

Recommendation ITU-R M.2071-2

(12/2023)

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

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



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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.2071-2*

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

(Question ITU-R 229 3/5)

(2015-2017-2023)

Scope

This Recommendation provides the unwanted emission characteristics of mobile stations using radio interfaces for the terrestrial component of IMT-Advanced, suitable for establishing the technical basis for global circulation of IMT-Advanced terminals. The table provided for information in this Recommendation on unwanted emissions could also be used as guidance by Administrations. Implementation of unwanted emission characteristics of mobile stations using radio interfaces for the terrestrial component of IMT-Advanced specified in any of the bands 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 one of the basic requirements of global circulation is that the MS does not cause harmful interference in any country where it is taken;
- f) that the harmonization of unwanted emission limits will facilitate global use and access to a global market;
- g) that unwanted emission limits are dependent on the transmitter emission characteristics in addition to depending on services operating in other bands,

noting

- a) that IMT-Advanced mobile stations should comply with local, regional, and international regulations for OoB and spurious emissions relevant to their operations, wherever such regulations apply;

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

b) that in order to reflect the wide applicability of IMT-Advanced radio interfaces technologies and to maintain consistency with the technology specifications, the notes and annexes of this Recommendation being based on the ongoing work in standardization bodies, may contain material that reflects information related to the use of these technologies in bands other than those identified for IMT,

recognizing

a) that Recommendation ITU-R M.1036 provides the frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications in the bands identified for IMT in the Radio Regulations;

b) that Recommendation ITU-R SM.329 provides limits for unwanted emissions in spurious domain emissions as well as measurement methods of spurious emissions;

c) that Recommendation ITU-R SM.1541 provides OoB domain emission and encourages the development of specific limits for each system and each frequency band;

d) that RR Appendix 3 indicates maximum levels of spurious emissions for mobile service stations;

e) that Recommendation ITU-R M.1579 establishes the technical basis for global circulation of IMT-2000 and IMT-Advanced MSs;

f) that Recommendation ITU-R M.2012 provides “Detailed specifications of the terrestrial radio interfaces of International Mobile Telecommunications Advanced (IMT-Advanced)” and in particular recommends that the terrestrial radio interfaces for IMT-Advanced should be “LTE-Advanced” and “WirelessMAN-Advanced”,

recommends

1 that the unwanted emission characteristics of mobile stations that correspond to the LTE-Advanced radio interface specifications for the terrestrial component of IMT-Advanced should be based on the limits contained in Annex 1 for the bands specified in Table A1-1¹;

2 that the unwanted emission characteristics of mobile stations that correspond to the WirelessMAN-Advanced radio interface specifications for the terrestrial component of IMT-Advanced should be based on the limits contained in Annex 2².

Annex 1 – LTE-Advanced³

Annex 2 – WirelessMAN-Advanced⁴

¹ For LTE-Advanced mobile stations in the bands specified in Table A1-2 unwanted emission characteristics in Annex 1 are provided for information, which can be used for decisions at national level.

² For WirelessMAN-Advanced in bands not identified for IMT in the Radio Regulations unwanted emission characteristics in Annex 2 are provided for information only, which can be used for decisions at national level.

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

⁴ 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 A1-1

Frequency bands utilized by E-UTRA and identified for IMT in the RR

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
6 ¹	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	2110 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
17	704 MHz – 716 MHz	734 MHz – 746 MHz	FDD
18	815 MHz – 830 MHz	860 MHz – 875 MHz	FDD

TABLE A1-1 (continued)

E-UTRA operating band	Uplink (UL) operating band BS receive UE transmit		Downlink (DL) operating band BS transmit UE receive		Duplex mode
	$F_{UL_low} - F_{UL_high}$		$F_{DL_low} - F_{DL_high}$		
19	830 MHz	–	845 MHz	875 MHz – 890 MHz	FDD
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
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
30	2 305 MHz	–	2 315 MHz	2 350 MHz – 2 360 MHz	FDD
31	452.5 MHz	–	457.5 MHz	462.5 MHz – 467.5 MHz	FDD
32	N/A		1 452 MHz	– 1 496 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
42	3 400 MHz	–	3 600 MHz	3 400 MHz – 3 600 MHz	TDD
44	703 MHz	–	803 MHz	703 MHz – 803 MHz	TDD
45	1 447 MHz	–	1 467 MHz	1 447 MHz – 1 467 MHz	TDD
48	3 550 MHz	–	3 700 MHz	3 550 MHz – 3 700 MHz	TDD
50	1 432 MHz	–	1 517 MHz	1 432 MHz – 1 517 MHz	TDD ¹⁴
51	1 427 MHz	–	1 432 MHz	1 427 MHz – 1 432 MHz	TDD ¹⁴
65	1 920 MHz	–	2 010 MHz	2 110 MHz – 2 200 MHz	FDD
66	1 710 MHz	–	1 780 MHz	2 110 MHz – 2 200 MHz	FDD ⁵
67	N/A		738 MHz	– 758 MHz	FDD ²
68	698 MHz	–	728 MHz	753 MHz – 783 MHz	FDD
69	N/A		2 570 MHz	– 2 620 MHz	FDD ²
71	663 MHz	–	698 MHz	617 MHz – 652 MHz	FDD
72	451 MHz	–	456 MHz	461 MHz – 466 MHz	FDD
73	450 MHz	–	455 MHz	460 MHz – 465 MHz	FDD

TABLE A1-1 (*end*)

E-UTRA operating band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex mode
	$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
74	1 427 MHz – 1 470 MHz	1 475 MHz – 1 518 MHz	FDD
75	N/A	1 432 MHz – 1 517 MHz	FDD ²
76	N/A	1 427 MHz – 1 432 MHz	FDD ²
85	698 MHz – 716 MHz	728 MHz – 746 MHz	FDD

TABLE A1-2

Frequency bands utilized by E-UTRA and not or not fully identified for IMT in the RR

E-UTRA operating band	Uplink (UL) operating band BS receive UE transmit	Downlink (DL) operating band BS transmit UE receive	Duplex mode
	$F_{UL_low} - F_{UL_high}$	$F_{DL_low} - F_{DL_high}$	
24	1 626.5 MHz – 1 660.5 MHz	1 525 MHz – 1 559 MHz	FDD
...			
41	2 496 MHz – 2 690 MHz	2 496 MHz – 2 690 MHz	TDD
43	3 600 MHz – 3 800 MHz	3 600 MHz – 3 800 MHz	TDD
...			
53	2 483.5 MHz – 2 495 MHz	2 483.5 MHz – 2 495 MHz	TDD
...			
87	410 MHz – 415 MHz	420 MHz – 425 MHz	FDD
88	412 MHz – 417 MHz	422 MHz – 427 MHz	FDD

NOTE 1 – Bands 6, 23 are 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 carrier aggregation (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 – For the E-UTRA operating frequency bands in Table A1-1 where the frequency arrangements differ from the recommended ones by the ITU-R (see Recommendation ITU-R M.1036) unwanted emission characteristics in this Recommendation are provided as a guidance.

NOTE 4 – A UE that complies with the E-UTRA Band 65 minimum requirements in this specification shall also comply with the E-UTRA Band 1 minimum requirements.

NOTE 5 – The range 2 180-2 200 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured.

NOTE 6 – A UE that supports E-UTRA Band 66 shall receive in the entire DL operating band

NOTE 7 – A UE that supports E-UTRA Band 66 and CA operation in any CA band shall also comply with the minimum requirements specified for the DL CA configurations CA_66B, CA_66C and CA_66A-66A.

Notes to Table A1-2:

NOTE 8 – A UE that complies with the E-UTRA Band 66 minimum requirements in this specification shall also comply with the E-UTRA Band 4 minimum requirements.

NOTE 9 – This band is an unlicensed band restricted to licensed-assisted operation using Frame Structure Type 3.

NOTE 10 – In this version of the specification, restricted to E-UTRA DL operation when carrier aggregation is configured.

NOTE 11 – The range 2 010-2 020 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured and TX-RX separation is 300 MHz. The range 2 005-2 020 MHz of the DL operating band is restricted to E-UTRA operation when carrier aggregation is configured and TX-RX separation is 295 MHz.

NOTE 12 – This band is unlicensed band used for V2X communication. There is no expected network deployment in this band so both Frame Structure Type 1 and Frame Structure Type 2 can be used.

NOTE 13 – A UE that complies with the E-UTRA Band 74 minimum requirements in this specification shall also comply with the E-UTRA Band 11 and Band 21 minimum requirements.

NOTE 14 – UE that complies with the E-UTRA Band 50 minimum requirements in this specification shall also comply with the E-UTRA Band 51 minimum requirements.

NOTE 15 – A UE that complies with the E-UTRA Band 75 minimum requirements in this specification shall also comply with the E-UTRA Band 76 minimum requirements.

NOTE 16 – Uplink transmission is not allowed at this band for UE with external vehicle-mounted antennas

1.1 Channel bandwidth

Requirements in the present document are specified for the channel bandwidths listed in Table A1-3.

TABLE A1-3

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 A1-4

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⁾		

TABLE A1-4 (continued)

E-UTRA band / Channel bandwidth						
E-UTRA band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
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)}
30			Yes	Yes ⁽¹⁾		
31	Yes	Yes ⁽¹⁾	Yes ⁽¹⁾			
...						
33			Yes	Yes	Yes	Yes
34			Yes	Yes	Yes	
35	Yes	Yes	Yes	Yes	Yes	Yes
36	Yes	Yes	Yes	Yes	Yes	Yes
37			Yes	Yes	Yes	Yes
38			Yes	Yes	Yes ⁽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

TABLE A1-4 (*end*)

E-UTRA band / Channel bandwidth						
E-UTRA band	1.4 MHz	3 MHz	5 MHz	10 MHz	15 MHz	20 MHz
45			Yes	Yes	Yes	Yes
46				Yes		Yes
47				Yes		Yes
48			Yes	Yes	Yes	Yes
...						
53	Yes	Yes	Yes	Yes		
...						
65	Yes	Yes	Yes	Yes	Yes	Yes
66	Yes	Yes	Yes	Yes	Yes	Yes
68			Yes	Yes	Yes ⁽⁵⁾	
70			Yes	Yes	Yes	Yes ⁽⁴⁾
71			Yes	Yes ⁽¹⁾	Yes ⁽¹⁾	Yes ^{(1),(6)}
72	Yes	Yes ⁽¹⁾	Yes ⁽¹⁾			
73	Yes	Yes ⁽¹⁾	Yes ⁽¹⁾			
74	Yes	Yes	Yes	Yes ⁽¹⁾	Yes ⁽¹⁾	Yes ⁽¹⁾
85			Yes ⁽¹⁾	Yes ⁽¹⁾		
87	Yes	Yes ⁽¹⁾	Yes ⁽¹⁾			
88	Yes	Yes ⁽¹⁾	Yes ⁽¹⁾			

- ⁽¹⁾ Refers to the bandwidth for which a relaxation of the specified UE receiver sensitivity requirement is allowed.
- ⁽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.
- ⁽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 (§ 4.3).
- ⁽⁴⁾ For the 20 MHz bandwidth, the minimum requirements are restricted to E UTRA operation when carrier aggregation is configured.
- ⁽⁵⁾ For the 15 MHz bandwidth, the minimum requirements are specified for E-UTRA UL carrier frequencies confined to either 705.5 MHz or 710.5-720.5 MHz.
- ⁽⁶⁾ For the 20 MHz bandwidth, the minimum requirements are specified for E-UTRA UL carrier frequencies confined to either 673-678 MHz or 683-688 MHz.

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.

Requirements for intra-band contiguous CA are defined for the CA configurations and bandwidth combination sets specified in TS 36.521-1 V16.9.0, subclause 5.4.2A.1, Table 5.4.2A.1-1.

Requirements for inter-band CA are defined for the CA configurations and bandwidth combination sets specified in TS 36.521-1 V16.9.0, subclause 5.4.2A.1, Tables 5.4.2A.1-2, 5.4.2A.1-2a, 5.4.2A.1-2b and 5.4.2A.1-2c.

Requirements for intra-band non-contiguous CA are defined for the CA configurations and bandwidth combination sets specified in TS 36.521-1 V16.9.0, subclause 5.4.2A.1, Tables 5.4.2A.1-3, 5.4.2A.1-4 and 5.4.2A.1-5.

Requirements for UL-MIMO are defined for bandwidth combination sets in TS 36.521-1 V16.9.0, Table 5.4.2.1-1.

Requirements for ProSe are defined for bandwidth combination sets in TS 36.521-1 V16.9.0, clause 5.4.2D.1, Tables 5.4.2D.1-1 and 5.4.2D.1-2.

Requirements for category NB1 and category NB2 are defined for bandwidth combination sets in TS 36.521-1 V16.9.0, clause 5.4.2D.1, Tables 5.4.2D.1-1 and 5.4.2D.1-4.

Requirements for V2X Communication are defined for bandwidth combination sets in TS 36.521-1 V16.9.0, clause 5.4.2G.1, Tables 5.4.2G.1-1, 5.4.2G.1-2, 5.4.2G.1-3 and 5.4.2D.1-2.

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.

Composite spectrum emission mask: Emission mask requirement for intraband non-contiguous carrier aggregation which is a combination of individual sub-block spectrum emissions masks.

Composite spurious emission requirement: Spurious emission requirement for intraband non-contiguous carrier aggregation which is a combination of individual sub-block spurious emission requirements.

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

Contiguous resource allocation: A resource allocation of consecutive resource blocks within one carrier or across contiguously aggregated carriers. The gap between contiguously aggregated carriers due to the nominal channel spacing is allowed.

