$	30	-13
2	$5.1 \leq \Delta f \leq 25.0$	100	-13

NOTE – The first measurement position with a 30 kHz filter is at Δf equals to 5.015 MHz; the last is at Δf equals to 5.085 MHz. The first measurement position with a 100 kHz filter is at Δf equals to 5.150 MHz; the last is at Δf equals to 24.950 MHz.

TABLE 39

Channel mask for 10 MHz bandwidth: $802 \leq fc \leq 857$ (BCG 7.H)

No	Frequency offset Δf from channel center (MHz)	Integration bandwidth (MHz)	Allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \leq \Delta f < \text{to } 10$	5	1.6
2	$10 \leq \Delta f \leq \text{to } 25$	2	-10

NOTE – The measurement position with a 5 MHz filter is at Δf equals to 7.5 MHz. The first measurement position with a 2 MHz filter is at Δf equals to 11 MHz; the last is at Δf equals to 24 MHz.

6.1.2 Transmitter spurious emission specification

Table 40 specifies the additional spurious emission limits.

TABLE 40

Spurious emissions (BCG 7.H)

No	Transmit frequency range (MHz)	Measurement frequency range (MHz)	MBW (KHz)	Maximum emission level (dBm)
1	698-798	$30 \leq f < 4310$	100	-13
2	746-758, 776-788	$763 \leq f \leq 775, 793 \leq f \leq 805$	6.25	-35
3	758-763, 763-768, 788-793, 793-798	$769 \leq \Delta f \leq 775, 799 \leq f \leq 805$	6.25	-35
4	797-862	$797 \leq f \leq 862$	5 000	-37
5	797-862	$790 \leq f \leq 791$	1 000	-44
6	797-862	$470 \leq f \leq 790$	8 000	-65

7 Band Class 8

7.1 Band Class Group 8.C

7.1.1 Transmitter spurious emission specification

Table 41 specifies the additional spurious emission limits.

TABLE 41

Additional spurious emissions (BCG 8.C)

No	Spurious frequency (f) range (MHz)	MBW (KHz)	Maximum emission level (dBm)
1	2 010-2 025 2 300-2 400	1 000	-50

7.2 Band Class Group 8.E

7.2.1 Transmitter spurious emission specification

Table 42 specifies the additional spurious emission limits.

TABLE 42

Additional spurious emissions (BCG 8.E)

No	Spurious frequency (f) range (MHz)	MBW (KHz)	Maximum emission level (dBm)
1	2 110-2 170 1 805-1 880 2 620-2 690 925-960 1 844.9-1 879.9 1 475.9-1 500.9 1 900-1 920 2 570-2 620 1 880-1 920 2 300-2 400	1 000	-50
2	860-895	1 000	-50
3	1 884.5-1 919.6	300	-41

7.3 Band Class Group 8.F

7.3.1 Transmitter spurious emission specification

Table 43 specifies the additional spurious emission limits.

TABLE 43

Additional spurious emissions (BCG 8.F)

No	Spurious frequency (<i>f</i>) range (MHz)	MBW (KHz)	Maximum emission level (dBm)
1	925-960 1 880-1 920 1 930-1 990 2 010-2 025 2 110-2 170 2 300-2 400 2 570-2 620	1 000	-50