Contiguous spectrum: Spectrum consisting of a contiguous block of spectrum with no sub-block gaps.

Enhanced performance requirements type A: This defines performance requirements assuming as baseline receiver reference symbol based linear minimum mean square error interference rejection combining.

Inter-band carrier aggregation: Carrier aggregation of component carriers in different operating bands.

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

Intra-band contiguous carrier aggregation: Contiguous carriers aggregated in the same operating band.

Intra-band non-contiguous carrier aggregation: Non-contiguous carriers aggregated in the same operating band.

Lower sub-block edge: The frequency at the lower edge of one sub-block. It is used as a frequency reference point for both transmitter and receiver requirements.

Category NB1/NB2 stand-alone operation: Category NB1/NB2 is operating standalone when it utilizes its own spectrum, for example the spectrum used by GERAN systems as a replacement of one or more GSM carriers, as well as scattered spectrum for potential IoT deployment.

Category NB1/NB2 guard band operation: Category NB1/NB2 is operating in guard band when it utilizes the unused resource block(s) within a E-UTRA carrier's guard-band.

Category NB1/NB2 in-band operation: Category NB1/NB2 is operating in-band when it utilizes the resource block(s) within a normal E-UTRA carrier.

Non-contiguous spectrum: Spectrum consisting of two or more sub-blocks separated by sub-block gap(s).

Sub-block: This is one contiguous allocated block of spectrum for transmission and reception by the same UE. There may be multiple instances of sub-blocks within an RF bandwidth.

Sub-block bandwidth: The bandwidth of one sub-block.

Sub-block gap: A frequency gap between two consecutive sub-blocks within an RF bandwidth, where the RF requirements in the gap are based on co-existence for un-coordinated operation.

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

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

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

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

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

Upper sub-block edge: The frequency at the upper edge of one sub-block. It is used as a frequency reference point for both transmitter and receiver requirements.

V2X Communication: V2X (Vehicle-to-Everything) service is operating in ITS spectrum and/or LTE licensed operating bands.

2.2 Symbols

For the purposes of the present Recommendation, 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
$F_{agg_alloc_low}$	Aggregated Transmission Bandwidth Configuration. The lowest frequency of the simultaneously transmitted resource blocks
$F_{agg_alloc_high}$	Aggregated Transmission Bandwidth Configuration. The highest frequency of the simultaneously transmitted resource blocks
$F_{Interferer}$ (offset)	Frequency offset of the interferer
$F_{Interferer}$	Frequency of the interferer
F_C	Frequency of the carrier centre frequency
F_{C_agg}	Aggregated Transmission Bandwidth Configuration. Center frequency of the aggregated carriers
$F_{C,block,high}$	Center frequency of the highest transmitted/received carrier in a sub-block
$F_{C,block,low}$	Center frequency of the lowest transmitted/received carrier in a sub-block
F_{C_low}	The centre frequency of the <i>lowest carrier</i> , expressed in MHz
F_{C_high}	The centre frequency of the <i>highest carrier</i> , expressed in MHz
F_{DL_low}	The lowest frequency of the downlink operating band
F_{DL_high}	The highest frequency of the downlink operating band
F_{UL_low}	The lowest frequency of the uplink operating band
F_{UL_high}	The highest frequency of the uplink operating band
$F_{edge,block,low}$	The lower sub-block edge, where $F_{edge,block,low} = F_{C,block,low} - F_{offset}$.
$F_{edge,block,high}$	The upper sub-block edge, where $F_{edge,block,high} = F_{C,block,high} + F_{offset}$.
F_{edge_low}	The <i>lower edge</i> of aggregated channel bandwidth, expressed in MHz
F_{edge_high}	The <i>higher edge</i> of aggregated channel bandwidth, expressed in 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>
$F_{offset,block,low}$	Separation between lower edge of a sub-block and the center of the lowest component carrier within the sub-block

$F_{offset,block,high}$	Separation between higher edge of a sub-block and the center of the highest component carrier within the sub-block
F_{OOB}	The boundary between the E-UTRA out of band emission and spurious emission domains
I_o	The power spectral density of the total input signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector, including the own-cell downlink signal
I_{or}	The total transmitted power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the eNode B transmit antenna connector
\hat{I}_{or}	The total received power spectral density of the own-cell downlink signal (power averaged over the useful part of the symbols within the transmission bandwidth configuration, divided by the total number of RE for this configuration and normalised to the subcarrier spacing) at the UE antenna connector
I_{ot}	The received power spectral density of the total noise and interference for a certain RE (average power obtained within the RE and normalized to the subcarrier spacing) as measured at the UE antenna connector
L_{CRB}	Transmission bandwidth which represents the length of a contiguous resource block allocation expressed in units of resources blocks
N_{cp}	Cyclic prefix length
N_{DL}	Downlink EARFCN
N_{oc}	The power spectral density of a white noise source (average power per RE normalised to the 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
$N_{oc'}$	The power spectral density (average power per RE normalised to the subcarrier spacing) of the summation of the received power spectral densities of the strongest interfering cells explicitly defined in a test procedure plus, as measured at the UE antenna connector. The respective power spectral density of each interfering cell relative to is defined by its associated DIP value
$N_{offs-DL}$	Offset used for calculating downlink EARFCN
$N_{offs-UL}$	Offset used for calculating uplink EARFCN

N_{otx}	The power spectral density of a white noise source (average power per RE normalised to the subcarrier spacing) simulating eNode B transmitter impairments as measured at the eNode B 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
$N_{RB,c}$	The transmission bandwidth configuration of component carrier c , expressed in units of resource blocks
$N_{RB,largest\ BW}$	The largest transmission bandwidth configuration of the component carriers in the bandwidth combination, expressed in units of resource blocks
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
P_{UW}	Power of an unwanted DL signal
P_W	Power of a wanted DL signal
RB_{start}	Indicates the lowest RB index of transmitted resource blocks
RB_{end}	Indicates the highest RB index of transmitted resource blocks
Δf_{oOB}	Δ Frequency of out-of-band emission
$\Delta R_{IB,c}$	Allowed reference sensitivity relaxation due to support for inter-band CA operation, for serving 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
W_{gap}	Sub-block gap size

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	Intra-band contiguous CA of component carriers in one sub-block within Band X where X is the applicable E-UTRA operating band
CA_X-X	Intra-band non-contiguous CA of component carriers in two sub-blocks within Band X where X is the applicable E-UTRA operating band
CA_X-Y	Inter-band CA of component carrier(s) in one sub-block within Band X and component carrier(s) in one sub-block within Band Y where X and Y are the applicable E-UTRA operating band
CA_X-X-Y	CA of component carriers in two sub-blocks within Band X and component carrier(s) in one sub-block within Band Y where X and Y are the applicable E-UTRA operating bands
CC	Component carriers
CG	Carrier group
CPE	Customer premise equipment
CPE_X	Customer premise equipment for E-UTRA operating band X
CW	Continuous wave
DC	Dual connectivity
DC_X-Y	Inter-band DC of component carrier(s) in one sub-block within Band X and component carrier(s) in one sub-block within Band Y where X and Y are the applicable E-UTRA operating band
DCI	Downlink control information
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
MCG	Main carrier group
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
ProSe	Proximity-based services
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
SCG	Secondary carrier group
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
V2X	Vehicle-to-Everything
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 Unwanted emission characteristics

TABLE A1-5

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 A1-1	1.4, 3, 5, 10, 15, 20
NS_03	3.1.3.1	2, 4,10, 23, 25, 35, 36, 66, 70	3
			5
			10
			15
			20
NS_04	3.1.3.2	41	5
	4.5.18		10, 15, 20
NS_05	4.5.1	1	10,15,20
NS_06	3.1.3.3	12, 13, 14, 17	1.4, 3, 5, 10
NS_07	3.1.3.3	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	3.1.3.1	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	3.1.3.1	23	5, 10, 15, 20
	4.5.14		
NS_21	3.1.3.1	30	5, 10
	4.5.15		
NS_22	4.5.16	42, 43	5, 10, 15, 20
NS_23	4.5.17	42, 43	5, 10, 15, 20
NS_24	4.5.19	65	5, 10, 15, 20
NS_25	4.5.20	65	5, 10, 15, 20

TABLE A1-5 (*end*)

Network signalling value	Requirements (subclause)	E-UTRA band	Channel bandwidth (MHz)
NS_27	3.1.3.4 4.5.21	48	5, 10, 15, 20
NS_28	4.5.22	46	20
NS_29	4.5.23	46	20
NS_30	4.5.24	46	20
NS_31	4.5.25	46	20
NS_35	3.1.3.5	71	5, 10, 15, 20
NS_36	4.5.26	68	5, 10, 15
NS_38	4.5.27	74	1.4, 3, 5, 10, 15, 20
NS_39	4.5.28	74	10, 15, 20
NS_44	4.5.29	38	5, 10, 15, 20
NS_45	4.5.30	53	1.4, 3, 5, 10
NS_32	-	-	-

NOTE 1 – The signalling is for purposes other than additional emission requirements.

TABLE A1-6

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, 4.6.7	CA_41C
CA_NS_05	4.6.4	CA_38C
CA_NS_06	4.6.5	CA_7C
CA_NS_07	4.6.6	CA_39C

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 A1-7 and A1-8 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 A1-7 or Table A1-8 for the specified channel bandwidths.

TABLE A1-7

E-UTRA spectrum emission mask, E-UTRA bands ≤ 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 A1-8

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

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

3.1.1A Spectrum emission mask for multi-cluster PUSCH

The power of any UE emission shall not exceed the levels specified in Table A1-9 or Table A1-10 for the specified channel bandwidth.

TABLE A1-9

General E-UTRA spectrum emission mask, E-UTRA bands ≤ 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
0-1	-8.5	-11.5	-13.5	-16.5	-18.5	-19.5	30 kHz
1-2.5	-8.5	-8.5	-8.5	-8.5	-8.5	-8.5	1 MHz
2.5-2.8	-23.5						1 MHz
2.8-5							1 MHz
5-6		-23.5	-11.5	-11.5	-11.5	-11.5	1 MHz
6-10			-23.5				1 MHz
10-15				-23.5	1 MHz		
15-20					-23.5		1 MHz
20-25						-23.5	1 MHz

TABLE A1-10

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

Δf_{oob} (MHz)	Spectrum emission limit (dBm)/Channel bandwidth						
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	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						1 MHz
2.8-5							1 MHz
5-6		-23.2	-11.2	-11.2	-11.2	-11.2	1 MHz
6-10			-23.2				1 MHz
10-15				-23.2	1 MHz		
15-20					-23.2		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 two E-UTRAs, the spectrum emission mask of the UE is defined per component carrier while both component carriers are active and the requirements are specified in Tables A1-11 and A1-12. If for some frequency spectrum emission masks of component carriers overlap then spectrum emission mask allowing higher power spectral density applies for that frequency. If for some frequency a component carrier spectrum emission mask overlaps with the channel bandwidth of another component carrier, then the emission mask does not apply for that frequency.

For intra-band contiguous carrier aggregation the spectrum emission mask of the UE applies to frequencies (Δf_{oB}) starting from the \pm edge of the aggregated channel bandwidth (see § 1.1.2). For intra-band contiguous carrier aggregation the bandwidth class B and C, the power of any UE emission shall not exceed the levels specified in Table A1-11 or Table A1-12 for bandwidth Class C and Table A1-13 or Table A1-14 for Bandwidth Class B, as applicable.

TABLE A1-11

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)	25RB+100R B (24.95 MHz)	50RB+100RB (29.9 MHz)	75RB+75RB (30 MHz)	75RB+100RB (34.85 MHz)	100RB+100RB (39.8 MHz)	MBW
$\pm 0-1$	-20.5	-21	-21	-22	-22.5	30 kHz
$\pm 1-5$	-8.5	-8.5	-8.5	-8.5	-8.5	1 MHz
$\pm 5-24.95$	-11.5	-11.5	-11.5	-11.5	-11.5	1 MHz
$\pm 24.95-29.9$	-23.5					1 MHz
$\pm 29.9-29.95$		-23.5				1 MHz
$\pm 29.95-30$						1 MHz
$\pm 30-34.85$			-23.5			1 MHz
$\pm 34.85-34.9$				-23.5		1 MHz
$\pm 34.9-35$						1 MHz
$\pm 35-39.8$						1 MHz
$\pm 39.8-39.85$				-23.5	-23.5	1 MHz
$\pm 39.85-44.8$						1 MHz

TABLE A1-12

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

Spectrum emission limit (dBm)/ $BW_{Channel_CA}$						
Δf_{oB} (MHz)	25RB+100RB (24.95 MHz)	50RB+100RB (29.9 MHz)	75RB+75R B (30 MHz)	75RB+100RB (34.85 MHz)	100RB+100RB (39.8 MHz)	MBW
$\pm 0-1$	-20.2	-20.7	-20.7	-21.7	-22.2	30 kHz
$\pm 1-5$	-8.2	-8.2	-8.2	-8.2	-8.2	1 MHz
$\pm 5-24.95$	-11.2	-11.2	-11.2	-11.2	-11.2	1 MHz
$\pm 24.95-29.9$	-23.2					1 MHz
$\pm 29.9-29.95$		-23.2				1 MHz
$\pm 29.95-30$						1 MHz
$\pm 30-34.85$			-23.2			1 MHz
$\pm 34.85-34.9$				-23.2		1 MHz
$\pm 34.9-35$						1 MHz

TABLE A1-12 (*end*)

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

Spectrum emission limit (dBm)/ $BW_{Channel_CA}$						
Δf_{OOB} (MHz)	25RB+100RB (24.95 MHz)	50RB+100RB (29.9 MHz)	75RB+75R B (30 MHz)	75RB+100RB (34.85 MHz)	100RB+100RB (39.8 MHz)	MBW
±35-39.8						1 MHz
±39.8-39.85					-23.2	1 MHz
±39.85-44.8						1 MHz

TABLE A1-13

General E-UTRA spectrum emission mask for CA Bandwidth Class B, E-UTRA bands ≤ 3 GHz

Spectrum emission limit [dBm]/ $BW_{Channel_CA}$			
Δf_{OOB} (MHz)	25RB+50RB (14.95 MHz)	50RB+50RB (19.9 MHz)	MBW
±0-1	-20	-21	30 kHz
±1-5	-10	-10	1 MHz
±5-14.95	-13	-13	1 MHz
±14.95-19.90	-25	-13	1 MHz
±19.90-19.95	-25	-25	1 MHz
±19.95-24.90		-25	1 MHz

TABLE A1-14

General E-UTRA spectrum emission mask for CA Bandwidth Class B, 3 GHz < E-UTRA bands ≤ 4.2 GHz

Spectrum emission limit [dBm]/ $BW_{Channel_CA}$			
Δf_{OOB} (MHz)	25RB+50RB (14.95 MHz)	50RB+50RB (19.9 MHz)	MBW
±0-1	-20	-21	30 kHz
±1-5	-10	-10	1 MHz
±5-14.95	-13	-13	1 MHz
±14.95-19.90	-25	-13	1 MHz
±19.90-19.95	-25	-25	1 MHz
±19.95-24.90		-25	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.

3.1.3 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 A1-5.

3.1.3.1 Additional E-UTRAN spectrum emission with NS value of “NS_03”, “NS_11”, “NS_20” and “NS_21”

When “NS_03”, “NS_11”, “NS_20” or “NS_21” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Tables A1-15 and A1-16.

TABLE A1-15

Additional requirements, E-UTRA bands ≤ 3 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	-8.5	-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
6-10			-23.5				1 MHz
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 -0.5 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 spectrum emission mask (SEM) requirement applies to bands corresponding to NS value NS_03 as defined in Table A1-5.

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 A1-16

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

Spectrum emission limit (dBm)/Channel bandwidth							
Δf_{oob} (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		-23.2	-23.2	-23.2	-23.2	-23.2	1 MHz
5-6							1 MHz
6-10							1 MHz
10-15				-23.2			1 MHz
15-20					-23.2		1 MHz
20-25						-23.2	1 MHz

NOTE 1 – The first and last measurement position with a 30 kHz filter is at Δf_{oob} equals to 0.015 MHz and 0.985 MHz.

NOTE 2 – At the boundary of spectrum emission limit, the first and last measurement position with a 1 MHz filter is the inside of +0.5 MHz and -0.5 MHz, respectively.

NOTE 3 – The measurements 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 A1-5.

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

NOTE – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the 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 Table A1-17.

TABLE A1-17

Additional requirements (network signalled value "NS_04")

Spectrum emission limit (dBm)/Channel bandwidth						
Δf_{oob} (MHz)		5 MHz	10 MHz	15 MHz	20 MHz	MBW
$\pm 0-1$		-13.5	-16.5	-18.5	-19.5	30 kHz
$\pm 1-2.5$						1 MHz
$\pm 2.5-2.8$		-8.5	-8.5	-8.5	-8.5	1 MHz
$\pm 2.8-5$						1 MHz
$\pm 5-6$		-11.5	-11.5	-11.5		1 MHz
$\pm 6-9$		-23.5				1 MHz
$\pm 9-10$			-23.5			1 MHz
$\pm 10-13.5$					-11.5	1 MHz
$\pm 13.5-15$				-23.5		1 MHz
$\pm 15-18$						1 MHz
$\pm 18-20$						1 MHz
$\pm 20-25$						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.

3.1.3.3 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 A1-18 and A1-19.

TABLE A1-18

Additional requirements, E-UTRA bands ≤ 3 GHz

Spectrum emission limit (dBm)/Channel bandwidth					
Δf_{oob} (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				1 MHz
2.5-2.8	-23.5	-11.5	-11.5	-11.5	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

Notes to Table A1-18:

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 A1-5.

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 A1-19
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	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 A1-5.

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.

3.1.3.4 Additional E-UTRAN spectrum emission with NS value of “NS_27”

When “NS_27” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-20.

TABLE A1-20
Additional requirements

Spectrum emission limit (dBm)/Channel bandwidth					
Δf_{OOB} (MHz)	5 MHz	10 MHz	15 MHz	20 MHz	MBW
$\pm 0-1$	-11.2	-11.2	-11.2	-11.2	Note 1
$\pm 1-10$	-11.2	-11.2	-11.2	-11.2	1 MHz
$\pm 10-15$		-23.2	-23.2	-23.2	1 MHz
$\pm 15-20$			-23.2	-23.2	1 MHz
$\pm 20-25$				-23.2	1 MHz

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

3.1.3.5 Additional E-UTRAN spectrum emission with NS value of “NS_35”

When “NS_35” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-21.

TABLE A1-21
Additional requirements

Δf_{OOB} (MHz)	5 MHz	10 MHz	15 MHz	20 MHz	MBW
$\pm 0-0.1$	-13.5	-16.5	-18.5	-19.5	30 kHz
$\pm 0.1-6$	-11.5	-11.5	-11.5	-11.5	100 kHz
$\pm 6-10$	-23.5 ¹	-11.5	-11.5	-11.5	100 kHz
$\pm 10-15$		-23.5 ¹	-11.5	-11.5	100 kHz
$\pm 15-20$			-23.5 ⁽¹⁾	-11.5	100 kHz
$\pm 20-25$				-23.5	1 MHz

⁽¹⁾ The measurement bandwidth shall be 1 MHz.

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 A1-6.

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 A1-22.

TABLE A1-22
Additional requirements

Spectrum emission limit [dBm]/ $BW_{Channel_CA}$							
Δf_{OOB} (MHz)	50+75RB (24.75 MHz)	25+100RB (24.95 MHz)	50+100RB (29.9 MHz)	75+75RB (30 MHz)	75+100RB (34.85 MHz)	100+100RB (39.8 MHz)	MBW
± 0-1	-22	-22	-22.5	-23	-23.5	-24	30 kHz
±1-5	-10	-10	-10	-10	-10	-10	1 MHz
±5-22.95	-13	-13	-13	-13	-13	-13	1 MHz
±22.95-23.25	-13	-25	-13	-13	-13	-13	1 MHz
±23.25-27.9	-25	-25	-13	-13	-13	-13	1 MHz
±27.9-28.5	-25	-25	-25	-13	-13	-13	1 MHz
±28.5-29.75	-25	-25	-25	-25	-13	-13	1 MHz
±29.75-29.95		-25	-25	-25	-13	-13	1 MHz
±29.95-32.85			-25	-25	-13	-13	1 MHz
±32.85-34.9			-25	-25	-25	-13	1 MHz
±34.9-35				-25	-25	-13	1 MHz
±35-37.8					-25	-13	1 MHz
±37.8-39.85					-25	-25	1 MHz
±39.85-44.8						-25	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 A1-6.

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 ($E\text{-UTRA}_{ACLR}$) 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 Tables A1-23, A1-24 and

A1-25. If the measured adjacent channel power is greater than -50 dBm then the $E-UTRA_{ACLR}$ shall be higher than the value specified in Tables A1-23, A1-24 and A1-25.

TABLE A1-23

General requirements for $E-UTRA_{ACLR}$ for UEs with 23 dBm output power

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

TABLE A1-24

**Additional $E-UTRA_{ACLR}$ requirements UEs with 31 dBm output power
(applicable for operating band 14 only)**

	Channel bandwidth / $E-UTRA_{ACLR1}$ / MBW					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
$E-UTRA_{ACLR1}$			36.2 dB	36.2 dB		
E-UTRA channel MBW			4.5 MHz	9.0 MHz		
Adjacent channel centre frequency offset (MHz)			+5/-5	+10/-10		

NOTE – $E-UTRA_{ACLR1}$ shall be applicable for > 23 dBm.

TABLE A1-25

Additional $E-UTRA_{ACLR}$ requirements UEs with 26 dBm output power

	Channel bandwidth / $E-UTRA_{ACLR1}$ / MBW					
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz
$E-UTRA_{ACLR1}$			30.2 dB	30.2 dB	30.2 dB	30.2 dB
E-UTRA channel MBW			4.5 MHz	9.0 MHz	13.5 MHz	18 MHz
Adjacent channel centre frequency offset (MHz)			+5 MHz or -5 MHz	+10 MHz or -10 MHz	+15 MHz or -15 MHz	+20 MHz or -20 MHz

3.2.1A Additional minimum requirement for E-UTRA (network signalled value “NS_29”)

When “NS_29” is indicated in the cell, the UE emission shall meet the additional requirements specified in Table A1-26 for E-UTRA channels assigned within the frequency ranges

5 150-5 350 MHz and 5 470-5 725 MHz. The assigned E-UTRA channel power and alternative adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidths specified in Table A1-26. If the measured alternative adjacent channel power is greater than -50 dBm then the $E-UTRA_{ACLR2}$ shall be higher than the value specified in Table A1-25.

TABLE A1-26

Additional $E-UTRA_{ACLR}$ requirement

	Channel bandwidth / $E-UTRA_{ACLR2}$ / MBW
	20 MHz
$E-UTRA_{ACLR2}$	40 dBc
E-UTRA channel measurement bandwidth	Note 1
Adjacent channel centre frequency offset [MHz]	+40 / -40

NOTE 1 – 18 MHz for E-UTRA channels assigned within 5 150-5 350 MHz; 19 MHz for E-UTRA channels assigned within 5 470-5 725 MHz.

3.2.1.1 E-UTRA ACLR for multi clustered PUSCH

For multi clustered PUSCH allocation, the E-UTRA ACLR requirements in Tables A1-23, A1-24 and A1-25 apply as appropriate.

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 A1-7. If the measured UTRA channel power is greater than -50 dBm then the $UTRA_{ACLR}$ shall be higher than the value specified in Table A1-27.

TABLE A1-27
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 5 MHz channel MBW ¹	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz	3.84 MHz
UTRA 1.6 MHz 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 5 MHz and for UTRA TDD is 1.6 MHz.

3.2.2.1 UTRA ACLR for multi clustered PUSCH

For multi clustered PUSCH allocation, the UTRA ACLR requirements in Table A1-27 apply.

3.2.3 UTRA ACLR for CA

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, the UTRA Adjacent Channel Leakage power Ratio ($UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the assigned channel bandwidth on the component carrier to the filtered mean power centred on an adjacent channel frequency. The UTRA Adjacent Channel Leakage power Ratio is defined per carrier and the requirement is specified in § 3.2.2.

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.

For intra-band non-contiguous carrier aggregation when all sub-blocks consist of one component carrier the UTRA Adjacent Channel Leakage power Ratio ($UTRA_{ACLR}$) is the ratio of the sum of the filtered mean powers centered on the assigned sub-block frequencies to the filtered mean power centred on an adjacent(s) UTRA channel frequency. $UTRA_{ACLR1/2}$ requirements are applicable for all sub-blocks and are specified in Table A1-27. $UTRA_{ACLR1}$ is required to be met in the sub-block gap when the gap bandwidth W_{gap} is $5 \text{ MHz} \leq W_{gap} < 15 \text{ MHz}$. Both $UTRA_{ACLR1}$ and $UTRA_{ACLR2}$ are required to be met in the sub-block gap when the gap bandwidth W_{gap} is $15 \text{ MHz} \leq W_{gap}$.

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band), the UTRA Adjacent Channel Leakage power Ratio ($UTRA_{ACLR}$) is defined as follows. For the E-UTRA band supporting one component carrier, the UTRA Adjacent Channel Leakage power Ratio ($UTRA_{ACLR}$) is the ratio of the filtered

mean power centred on the assigned channel bandwidth of the component carrier to the filtered mean power centred on an adjacent(s) UTRA channel frequency and the requirements specified in § 3.2.2 apply. For the E-UTRA band supporting two contiguous component carriers the UTRA Adjacent Channel Leakage power Ratio ($UTRA_{ACLR}$) is the ratio of the filtered mean power centred on the aggregated channel bandwidth to the filtered mean power centred on an adjacent(s) UTRA channel frequency and the requirements specified in § 3.2.2 apply.

$UTRA_{ACLR}$ 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 A1-28. If the measured UTRA channel power is greater than -50 dBm then the $UTRA_{ACLR}$ shall be higher than the value specified in Table A1-28 for intraband contiguous carrier aggregation or Table A1-29 for intraband non-contiguous carrier aggregation. If the measured UTRA channel power is greater than -50 dBm then the $UTRA_{ACLR}$ shall be higher than the value specified in Table A1-28 for intraband contiguous carrier aggregation or Table A1-29 for intraband non-contiguous carrier aggregation.

For carrier aggregation with one or two uplink component carriers, the $UTRA_{ACLR}$ requirements for the UEs with 26 dBm output power are not applicable to the uplink component carrier(s) assigned to one of the E-UTRA band in Band 7, 12, 13, 17, 20, 24, 27, 30, 33, 35, 36, 37, 38, 40, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 68, 70, 71 or 85.

TABLE A1-28

General requirements for CA $UTRA_{ACLR1/2}$

	CA bandwidth class / $UTRA_{ACLR1/2}$ / MBW
	CA bandwidth class B, C and D
$UTRA_{ACLR1}$	32.2 dB
Adjacent channel centre frequency offset (MHz)	$\frac{+ BW_{\text{Channel_CA}} / 2 + BW_{\text{UTRA}} / 2}{- BW_{\text{Channel_CA}} / 2 - BW_{\text{UTRA}} / 2}$
$UTRA_{ACLR2}$	35.2 dB
Adjacent channel centre frequency offset (MHz)	$\frac{+ BW_{\text{Channel_CA}} / 2 + 3 * BW_{\text{UTRA}} / 2}{- W_{\text{Channel_CA}} / 2 - 3 * BW_{\text{UTRA}} / 2}$
CA E-UTRA channel MBW	$BW_{\text{Channel_CA}} - 2 * BW_{\text{GB}}$
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.

TABLE A1-29

Requirements for intraband non-contiguous CA $UTRA_{ACLR1/2}$

	CA bandwidth class / $UTRA_{ACLR1/2}$ / MBW
$UTRA_{ACLR1}$	32.2 dB
Adjacent channel centre frequency offset (MHz)	$\frac{+ F_{edge,block,high} + BW_{UTRA}/2}{- F_{edge,block,low} - BW_{UTRA}/2}$
$UTRA_{ACLR2}$	36 dB
Adjacent channel centre frequency offset (MHz)	$\frac{+ F_{edge,block,high} + 3*BW_{UTRA}/2}{- F_{edge,block,low} - 3*BW_{UTRA}/2}$
CA E-UTRA channel MBW	$BW_{Channel,block} - 2* BW_{GB}$
UTRA 5 MHz channel MBW	3.84 MHz
UTRA 1.6 MHz channel MBW	1.28 MHz

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 A1-30. If the measured adjacent channel power is greater than -50 dBm then the E- $UTRA_{ACLR}$ shall be higher than the value specified in Tables A1-30 and A1-31.

TABLE A1-30

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

	CA bandwidth class / CA E- $UTRA_{ACLR}$ / MBW
	CA bandwidth class B, C and D (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)	$\frac{+BW_{Channel_CA}}{-BW_{Channel_CA}}$

TABLE A1-31

General requirements for CA E-UTRA_{ACLR} for UL CA_{41C}

	CA bandwidth class / CA E-UTRA _{ACLR} / MBW
	CA bandwidth class C
CA E-UTRA _{ACLR}	30.8 dB
CA E-UTRA channel MBW	$BW_{Channel_CA} - 2 * BW_{GB}$
Adjacent channel centre frequency offset (MHz)	$+BW_{Channel_CA}$ / $-BW_{Channel_CA}$

For inter-band carrier aggregation with one component carrier per operating band and the uplink active in two E-UTRA bands, E-UTRA Adjacent Channel Leakage power Ratio (*E-UTRA_{ACLR}*) is the ratio of the filtered mean power centred on the assigned channel bandwidth on a component carrier to the filtered mean power centred on an adjacent channel frequency. The E-UTRA Adjacent Channel Leakage power Ratio is defined per carrier and the requirement is specified in § 3.2.1.

For intra-band non-contiguous carrier aggregation when all sub-blocks consist of one component carrier the E-UTRA Adjacent Channel Leakage power Ratio (*E-UTRA_{ACLR}*) is the ratio of the sum of the filtered mean powers centred on the assigned sub-block frequencies to the filtered mean power centred on an adjacent channel frequency at nominal channel spacing. In case the sub-block gap bandwidth W_{gap} is smaller than of the sub-block bandwidth then for that sub-block no *E-UTRA_{ACLR}* requirement is set for the gap. In case the sub-block gap bandwidth W_{gap} is smaller than either of the sub-block bandwidths then no *E-UTRA_{ACLR}* requirement is set for the gap. The assigned E-UTRA sub-block power and adjacent E-UTRA channel power are measured with rectangular filters with measurement bandwidths specified in Table A1-32. 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 A1-32.

TABLE A1-32

General requirements for non-contiguous intraband CA E-UTRA_{ACLR1}

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

For combinations of intra-band and inter-band carrier aggregation with three uplink component carriers (up to two contiguously aggregated carriers per band), the E-UTRA Adjacent Channel Leakage power Ratio (*E-UTRA_{ACLR}*) is defined as follows. For the E-UTRA band supporting one component carrier, the E-UTRA Adjacent Channel Leakage power Ratio (*E-UTRA_{ACLR}*) is the ratio of the filtered mean power centred on the assigned channel bandwidth of the component carrier to the filtered mean power centred on an adjacent channel frequency and the requirements in § 3.2.1 apply. For the E-UTRA band supporting two contiguous component carriers the E-UTRA Adjacent Channel Leakage power Ratio (*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(s) aggregated channel bandwidth at nominal channel spacing and the requirements of CA E-UTRA_{ACL}R specified in § 3.2.4 apply.

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 A1-15.

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

3.4 Out of band emission mask for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in document TS 36.521-1 V16.9.0, clause 5.4.2D.1, Tables 5.4.2D.1-1 and 5.4.2D.1-2, the requirements in § 3.1.1 apply.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in document TS 36.521-1 V16.9.0, clause 5.4.2D.1, Tables 5.4.2D.1-1 and 5.4.2D.1-2, the requirements in § 3.1.1 apply per E-UTRA ProSe sidelink and E-UTRA uplink transmission as specified for the corresponding inter-band aggregation with uplink assigned to two bands.

3.5 Out of band emission mask for category NB1 and NB2

3.5.1 Spectrum emission mask for NB1 and NB2

The spectrum emission mask of the category NB1 and NB2 UE applies to frequencies (Δf_{OOB}) starting from the \pm edge of the assigned category NB1 or NB2 channel bandwidth. For frequencies greater than (Δf_{OOB}) as specified in Table A1-33 the spurious requirements in § 4 are applicable.

The power of any category NB1 or NB2 UE emission shall not exceed the levels specified in Table A1-33. The spectrum emission limit between each Δf_{OOB} is linearly interpolated.

TABLE A1-33

Category NB1 and NB2 UE spectrum emission mask, E-UTRA bands ≤ 3 GHz

Δf_{OOB} (kHz)	Emission limit (dBm)	MBW
0-100	$(27.5 + (F - 0) \times \frac{-3.5 - 27.5}{100 - 0})$	30 kHz
100-150	$(-3.5 + (F - 100) \times \frac{-6.5 - (-3.5)}{150 - 100})$	30 kHz
150-300	$(-6.5 + (F - 150) \times \frac{-27.5 - (-6.5)}{300 - 150})$	30 kHz
300-500	$(-27.5 + (F - 300) \times \frac{-33.5 - (-27.5)}{500 - 300})$	30 kHz
500-1 700	-33.5	30 kHz

In addition to the spectrum emission mask requirement in Table A1-33, a category NB1 or NB2 UE shall also meet the applicable E-UTRA spectrum emission mask requirement in § 3.1. E-UTRA spectrum emission requirement applies for frequencies that are F_{offset} away from edge of NB1 or NB2 channel edge as defined in Table A1-34.

TABLE A1-34

Foffset for category NB1 and NB2 UE spectrum emission mask

Channel BW (MHz)	F_{offset} [kHz]
1.4	165
3	190
5	200
10	225
15	240
20	245

NOTE 1 – F_{offset} in this Table is used to guarantee co-existence for guard-band operation.

3.5.2 Additional spectrum emission mask for NB1 and NB2**3.5.2.1 Additional spectrum emission with NS value of “NS_02”**

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 broadcast message.

When “NS_02” is indicated in the cell, the NB-IoT channel is deployed in the lower guard-band of a 10 MHz E-UTRA channel and the separation between the two channel centres is equal to 4.695 MHz. The power of any UE emission shall not exceed the levels specified in Table A1-7 for the specified E-UTRA channel bandwidth and the levels specified in Table A1-33 for the NB-IoT channel.

3.5.2.2 Additional spectrum emission with NS value of “NS_03”

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 broadcast message.

When “NS_03” is indicated in the cell, the NB-IoT channel is deployed in the upper guard-band of a 10 MHz E-UTRA channel and the separation between the two channel centres is equal to 4.695 MHz. The power of any UE emission shall not exceed the levels specified Table A1-7 for the specified E-UTRA channel bandwidth and the levels specified in Table A1-33 for the NB-IoT channel.

3.5.3 Adjacent Channel Leakage Ratio for NB1 and NB2

Adjacent Channel Leakage power Ratio is the ratio of the filtered mean power centred on the assigned channel frequency to the filtered mean power centred on an adjacent channel frequency. The assigned category NB1 or NB2 channel power and adjacent channel power are measured with filters and measurement bandwidths specified in Table A1-35. If the measured adjacent channel power is greater than -50 dBm then the category NB1 or NB2 UE ACLR shall be higher than the value specified in Table A1-35. GSM_{ACLR} requirement is intended for protection of GSM system. $UTRA_{ACLR}$ requirement is intended for protection of UTRA and E-UTRA systems.

TABLE A1-35
Category NB1 and NB2 UE ACLR requirements

	<i>GSM_{ACLR}</i>	<i>UTRA_{ACLR}</i>
ACLR	19.2 dB	36.2 dB
Adjacent channel centre frequency offset from category NB1 or NB2 Channel edge	±200 kHz	±2.5 MHz
Adjacent channel measurement bandwidth	180 kHz	3.84 MHz
Measurement filter	Rectangular	RRC-filter $\alpha = 0.22$
Category NB1 and NB2 channel measurement bandwidth	180 kHz	180 kHz
Category NB1 and NB2 channel Measurement filter	Rectangular	Rectangular

3.6 Out of band emission mask for V2X Communication

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands, the requirements in § 3.1.1 apply except for the ACLR requirements for power class 2 V2X UE.

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands, the requirements in § 3.1.1 apply per V2X sidelink transmission and E-UTRA uplink transmission as specified for the corresponding inter-band concurrent operation with uplink assigned to two bands.

For intra-band contiguous multi-carrier operation, the general CA spectrum emission mask for CA Bandwidth Class B shall apply for V2X Bandwidth Class B, the general CA spectrum emission mask for CA Bandwidth Class C shall apply for V2X Bandwidth Class C and C1.

For intra-band contiguous multi-carrier operation, the E-UTRA ACLR requirement for CA Bandwidth Class B specified in § 3.2.4 shall apply for V2X Bandwidth Class B, the general CA spectrum emission mask for CA Bandwidth Class C specified in § 3.2.4 shall apply for V2X Bandwidth Class C and C1.

For power class 2 V2X UE, the assigned channel power and adjacent channel power are measured with rectangular filters with measurement bandwidths specified in Table A1-36. If the measured adjacent channel power is greater than -50 dBm then ACLR shall be higher than the value specified in Table A1-36.

TABLE A1-36
ACLR requirements for power class 2 V2X Communication

	Channel bandwidth / ACLR / Measurement bandwidth	
	10 MHz	20 MHz
ACLR	31 dB	31 dB
E-UTRA channel measurement bandwidth	9.0 MHz	18 MHz
Adjacent channel centre frequency offset (MHz)	+10 / -10	+20 / -20

For V2X UE supporting Transmit Diversity, if the UE transmits on two antenna connectors at the same time, the requirements specified for single carrier apply to each transmit antenna connector.

If V2X UE transmits on one antenna connector at a time, the requirements specified for single carrier shall apply to the active antenna connector.

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 A1-37 from the edge of the channel bandwidth. The spurious emission limits in Table A1-38 apply for all transmitter band configurations, N_{RB} , and channel bandwidths.

TABLE A1-37

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 A1-38.

TABLE A1-38

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

4.1.1 Spurious emissions requirements for multi clustered PUSCH

For multi clustered PUSCH allocation, the boundary between E-UTRA Δf_{oB} and spurious domain in Table A1-37 and the spurious emissions requirements in Table A1-38 apply.

4.2 Spurious emissions requirements for CA

For inter-band carrier aggregation with uplink assigned to two E-UTRA bands, the spurious emission requirement in Table A1-38 apply for the frequency ranges that are more than Δf_{oB} as defined in Table A1-37 away from edges of the assigned channel bandwidth on a component carrier. If for some frequency a spurious emission requirement of individual component carrier overlaps with the spectrum emission mask or channel bandwidth of another component carrier then it does not apply.

For intra-band contiguous carrier aggregation, the spurious emission limits apply for the frequency ranges that are more than Δf_{oB} (MHz) in Table A1-39 from the \pm edge of the aggregated channel bandwidth. For frequencies Δf_{oB} greater than F_{oB} as specified in Table A1-39 the spurious requirements in Table A1-38 are applicable.

TABLE A1-39
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 A1-37
B	$BW_{Channel_CA} + 5$
C	$BW_{Channel_CA} + 5$

For intra-band non-contiguous carrier aggregation transmission the spurious emission requirement is defined as a composite spurious emission requirement. Composite spurious emission requirement applies to frequency ranges that are more than Δf_{oB} away from the edges of the sub-blocks. Composite spurious emission requirement is defined as follows:

- a) Composite spurious emission requirement is a combination of individual sub-block spurious emission requirements.
- b) In case the sub-block consists of one component carrier the sub-block spurious emission requirement and Δf_{oB} are defined in § 4.1.
- c) If for some frequency an individual sub-block spurious emission requirement overlaps with the general spectrum emission mask or the sub-block bandwidth of another sub-block then it does not apply.

4.3 Spurious emission band UE co-existence

This section 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 A1-40
Spurious emissions band UE co-existence limits

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
1	E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76, 87, 88 NR Band n78, n79	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 34	F _{DL_low} - F _{DL_high}	-50	1	15
	NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
	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, 44
2	E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 50, 51, 53, 66, 70, 71, 74, 85	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 NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
3	E-UTRA Band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76, 87, 88 NR Band n79	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 3	F _{DL_low} - F _{DL_high}	-50	1	15
	E-UTRA Band 22, 42, 52 NR Band n77, n78	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	1 884.5 - 1 915.7	-41	0.3	
4	E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 48, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 42, NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
5	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 50, 51, 65, 66, 70, 71, 73, 74, 85	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 26	859 - 869	-27	1	
	E-UTRA Band 41, 52, 53 NR Band n77, n78, n79	F _{DL_low} - F _{DL_high}	-50	1	2
	E-UTRA Band 18, 19	F _{DL_low} - F _{DL_high}	-40	1	39
	E-UTRA Band 11, 21	F _{DL_low} - F _{DL_high}	-50	1	39

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
	Frequency range	1884.5 - 1915.7	-41	0.3	8, 39
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, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 20, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 87, 88 NR Band n77, n78	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, 31, 32, 33, 34, 38, 39, 40, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76, 87, 88	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA band 3, 7, 22, 41, 42, 43, 52 NR Band n77, n78, n79	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 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, 3, 11, 18, 19, 21, 26, 28, 34	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 42	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	945 - 960	-50	1	
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8
	Frequency range	2 545 - 2 575	-50	1	
	Frequency range	2 595 - 2 645	-50	1	
10	E-UTRA Band 2, 4, 5, 10, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 41, 43, 66, 70, 85	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 22, 42, NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
11	E-UTRA Band 1, 3, 11, 18, 19, 21, 28, 34, 40, 42, 65 NR Band n77, n78, n79	F _{DL_low} - F _{DL_high}	-50	1	
	Frequency range	945 - 960	-50	1	
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8
	Frequency range	2 545 - 2 575	-50	1	
	Frequency range	2 595 - 2 645	-50	1	
12	E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 70, 71, 74	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 4, 48, 50, 51, 66 NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
	E-UTRA Band 12, 85	F _{DL_low} - F _{DL_high}	-50	1	15
13	E-UTRA Band 2, 4, 5, 12, 13, 17, 25, 26, 27, 29, 41, 48, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 14	F _{DL_low} - F _{DL_high}	-50	1	15
	E-UTRA Band 24, 30 NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	769 - 775	-35	0.00625	15
	Frequency range	799 - 805	-35	0.00625	15
14	E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 23, 24, 25, 26, 27, 29, 30, 41, 48, 53, 66, 70, 71, 85	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	769 - 775	-35	0.00625	12, 15
	Frequency range	799 - 805	-35	0.00625	12, 15
17	E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 71, 74	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 4, 50, 51, 53, 66, 70, NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
	E-UTRA Band 12, 48, 85	F _{DL_low} - F _{DL_high}	-50	1	15

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
18	E-UTRA Band 1, 3, 11, 21, 34, 40, 42, 65 NR Band n79	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n77, n78	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	758 - 799	-50	1	
	Frequency range	799 - 803	-40	1	15
	Frequency range	860 - 890	-40	1	
	Frequency range	945 - 960	-50	1	
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8
	Frequency range	2 545 - 2 575	-50	1	
	Frequency range	2 595 - 2 645	-50	1	
19	E-UTRA Band 1, 3, 11, 21, 28, 34, 40, 42, 65 NR Band n79	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n77, n78	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	945 - 960	-50	1	
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8
	Frequency range	2 545 - 2 575	-50	1	
	Frequency range	2 595 - 2 645	-50	1	
20	E-UTRA Band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 68, 72, 74, 75, 76, 87, 88	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, 52, 69 NR Band n77, n78	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	758 - 788	-50	1	
	Frequency range				
21	E-UTRA Band 1, 3, 18, 19, 28, 34, 40, 42, 65 NR Band n77, n78, n79	F _{DL_low} - F _{DL_high}	-50	1	
	Frequency range	945 - 960	-50	1	
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8
	Frequency range	2 545 - 2 575	-50	1	
	Frequency range	2 595 - 2 645	-50	1	

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
22	E-UTRA Band 1, 3, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 39, 40, 43, 65, 67, 68, 69, 72, 75, 76, 87, 88	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, 12, 13, 14, 17, 23, 24, 26, 27, 29, 30, 41, 66	F _{DL_low} - F _{DL_high}	-50	1	
24	E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 66, 70, 71, 85	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
25	E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 42, 48, 53, 66, 70, 71, 85	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, NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
26	E-UTRA Band 1, 2, 3, 4, 5, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 50, 51, 65, 66, 70, 71, 73,74, 85	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 41, 53 NR Band n77, n78, n79	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	703 - 799	-50	1	
	Frequency range	799 - 803	-40	1	15
	Frequency range	945 - 960	-50	1	
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
27	E-UTRA Band 1, 2, 3, 4, 5, 7, 12, 13, 14, 17, 25, 26, 27, 29, 30, 31, 38, 40, 41, 42, 43, 65, 66, 73, 85	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 28	F _{DL_low} - 790	-50	1	
	NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	799 - 805	-35	0.00625	
28	E-UTRA Band 1, 4, 22, 32, 42, 43, 50, 51, 65, 66, 73, 74, 75, 76 NR Band n77, n78	F _{DL_low} - F _{DL_high}	-50	1	2
	E-UTRA Band 1	F _{DL_low} - F _{DL_high}	-50	1	19, 25
	E-UTRA Band 2, 3, 5, 7, 8, 18, 19, 20, 25, 26, 27, 31, 34, 38, 40, 41, 52, 72, 87, 88 NR Band n79	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 11, 21	F _{DL_low} - F _{DL_high}	-50	1	19, 24
	Frequency range	470 - 694	-42	8	15, 35
	Frequency range	470 - 710	-26.2	6	34
	Frequency range	662 - 694	-26.2	6	15
	Frequency range	758 - 773	-32	1	15
	Frequency range	773 - 803	-50	1	
Frequency range	1 884.5 - 1 915.7	-41	0.3	8, 19	
30	E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 38, 41, 48, 53, 66, 70, 71, 85	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
31	E-UTRA Band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31, 32, 33, 34, 38, 40, 42, 43, 50, 51, 52, 65, 67, 68, 69, 74, 75, 76, 87, 88	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 3	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	470 - 694	-42	8	
...					

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
33	E-UTRA Band 1, 7, 8, 20, 22, 28, 31, 32, 34, 38, 40, 42, 43, 52, 65, 67, 69, 72, 73, 75, 76, 87, 88	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, 31, 32, 33, 38, 39, 40, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 69, 72, 73, 74, 75, 76, 87, 88 NR Band n78, n79	F _{DL_low} - F _{DL_high}	-50	1	5
	NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2, 5
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8
35					
36					
37		-			
38	E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 66, 67, 68, 72, 74, 75, 76, 85, 87, 88 NR Band n77, n78, n79	F _{DL_low} - F _{DL_high}	-50	1	
	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 1, 8, 22, 26, 28, 34, 40, 41, 42, 44, 45, 50, 51, 52, 73, 74 NR Band n79	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n77, n78	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	1 805 - 1 855	-40	1	33
	Frequency range	1 855 - 1 880	-15.5	5	15, 26, 33
40	E-UTRA Band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 45, 50, 51, 52, 65, 67, 68, 69, 72, 73, 74, 75, 76, 87, 88 NR Band n77, n78	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n79	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
41	E-UTRA Band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 45, 48, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85 NR Band n77, n78	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
	NR Band n79	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8, 30
42	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 50, 51, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 87, 88 NR Band n79	F _{DL_low} - F _{DL_high}	-50	1	
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8
43	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 20, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 50, 51, 65, 66, 67, 68, 69, 72, 73, 74, 75, 76, 85, 87, 88	F _{DL_low} - F _{DL_high}	-50	1	
44	E-UTRA Band 1, 40, 42, 45	F _{DL_low} - F _{DL_high}	-50	1	2
	E-UTRA Band 3, 5, 8, 34, 39, 41, 73	F _{DL_low} - F _{DL_high}	-50	1	
45	E-UTRA Band 1, 3, 5, 8, 34, 39, 40, 41, 42, 44, 52, 73	F _{DL_low} - F _{DL_high}	-50	1	
...					
47	E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 65, 68, 72, 73 NR band n77, n78, n79	F _{DL_low} - F _{DL_high}	-50	1	
	Frequency range	5 925 - 5 950	-30 EIRP	1	38, 40, 43
	Frequency range	5 815 - 5 855	-30 EIRP	1	38, 43, 45
48	E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85	F _{DL_low} - F _{DL_high}	-50	1	
50	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85	F _{DL_low} - F _{DL_high}	-50	1	
51	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85	F _{DL_low} - F _{DL_high}	-50	1	
52	E-UTRA Band 1, 3, 5, 7, 8, 20, 28, 31, 33, 34, 38, 39, 40, 41, 45, 47, 50, 51, 68, 72, 73, 74, 87, 88	F _{DL_low} - F _{DL_high}	-50	1	

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
53	E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 48, 66, 70, 71, 85 NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	
65	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 38, 40, 42, 43, 50, 51, 65, 68, 69, 72, 74, 75, 76, 87, 88 NR Band n78, n79	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
	E-UTRA Band 5, 11, 18, 19, 21, 26, 27, 41	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 34	F _{DL_low} - F _{DL_high}	-50	1	36
	Frequency range	1 884.5 - 1 915.7	-41	0.3	37
	Frequency range	1 900 - 1 915	-15.5	5	15, 26, 27
	Frequency range	1 915 - 1 920	+1.6	5	15, 26, 27
66	E-UTRA Band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 42, 48 NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
68	E-UTRA Band 3, 7, 8, 20, 28, 31, 38, 40, 47, 72, 74, 87, 88	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 1, 22, 42, 43, 50, 51, 52, 65	F _{DL_low} - F _{DL_high}	-50	1	2
...					
70	E-UTRA Band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 48, 53, 66, 70, 71, 85	F _{DL_low} - F _{DL_high}	-50	1	
	NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
71	E-UTRA Band 4, 5, 12, 13, 14, 17, 24, 26, 30, 48, 53, 66, 85	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 2, 25, 41, 70 NR Band n77	F _{DL_low} - F _{DL_high}	-50	1	2
	E-UTRA Band 29	F _{DL_low} - F _{DL_high}	-38	1	15
	E-UTRA Band 71	F _{DL_low} - F _{DL_high}	-50	1	15
72	E-UTRA Band 1, 7, 20, 22, 28, 31, 32, 33, 34, 38, 42, 43, 47, 52, 65, 68, 72, 87, 88	F _{DL_low} - F _{DL_high}	-50	1	
	E-UTRA Band 3, 8, 40	F _{DL_low} - F _{DL_high}	-50	1	2
	Frequency range	470 - 694	-42	8	

TABLE A1-40 (continued)

E-UTRA band	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Comment
73	E-UTRA Band 1, 26, 28, 33, 34, 39, 41, 42, 43, 44, 45, 47, 52	F_{DL_low} - F_{DL_high}	-50	1	
	E-UTRA Band 3, 5, 8, 27, 40	F_{DL_low} - F_{DL_high}	-50	1	2
74	E-UTRA Band 1, 2, 3, 4, 5, 7, 8, 12, 13, 17, 18, 19, 20, 26, 28, 29, 31, 34, 38, 39, 40, 41, 42, 43, 48, 52, 65, 66, 67, 68, 85 NR Band n77, n78	F_{DL_low} - F_{DL_high}	-50	1	
	NR Band n79	F_{DL_low} - F_{DL_high}	-50	1	2
	Frequency range	1 884.5 - 1 915.7	-41	0.3	8
	Frequency range	1 400 - 1 427	-32	27	15, 41
	Frequency range	1 475 - 1 488	-50	1	42
	Frequency range	1 488 - 1 518	-50	1	15
85	E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 70, 71, 74	F_{DL_low} - F_{DL_high}	-50	1	
	E-UTRA Band 4, 48, 51, 66 NR Band n77, n78	F_{DL_low} - F_{DL_high}	-50	1	2
	E-UTRA Band 2, 5, 13, 14, 17, 24, 25, 26, 27, 30, 41, 53, 70, 71, 74	F_{DL_low} - F_{DL_high}	-50	1	15
87	E-UTRA Band 1, 3, 7, 8, 22, 28, 31, 32, 33, 34, 38, 40, 42, 43, 47, 52, 65, 68, 72	F_{DL_low} - F_{DL_high}	-50	1	
	E-UTRA Band, 20	F_{DL_low} - F_{DL_high}	-50	1	2
	E-UTRA Band 87, 88	F_{DL_low} - F_{DL_high}	-50	1	15
	Frequency range	470 - 694	-42	8	
88	E-UTRA Band 1, 3, 7, 8, 20, 22, 28, 31, 32, 33, 34, 38, 40, 42, 43, 47, 52, 65, 68, 72	F_{DL_low} - F_{DL_high}	-50	1	
	E-UTRA Band 87	F_{DL_low} - F_{DL_high}	-20	1	15
	E-UTRA Band 88	F_{DL_low} - F_{DL_high}	-50	1	15
	Frequency range	470 - 694	-42	8	

Notes to Table A1-40:

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. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of $(2 \text{ MHz} + N \times L_{CRB} \times 180 \text{ kHz})$, where N is 2, 3, 4, (5) for the 2nd, 3rd, 4th (or 5th) harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

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 – N/A

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 – N/A

NOTE 10 – N/A

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 – N/A

NOTE 15 – These requirements also apply for the frequency ranges that are less than F_{oB} (MHz) in Table A1-37 and Table A1-39 from the edge of the channel bandwidth.

NOTE 16 – N/A

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 – N/A

NOTE 21 – This requirement is applicable for any channel bandwidths within the range 2 500-2 570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2 560.5-2 562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2 552-2 560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 22 – This requirement is applicable for any channel bandwidths within the range 2 570-2 615 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2 605.5-2 607.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2 597-2 605 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB. For carriers with channel bandwidth overlapping the frequency range 2 615-2 620 MHz the requirement applies with the maximum output power configured to +19 dBm in the IE P-Max.

NOTE 23 – This requirement is applicable only for the following cases:

- for carriers of 5 MHz channel bandwidth when carrier centre frequency (F_c) is within the range $902.5 \text{ MHz} \leq F_c < 907.5 \text{ MHz}$ with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency (F_c) is within the range $907.5 \text{ MHz} \leq F_c \leq 912.5 \text{ MHz}$ without any restriction on uplink transmission bandwidth
- for carriers of 10 MHz channel bandwidth when carrier centre frequency (F_c) is $F_c = 910 \text{ MHz}$ with an uplink transmission bandwidth 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 any channel bandwidths within the range 1 920-1 980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1 927.5-1 929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1 930-1 938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 28 – N/A

NOTE 29 – N/A

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.

NOTE 31 – N/A

NOTE 32 – N/A

NOTE 33 – This requirement is only applicable for carriers with bandwidth confined within 1 885-1 920 MHz (requirement for carriers with at least 1RB confined within 1 880-1 885 MHz is not specified). This requirement applies 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 1 892.5-1 894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1 895-1 903 MHz.

NOTE 34 – This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with $RB_{start} > 1$ and $RB_{start} < 48$.

NOTE 35 – This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of –25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 36 – This requirement is applicable for E-UTRA channel bandwidth allocated within 1 920-1 980 MHz.

NOTE 37 – Applicable when the upper edge of the channel bandwidth frequency is greater than 1 980 MHz.

NOTE 38 – Applicable when NS_33 or NS_34 is configured by the pre-configured radio parameters.

NOTE 39 – Applicable only when the assigned E-UTRA carrier is confined within 824 MHz and 849 MHz for UE category M1, M2 and UE category NB1 and NB2.

NOTE 40 – In the frequency range $x-5$ 950 MHz, SE requirement of –30 dBm/MHz should be applied; where $x = \max(5\ 925, f_c + 15)$, where f_c is the channel centre frequency.

NOTE 41 – Applicable for all bandwidths, and when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is greater than or equal to 1 427 MHz + the channel BW assigned for 1.4, 3, 5 and 10 MHz bandwidth, and when the lower edge of the assigned E-UTRA UL channel bandwidth frequency is greater than or equal to 1 440 MHz for 15 and 20 MHz bandwidth. This requirement shall be verified with UE transmission power of 15 dBm.

NOTE 42 – Applicable for 1.4, 3 and 5 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1 467 MHz assigned for 10 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1 463.8 MHz for 15 MHz bandwidth, and when the upper edge of the assigned E-UTRA UL channel bandwidth frequency is less than or equal to 1 460.8 MHz for 20 MHz bandwidth.

NOTE 43 – The e.i.r.p. requirement is converted to conducted requirement depending on the supported post antenna connector gain $G_{post\ connector}$ declared by the UE following the principle described in Annex I to TS38.101-1.

NOTE 44 – For category NB1 and NB2 UE when carrier centre frequency is 1 920.1 MHz, in case of single-tone uplink transmission the requirement is applicable only for sub-carrier index > 2 .

NOTE 45 – Resolution BW is 10% of the measurement BW and the result should be integrated to achieve the measurement bandwidth. The sweep time shall be set at least as (sweep points)*(symbol length) to improve the measurement accuracy.

4.4 Spurious emission band UE co-existence for CA

This section 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.

For inter-band carrier aggregation with the uplink assigned to two E-UTRA bands, the requirements in Table A1-41 apply on each component carrier with both component carriers are active.

NOTE – For inter-band carrier aggregation with uplink assigned to two E-UTRA bands the requirements in Table A1-41 could be verified by measuring spurious emissions at the specific frequencies where second and third order intermodulation products generated by the two transmitted carriers can occur; in that case, the

requirements for remaining applicable frequencies in Table A1-41 would be considered to be verified by the measurements verifying the one uplink inter-band CA UE to UE co-existence requirements.

TABLE A1-41

Spurious emissions band UE co-existence limits for dual-uplink inter-band carrier aggregation

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_1-3	E-UTRA band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 38, 40, 41, 43, 44, 50, 51, 65, 67, 72, 73, 74, 75, 76 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3, 34	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 22, 42, 52 NR band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	1 880 – 1 895	–40	1	3,12
	Frequency range	1 895 – 1 915	–15.5	5	3, 12, 13
	Frequency range	1 915 – 1 920	+1.6	5	3, 12, 13
CA_1-5	E-UTRA band 1, 5, 7, 8, 22, 28, 31, 38, 40, 42, 43, 50, 51, 65, 73, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3,34	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 26	859 – 869	–27	1	
	E-UTRA band 41, 52 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
CA_1-7	E-UTRA band 1, 5, 7, 8, 20, 22, 26, 27, 28, 31,32, 40, 42, 43, 50, 51, 52, 65, 67, 72, 74, 75, 76 NR band n78	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3, 34	F _{DL_low} – F _{DL_high}	–50	1	3
	NR Band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	1 880 – 1 895	–40	1	3,12
	Frequency range	1 895 – 1 915	–15.5	5	3, 12, 13
	Frequency range	1 915 – 1 920	+1.6	5	3, 12, 13
	Frequency range	2 570 – 2 575	+1.6	5	3, 13, 14
	Frequency range	2 575 – 2 595	–15.5	5	3, 13, 14
Frequency range	2 595 – 2 620	–40	1	3, 14	

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_1-8	E-UTRA band 1, 20, 28, 31, 32, 38, 40, 50, 51, 65, 67, 72, 73, 74, 75, 76	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3, 7, 22, 41, 42, 43, 52 NR Band n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 8, 34	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 11, 21	F _{DL_low} – F _{DL_high}	–50	1	11
	Frequency range	860 – 890	–40	1	3, 11
	NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	1 880 – 1 895	–40	1	3,12
	Frequency range	1 895 – 1 915	–15.5	5	3, 12, 13
	Frequency range	1 915 – 1 920	+1.6	5	3, 12, 13
CA_1-11	E-UTRA band 1, 3, 11, 18, 19, 21, 28, 34, 40, 42, 65 NR band n78, n79	F _{DL_low} – F _{DL_high}	–50	1	
	NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	945 – 960	–50	1	
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
CA_1-18	E-UTRA band 1, 3, 11, 21, 40, 42, 65 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 34	F _{DL_low} – F _{DL_high}	–50	1	3
	NR band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	758 – 799	–50	1	
	Frequency range	799 – 803	–40	1	3
	Frequency range	860 – 890	–40	1	
	Frequency range	945 – 960	–50	1	
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
CA_1-19	E-UTRA band 1, 3, 11, 21, 28, 40, 42, 65 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 34	F _{DL_low} – F _{DL_high}	–50	1	3
	NR band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	945 – 960	–50	1	
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_1-20	E-UTRA band 1, 3, 7, 8, 22, 31, 32, 34, 40, 43, 50, 51, 65, 67, 68, 72, 75, 76	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 20	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 38, 42, 69 NR band n77, n78	F _{DL_low} – F _{DL_high}	-50	1	2
	Frequency range	758 – 788	-50	1	
CA_1-21	NR band n77	F _{DL_low} – F _{DL_high}	-50	1	2
	E-UTRA band 1, 3, 18, 19, 28, 34, 40, 42, 65 NR band n78, n79	F _{DL_low} – F _{DL_high}	-50	1	
	Frequency range	945 – 960	-50	1	
	Frequency range	2 545 – 2 575	-50	1	
	Frequency range	2 595 – 2 645	-50	1	
CA_1-26	E-UTRA band 1, 5, 7, 11, 18, 19, 21, 22, 26, 31, 38, 40, 42, 43, 50, 51, 65, 73, 74 NR band n79	F _{DL_low} – F _{DL_high}	-50	1	
	Frequency range	1 880 – 1 895	-40	1	3, 12
	Frequency range	1 895 – 1 915	-15.5	5	3, 12, 13
	Frequency range	1 915 – 1 920	+1.6	5	3, 12, 13
	Frequency range	945 – 960	-50	1	
	E-UTRA band 41 NR band n77, n78	F _{DL_low} – F _{DL_high}	-50	1	2
	E-UTRA band 3, 34	F _{DL_low} – F _{DL_high}	-50	1	3
	Frequency range	703 – 799	-50	1	
	Frequency range	799 – 803	-40	1	3
CA_1-28	E-UTRA band 3, 5, 7, 8, 18, 19, 20, 26, 27, 31, 38, 40, 41, 72, 73	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 22, 32, 42, 43, 50, 51, 52, 74, 75, 76 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	-50	1	2
	E-UTRA band 34	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 11, 21	F _{DL_low} – F _{DL_high}	-50	1	5, 21
	E-UTRA band 1, 65	F _{DL_low} – F _{DL_high}	-50	1	5, 6
	Frequency range	470 – 694	-42	8	3, 22
	Frequency range	470 – 710	-26.2	6	23
	Frequency range	758 – 773	-32	1	3
	Frequency range	773 – 803	-50	1	
	Frequency range	662 – 694	-26.2	6	3
	Frequency range	1 880 – 1 895	-40	1	3, 12

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission					
	Protected band	Frequency range (MHz)		Maximum Level (dBm)	MBW (MHz)	Note
	Frequency range	1 895	1 915	-15.5	5	3, 12, 13
	Frequency range	1 915	1 920	+1.6	5	3, 12, 13
CA_1-41	E-UTRA band 1, 3, 5, 8, 26, 27, 28, 40, 42, 44, 45, 50, 51, 52, 65, 73, 74 NR band n78	F _{DL_low}	– F _{DL_high}	-50	1	
	E-UTRA band 34	F _{DL_low}	– F _{DL_high}	-50	1	3
	NR band n77, n79	F _{DL_low}	– F _{DL_high}	-50	1	2
	Frequency range	1 880	1 895	-40	1	3,12
	Frequency range	1 895	1 915	-15.5	5	3, 12, 13
	Frequency range	1 915	1 920	+1.6	5	3, 12, 13
	E-UTRA band 11, 18, 19, 21	F _{DL_low}	– F _{DL_high}	-50	1	30
	CA_1-42	E-UTRA band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 38, 40, 41, 44, 50, 51, 65, 67, 72, 73, 74, 75, 76 NR band n79	F _{DL_low}	– F _{DL_high}	-50	1
E-UTRA band 3, 34		F _{DL_low}	– F _{DL_high}	-50	1	3
Frequency range		1 880	1 895	-40	1	3,12
Frequency range		1 895	1 915	-15.5	5	3, 12, 13
Frequency range		1 915	1 920	+1.6	5	3, 12, 13
CA_2-4		E-UTRA band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 41, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low}	– F _{DL_high}	-50	1
	E-UTRA band 2, 25	F _{DL_low}	– F _{DL_high}	-50	1	3
	E-UTRA band 22, 42, 43 NR band n77	F _{DL_low}	– F _{DL_high}	-50	1	2
	CA_2-5	E-UTRA band 4, 5, 12, 13, 14, 17, 24, 28, 29, 30, 42, 50, 51, 66, 70, 71, 74, 85	F _{DL_low}	– F _{DL_high}	-50	1
E-UTRA band 2, 25		F _{DL_low}	– F _{DL_high}	-50	1	3
E-UTRA band 26		859	– 869	-27	1	
E-UTRA band 41, 43, 53 NR band n77		F _{DL_low}	– F _{DL_high}	-50	1	2
CA_2-7	E-UTRA band 2, 4, 5, 7, 12, 13, 14, 17, 26, 27, 29, 30, 42, 50, 51, 65, 66, 70, 74, 85	F _{DL_low}	– F _{DL_high}	-50	1	
	E-UTRA band 43	F _{DL_low}	– F _{DL_high}	-50	1	2

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_2-12	E-UTRA band 5, 13, 14, 17, 24, 26, 27, 30, 41, 50, 53, 71, 74	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 2, 12, 25, 85	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 4, 51, 66, 70 NR Band n77	F _{DL_low} – F _{DL_high}	-50	1	2
CA_2-13	E-UTRA band 4, 5,12,13,17, 22, 26, 27, 29, 41, 42, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 2,14, 25	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 24, 30, 43 NR band n77	F _{DL_low} – F _{DL_high}	-50	1	2
	Frequency range	769 – 775	-35	0.00625	3
	Frequency range	799 – 805	-35	0.00625	3
CA_2-14	E-UTRA band 4, 5, 12, 13, 14, 17, 24, 26, 27, 29, 30, 41, 48, 53, 66, 70, 71, 85	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 2, 25	F _{DL_low} – F _{DL_high}	-50	1	3
	NR band n77	F _{DL_low} – F _{DL_high}	-50	1	2
	Frequency range	769 – 775	-35	0.00625	3
	Frequency range	799 – 805	-35	0.00625	3, 9
CA_2-48	E-UTRA band 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low} – F _{DL_high}	-50	1	
CA_2-49	E-UTRA band 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low} – F _{DL_high}	-50	1	
CA_3-5	E-UTRA band 1, 5, 7, 8, 28, 31, 38, 40, 43, 50, 51, 65, 73, 74	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 3,34	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 22, 42, 52	F _{DL_low} – F _{DL_high}	-50	1	2
	E-UTRA band 26	859 – 869	-27	1	
CA_3-7	E-UTRA band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 40, 43, 44, 50, 51, 65, 67, 72, 74, 75, 76	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 3	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 22, 42, 52 NR Band n77, n78, n79	F _{DL_low} – F _{DL_high}	-50	1	2
	Frequency range	2 570 – 2 575	+1.6	5	3, 13, 14
	Frequency range	2 575 – 2 595	-15.5	5	3, 13, 14
	Frequency range	2 595 – 2 620	-40	1	3, 14

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_3-8	E-UTRA Band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 44, 50, 51, 65, 67, 72, 73, 74, 75, 76	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3, 8	F _{DL_low} – F _{DL_high}	–50	1	2, 3
	E-UTRA band 11, 21	F _{DL_low} – F _{DL_high}	–50	1	10,11
	E-UTRA band 7, 22, 41, 42, 43, 52 NR Band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	1884.5 – 1915.7	–41	0.3	4, 10, 11
	Frequency range	860 – 890	–40	1	3,11,17
CA_3A-11A	E-UTRA band 1, 18, 19, 28, 34, 40, 65	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 42	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	945 – 960	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
CA_3-18	E-UTRA band 1, 3, 11, 21, 28, 34, 40, 65 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
	NR band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	945 – 960	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
CA_3-19	E-UTRA band 1, 11, 21, 28, 40, 65	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3, 34	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 42 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	945 – 960	–50	1	
	Frequency range	1884.5 – 1 915.7	–41	0.3	3, 4
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
CA_3-20	E-UTRA Band 1, 7, 8, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 72, 74, 75, 76	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA Band 3, 20	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA Band 22, 38, 42, 52	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	758 – 788	–50	1	

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_3-21	E-UTRA Band 1, 18, 19, 28, 34, 40, 65 NR Band n79	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 3	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA Band 42 NR Band n77, n78	F _{DL_low} – F _{DL_high}	-50	1	2
	Frequency range	945 – 960	-50	1	
	Frequency range	1 884.5 – 1 915.7	-41	0.3	4
	Frequency range	2 545 – 2 575	-50	1	
	Frequency range	2 595 – 2 645	-50	1	
CA_3-26	E-UTRA band 1, 5, 7, 11, 18, 19, 21, 26, 34, 39, 40, 43, 50, 51, 65, 73, 74	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 3	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 22, 41, 42 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	-50	1	2
	Frequency range	1 884.5 – 1 915.7	-41	0.3	4
	Frequency range	703 – 799	-50	1	
		799 – 803	-40	1	3
	Frequency range	945 – 960	-50	1	
CA_3-28	E-UTRA band 1, 11, 18, 19, 21, 22, 32, 42, 43, 50, 51, 52, 65, 74, 75, 76 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	-50	1	2
	E-UTRA band 1	F _{DL_low} – F _{DL_high}	-50	1	5, 6
	E-UTRA band 3	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 5, 7, 8, 20, 26, 27, 31, 34, 38, 40, 41, 72, 73	F _{DL_low} – F _{DL_high}	-50	1	
	Frequency range	470 – 710	-26.2	6	23
	Frequency range	758 – 773	-32	1	3
	Frequency range	773 – 803	-50	1	
	Frequency range	1 884.5 – 1 915.7	-41	0.3	4, 5
CA_3-40	E-UTRA band 1, 5, 7, 8, 11, 18, 19, 20, 21, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 43, 44, 45, 50, 51, 65, 67, 68, 69, 72, 73, 74, 75, 76	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 3	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 22, 42, 52 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	-50	1	2
	Frequency range	1 884.5 – 1 915.7	-41	0.3	

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_3-41	E-UTRA band 1, 5, 8, 26, 28, 33, 34, 39, 40, 44, 45, 50, 51, 65, 73, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 11, 18, 19, 21	F _{DL_low} – F _{DL_high}	–50	1	18
	NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4, 18
CA_3-42	E-UTRA band 1, 5, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 45, 50, 51, 65, 67, 72, 73, 74, 75, 76 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 11, 18, 19, 21	F _{DL_low} – F _{DL_high}	–50	1	13
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
CA_4-5	E-UTRA band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 28, 29, 30, 43, 50, 51, 66, 70, 71, 74, 85	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 26	859 – 869	–27	1	
	E-UTRA band 41, 42, 53 NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
CA_4-7	E-UTRA band 2, 4, 5, 7, 12, 13, 14, 17, 26, 27, 28, 29, 30, 43, 50, 51, 66, 74, 85	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 42	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	2 570 – 2 575	+1.6	5	3, 13, 14
	Frequency range	2 575 – 2 595	–15.5	5	3, 13, 14
	Frequency range	2 595 – 2 620	–40	1	3, 14
CA_4-12	E-UTRA band 2, 5, 7, 13, 14, 17, 24, 25, 26, 27, 30, 41, 43, 50, 53, 71, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 4, 22, 42, 51, 66, 70 NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 12, 85	F _{DL_low} – F _{DL_high}	–50	1	3
CA_4-13	E-UTRA band 2, 4, 5, 7, 12, 13, 17, 25, 26, 27, 29, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 14	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 22, 24, 30, 42 NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	769 – 775	–35	0.00625	3
	Frequency range	799 – 805	–35	0.00625	3

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_4-17	E-UTRA band 2, 5, 7,13, 14, 17, 24, 25, 26, 27, 30, 41, 43, 50, 53, 71, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 4, 22, 42, 51, 66, 70 NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 12, 85	F _{DL_low} – F _{DL_high}	–50	1	3
CA_4-28	E-UTRA band 2, 5, 7, 14, 24, 25, 26, 27, 30, 41, 53, 70, 71	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 4, 42, 43, 48 50, 51, 66, 74	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	470 – 710	–26.2	6	23
	Frequency range	758 – 773	–32	1	3
	Frequency range	773 – 803	–50	1	
CA_5-7	E-UTRA band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 22, 28, 29, 30, 31, 40, 42, 43, 50, 51, 65, 66, 74, 85	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 52 NR Band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 26	859 – 869	–27	1	
	Frequency range	2 570 – 2 575	+1.6	5	3, 13, 14
	Frequency range	2 575 – 2 595	–15.5	5	3, 13, 14
	Frequency range	2 595 – 2 620	–40	1	3, 14
CA_5-12	E-UTRA band 2, 5, 13, 14, 17, 24, 25, 30, 31, 43, 50, 53, 71, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 4, 22, 41, 42, 51, 66, 70, NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 26	859 – 869	–27	1	
	E-UTRA band 12, 85	F _{DL_low} – F _{DL_high}	–50	1	3
CA_5-17	E-UTRA band 2, 5, 13, 14, 17, 24, 25, 30, 31, 43, 50, 71, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 4, 22, 41, 42, 51, 53, 66, 70 NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 26	859 – 869	–27	1	
	E-UTRA band 12, 85	F _{DL_low} – F _{DL_high}	–50	1	3

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_5-40	E-UTRA band 1, 3, 5, 7, 8, 11, 18, 19, 21, 28, 31, 34, 38, 42, 43, 45, 65, 73, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 26	859 – 869	–27	1	
	E-UTRA band 41, 52 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
CA_7-8	E-UTRA band 1, 20, 27, 28, 31, 32, 34, 40, 50, 51, 65, 67, 68, 72, 74, 75, 76	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3, 7, 22, 42, 43, 52 NR band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 8	F _{DL_low} – F _{DL_high}	–50	1	3
	Frequency range	2 570 – 2 575	+1.6	5	3, 13, 14
	Frequency range	2 575 – 2 595	–15.5	5	3, 13, 14
	Frequency range	2 595 – 2 620	–40	1	3, 14
CA_7-20	E-UTRA band 1,3, 7, 8, 22, 28, 31, 32, 33, 34, 40, 43, 50, 51, 65, 67, 72, 74, 75, 76	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 20	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 42, 52 NR band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	2 570 – 2 575	+1.6	5	2, 3, 13, 14
	Frequency range	2 575 – 2 595	–15.5	5	2, 3, 13, 14
	Frequency range	2 595 – 2 620	–40	1	3, 14
CA_7-26	E-UTRA band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 22, 29, 30, 31, 40, 42, 43, 65, 66, 85	F _{DL_low} – F _{DL_high}	–50	1	
	NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	2 570 – 2 575	+1.6	5	3, 13, 14
	Frequency range	2 575 – 2 595	–15.5	5	3, 13, 14
	Frequency range	2 595 – 2 620	–40	1	3, 14
	Frequency range	703 – 799	–50	1	
	Frequency range	799 – 803	–40	1	3
	Frequency range	945 – 960	–50	1	
Frequency range	1 884.5 – 1 915.7	–41	0.3	7	

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_7-28	E-UTRA band 2, 3, 5, 7, 8, 20, 26, 27, 31, 34, 40, 72 NR band n79	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 1, 4, 22, 32, 42, 43, 50, 51, 52, 65, 66, 74, 75, 76 NR band n77, n78	F _{DL_low} – F _{DL_high}	-50	1	2
	E-UTRA band 1	F _{DL_low} – F _{DL_high}	-50	1	5, 6
	Frequency range	758 – 773	-32	1	3
	Frequency range	773 – 803	-50	1	
	Frequency range	2 570 – 2 575	+1.6	5	3, 13, 14
	Frequency range	2 575 – 2 595	-15.5	5	3, 13, 14
	Frequency range	2 595 – 2 620	-40	1	3, 14
CA_8-20	E-UTRA band 1, 28, 31, 32, 33, 34, 39, 40, 45, 50, 51, 65, 67, 68, 72, 73, 74, 75, 76, 87, 88	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 3, 7, 22, 38, 41, 42, 43, 52, 69 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	-50	1	2
	E-UTRA band 8, 20	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 11, 21	F _{DL_low} – F _{DL_high}	-50	1	11
	Frequency range	758 – 788	-50	1	
	Frequency range	860 – 890	-40	1	3, 11
CA_8-28	E-UTRA band 3, 4, 7, 22, 32, 41, 42, 43, 50, 51, 52, 65, 66, 73, 74, 75, 76 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	-50	1	2
	E-UTRA band 1	F _{DL_low} – F _{DL_high}	-50	1	2, 5, 21
	E-UTRA band 8	F _{DL_low} – F _{DL_high}	-50	1	3
	E-UTRA band 2, 18, 20, 25, 27, 28, 31, 33, 34, 38, 39, 40, 68, 69, 72, 87, 88	F _{DL_low} – F _{DL_high}	-50	1	
	E-UTRA band 11, 21, 45	F _{DL_low} – F _{DL_high}	-50	1	21
	Frequency range	470 – 694	-42	8	3, 22
	Frequency range	470 – 710	-26.2	6	23
	Frequency range	662 – 694	-26.2	6	3
	Frequency range	758 – 773	-32	1	3
	Frequency range	773 – 803	-50	1	
	Frequency range	860 – 890	-40	1	3, 11
	Frequency range	1884.5 – 1915.7	-41	0.3	4, 5, 11

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_8-39	E-UTRA band 1, 28, 40, 45, 50, 51, 73, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 22, 41, 42, 52 NR band n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 8	F _{DL_low} – F _{DL_high}	–50	1	3
CA_8-41	E-UTRA band 1, 28, 34, 39, 40, 45, 50, 51, 65, 73, 74	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 3, 42, 52 NR Band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 11, 21	F _{DL_low} – F _{DL_high}	–50	1	11
	Frequency range	1884.5 – 1915.7	–41	0.3	4, 11
CA_11-18	E-UTRA band 1, 3, 11, 21, 28, 34, 40, 42, 65 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
	NR band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	860 – 890	–40	1	3
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
	Frequency range	945 – 960	–50	1	
CA_11-26	E-UTRA band 1, 3, 11, 18, 19, 21, 26, 28, 34, 40, 42, 65	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 1, 3, 11, 18, 19, 21, 26, 28, 34, 40, 42, 65	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
	Frequency range	2 545 – 2 575	–50	1	2
	Frequency range	2 595 – 2 645	–50	1	
	Frequency range	945 – 960	–50	1	
CA_13-66	E-UTRA band 2, 4, 5, 12, 13, 17, 25, 26, 27, 29, 41, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 14	F _{DL_low} – F _{DL_high}	–50	1	3
	E-UTRA band 24, 30, 48 NR Band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	769 – 775	–35	0.00625	3
	Frequency range	799 – 805	–35	0.00625	3, 9
CA_14-30	E-UTRA band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 41, 48, 53, 66, 70, 71, 85	F _{DL_low} – F _{DL_high}	–50	1	
	NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	769 – 775	–35	0.00625	3
	Frequency range	799 – 805	–35	0.00625	3, 9

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_14-66	E-UTRA band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 27, 29, 30, 41, 53, 66, 70, 71, 85	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 48 NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	769 – 775	–35	0.00625	3
	Frequency range	799 – 805	–35	0.00625	3, 9
CA_18-28	E-UTRA band 11, 21	F _{DL_low} – F _{DL_high}	–50	1	5, 21
	E-UTRA band 1, 65	F _{DL_low} – F _{DL_high}	–50	1	5, 6
	E-UTRA band 42, 43 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 3, 34, 40	F _{DL_low} – F _{DL_high}	–50	1	
	Frequency range	470 – 710	–26.2	6	23
	Frequency range	758 – 773	–32	1	3
	Frequency range	773 – 799	–50	1	
	Frequency range	799 – 803	–40	1	3
	Frequency range	860 – 890	–40	1	
	Frequency range	945 – 960	–50	1	3
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
CA_19-21	E-UTRA band 1, 3, 28, 34, 40, 42, 65 NR Band n79	F _{DL_low} – F _{DL_high}	–50	1	
	NR Band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	945 – 960	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
	E-UTRA band 1, 3, 11, 21, 28, 34, 40, 65 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
	Frequency range	945 – 960	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_19-42	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
	E-UTRA band 1, 42, 65 NR band n77, n78	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 1	F _{DL_low} – F _{DL_high}	–50	1	5, 6
	E-UTRA band 3, 18, 19, 34, 40 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
CA_21-28	Frequency range	470 – 710	–26.2	6	23
	Frequency range	773 – 803	–50	1	
	Frequency range	945 – 960	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4, 5
	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
	E-UTRA band 1, 3, 18, 19, 28, 34, 40, 65 NR band n79	F _{DL_low} – F _{DL_high}	–50	1	
	Frequency range	945 – 960	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4
CA_21-42	Frequency range	2 545 – 2 575	–50	1	
	Frequency range	2 595 – 2 645	–50	1	
	E-UTRA band 4, 5, 12, 13, 14, 17, 24, 26, 29, 30, 42, 48, 66, 70, 71, 85	F _{DL_low} – F _{DL_high}	–50	1	
	E-UTRA band 53 NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 4, 5, 12, 13, 14, 17, 24, 26, 27, 28, 29, 30, 42, 45, 48, 66, 70, 71	F _{DL_low} – F _{DL_high}	–50	1	
CA_25-26	E-UTRA band 2, 25, NR band n77	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 1, 2, 3, 4, 5, 11, 12, 13, 14, 17, 18,19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 42, 43, 48, 65, 66, 70, 71, 85	F _{DL_low} – F _{DL_high}	–50	1	
CA_25-41	E-UTRA band 41, 53 NR band n77	F _{DL_low} – F _{DL_high}	–50	1	1, 2
	Frequency range	703 – 799	–50	1	

TABLE A1-41 (continued)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_26-46	Frequency range	799 – 803	–40	1	2
	Frequency range	945 – 960	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	3
	E-UTRA band 1, 2, 3, 4, 5, 11, 12, 13, 14, 17, 18, 19, 21, 24, 25, 26, 29, 30, 31, 34, 39, 40, 50, 51, 65, 66, 70, 71, 73, 74	F _{DL_low} – F _{DL_high}	–50	1	1, 2
	E-UTRA band 41	F _{DL_low} – F _{DL_high}	–50	1	1
	Frequency range	703 – 799	–50	1	
CA_26-48	Frequency range	799 – 803	–40	1	2
	Frequency range	945 – 960	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	3
	E-UTRA band 1, 4, 22, 32, 42, 45, 43, 48, 52, 65, 66 NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 1	F _{DL_low} – F _{DL_high}	–50	1	5, 6
	E-UTRA band 2, 3, 5, 8, 20, 25, 26, 27, 31, 33, 34, 40	F _{DL_low} – F _{DL_high}	–50	1	
CA_28-41	E-UTRA band 11, 21	F _{DL_low} – F _{DL_high}	–50	1	5, 18, 21
	E-UTRA band 9, 18, 19	F _{DL_low} – F _{DL_high}	–50	1	5, 18
	Frequency range	470 – 694	–42	8	3, 22
	Frequency range	470 – 710	–26.2	6	23
	Frequency range	662 – 694	–26.2	6	3
	Frequency range	758 – 773	–32	1	3
	Frequency range	773 – 803	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4, 5, 18
	E-UTRA band 1, 4, 32, 50, 51, 66, 65, 74, 75, 76	F _{DL_low} – F _{DL_high}	–50	1	2
	E-UTRA band 1	F _{DL_low} – F _{DL_high}	–50	1	5, 6
CA_28-42	E-UTRA band 11, 21	F _{DL_low} – F _{DL_high}	–50	1	5, 21
	Frequency range	470 – 710	–26.2	6	23
	Frequency range	758 – 773	–32	1	3
	Frequency range	773 – 803	–50	1	
	Frequency range	1 884.5 – 1 915.7	–41	0.3	4, 5
	E-UTRA band 1, 8, 26, 28, 34, 40, 42, 44, 50, 51, 52, 73, 74	F _{DL_low} – F _{DL_high}	–50	1	
	NR band n77, n78, n79	F _{DL_low} – F _{DL_high}	–50	1	2
	Frequency range	1 805 – 1 855	–40	1	20

TABLE A1-41 (end)

E-UTRA CA configuration	Spurious emission				
	Protected band	Frequency range (MHz)	Maximum Level (dBm)	MBW (MHz)	Note
CA_39-41	Frequency range	1 855 – 1 880	–15.5	5	3, 13, 20
	E-UTRA band 1, 2, 3, 4, 5, 7, 8, 11, 12, 13, 14, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 29, 31, 32, 33, 34, 38, 39, 41, 44, 45, 50, 51, 65, 66, 67, 68, 69, 70, 72, 73, 74, 75, 76	F_{DL_low} – F_{DL_high}	–50	1	
	NR band n79	F_{DL_low} – F_{DL_high}	–50	1	2
	Frequency range	1 884.5 – 1 915.7	–41	0.3	8
CA_40-42	E-UTRA band 1, 3, 5, 8, 26, 28, 33, 34, 39, 40, 44, 45, 50, 51, 65, 73, 74	F_{DL_low} – F_{DL_high}	–50	1	
	E-UTRA band 9, 11, 18, 19, 21	F_{DL_low} – F_{DL_high}	–50	1	18
	NR band n79	F_{DL_low} – F_{DL_high}	–50	1	2
CA_41-42	Frequency range	1 884.5 – 1 915.7	–41	0.3	4, 18

NOTE 1 – F_{DL_low} and F_{DL_high} refer to each E-UTRA frequency band specified in Table A1-1.

NOTE 2 – As exceptions, measurements with a level up to the applicable requirements defined in Table A1-39 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 measurement bandwidth (MBW).

NOTE 3 – These requirements also apply for the frequency ranges that are less than F_{OOB} (MHz) in Table A1-37 and Table A1-39 from the edge of the aggregated channel bandwidth.

NOTE 4 – Applicable when co-existence with PHS system operating in 1 884.5-1 915.7 MHz.

NOTE 5 – 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 6 – As exceptions, measurements with a level up to the applicable requirement of –36 dBm/MHz is permitted for each assigned E-UTRA carrier used in the measurement due to 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 measurement bandwidth (MBW).

NOTE 7 – Applicable when NS_05 in § 4.5.1 is signalled by the network.

NOTE 8 – Applicable when NS_08 in § 4.5.3 is signalled by the network.

NOTE 9 – Whether the applicable frequency range should be 793-805 MHz instead of 799-805 MHz is TBD.

NOTE 10 – 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 11 – This requirement is applicable only for the following cases:

- for carriers of 5 MHz channel bandwidth when carrier centre frequency (F_c) is within the range $902.5 \text{ MHz} \leq F_c < 907.5 \text{ MHz}$ with an uplink transmission bandwidth less than or equal to 20 RB
- for carriers of 5 MHz channel bandwidth when carrier centre frequency (F_c) is within the range $907.5 \text{ MHz} \leq F_c \leq 912.5 \text{ MHz}$ without any restriction on uplink transmission bandwidth
- for carriers of 10 MHz channel bandwidth when carrier centre frequency (F_c) is $F_c = 910 \text{ MHz}$ with an uplink transmission bandwidth less than or equal to 32 RB with $RB_{start} > 3$.

Notes to Table A1-41 (end):

NOTE 12 – This requirement is applicable for any channel bandwidths within the range 1 920-1 980 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 1 927.5-1 929.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1 930-1 938 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE13 – For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

NOTE 14 – This requirement is applicable for any channel bandwidths within the range 2 500-2 570 MHz with the following restriction: for carriers of 15 MHz bandwidth when carrier centre frequency is within the range 2 560.5-2562.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 2 552-2 560 MHz the requirement is applicable only for an uplink transmission bandwidth less than or equal to 54 RB.

NOTE 15 – Applicable when NS_15 in § 4.5.8 is signalled by the network.

NOTE 16 – Applicable when NS_09 in § 4.5.4 is signalled by the network

NOTE 17 – This requirement is applicable only when Band 3 transmission frequency is less than or equal to 1 765 MHz.

NOTE 18 – This requirement applies when the E-UTRA carrier is confined within 2 545-2 575 MHz or 2 595-2 645 MHz and the channel bandwidth is 10 or 20 MHz

NOTE 19 – N/A

NOTE 20 – This requirement is only applicable for carriers with bandwidth confined within 1 885-1 920 MHz (requirement for carriers with at least 1RB confined within 1 880-1 885 MHz is not specified). This requirement applies 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 1 892.5-1 894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1 895-1 903 MHz.

NOTE 20 – This requirement is only applicable for carriers with bandwidth confined within 1 885-1 920 MHz (requirement for carriers with at least 1RB confined within 1 880-1 885 MHz is not specified). This requirement applies 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 1 892.5-1 894.5 MHz and for carriers of 20 MHz bandwidth when carrier center frequency is within the range 1 895-1 903 MHz.

NOTE 21 – 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 measurement bandwidth (MBW).

NOTE 22 – This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 23 – This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with $RB_{start} > 1$ and $RB_{start} < 48$.

NOTE 24 – Void.

NOTE 25 – N/A.

TABLE A1-42

Spurious emissions band UE co-existence limits for intra band carrier aggregation

E-UTRA CA configuration	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
CA_1	E-UTRA band 1, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 38, 40, 41, 42, 43, 44, 50, 51, 52, 65, 67, 72, 73, 74, 75, 76 NR band n78, n79	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 3	F _{DL_low}	–	F _{DL_high}	–50	1	10
	NR band n77	F _{DL_low}	–	F _{DL_high}	–50	1	2
CA_3	E-UTRA band 1, 7, 8, 20, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 43, 44, 50, 51, 65, 67, 72, 73, 74, 75, 76 NR band n79	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 3	F _{DL_low}	–	F _{DL_high}	–50	1	10
	E-UTRA band 22, 42, 52 NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	2
CA_5	E-UTRA band 1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 24, 25, 28, 29, 30, 31, 34, 38, 40, 42, 43, 45, 48, 65, 66, 70, 71, 85	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 52, 53 NR band n77, n78, n79	F _{DL_low}	–	F _{DL_high}	–50	1	2
CA_7	E-UTRA band 1, 3, 7, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 67, 72, 74, 75, 76 NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	
CA_8	E-UTRA band 1, 20, 28, 31, 32, 33, 34, 38, 39, 40, 50, 51, 72, 73, 74, 75, 76	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	10
	E-UTRA band 22, 41, 42, 43, 52 NR Band n77, n78, n79	F _{DL_low}		F _{DL_high}	–50	1	2
CA_38	E-UTRA band 1, 3, 8, 20, 22, 27, 28, 29, 30, 31, 32, 33, 34, 40, 42, 43, 50, 51, 52, 65, 67, 72, 74, 75, 76	F _{DL_low}	–	F _{DL_high}	–50	1	
CA_39	E-UTRA band 22, 34, 40, 41, 42, 44, 50, 51, 52, 73, 74 NR band n79	F _{DL_low}	–	F _{DL_high}	–50	1	
	NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	2
CA_40	E-UTRA band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 27, 28, 31, 32, 33, 34, 38, 39, 41, 42, 43, 44, 50, 51, 52, 65, 67, 72, 73, 74, 75, 76 NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	
	NR band n79	F _{DL_low}	–	F _{DL_high}	–50	1	2
	Frequency range	1884.5	–	1915.7	–41	0.3	15

TABLE A1-42 (end)

E-UTRA CA configuration	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
CA_41	E-UTRA band 1, 2, 3, 4, 5, 8, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 34, 39, 40, 42, 44, 50, 51, 52, 65, 66, 70, 71, 73, 74, 85 NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	
	NR band n79	F _{DL_low}	–	F _{DL_high}	–50	1	2
CA_42	E-UTRA band 1, 2, 3, 4, 5, 7, 8, 11, 18, 19, 20, 21, 25, 26, 27, 28, 31, 32, 33, 34, 38, 40, 41, 44, 50, 51, 65, 66, 67, 72, 73, 74, 75, 76 NR band n79	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	1 884.5	–	1 915.7	–41	0.3	
CA_48	E-UTRA band 2, 4, 5, 12, 13, 14, 17, 24, 25, 26, 29, 30, 41, 50, 51, 66, 70, 71, 74, 85	F _{DL_low}	–	F _{DL_high}	–50	1	
CA_66	E-UTRA band 2, 4, 5, 7, 12, 13, 14, 17, 24, 25, 26, 27, 28, 29, 30, 38, 41, 43, 50, 51, 66, 70, 71, 74, 85	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 42, 48, 49, 52 NR Band n77	F _{DL_low}	–	F _{DL_high}	–50	1	2

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 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th (or 5th) harmonic spurious emissions. Due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N × L_{CRB} × 180 kHz), where N is 2, 3, 4, (5) for the 2nd, 3rd, 4th (or 5th) harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

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 – N/A.

NOTE 6 – N/A.

NOTE 7 – N/A.

NOTE 8 – N/A.

NOTE 9 – N/A.

NOTE 10 – The requirement also applies for the frequency ranges that are less than F_{OoB} (MHz) in Table A1-37 and Table A1-39 from the edge of the channel bandwidth.

NOTE 11 – N/A.

NOTE 12 – N/A.

NOTE 13 – N/A.

NOTE 14 – N/A.

NOTE 15 – Applicable when co-existence with PHS system operating in 1 884.5-1 915.7 MHz.

TABLE A1-43

**Spurious emissions band UE co-existence limits for intra band
non-contiguous carrier aggregation**

E-UTRA CA configuration	Spurious emission						
	Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)	Note		
CA_4A-4A	E-UTRA band 2, 4, 5, 7, 10, 12, 13, 14, 17, 22, 23, 24, 25, 26, 27, 28, 29, 30, 41, 43, 50, 51, 53, 66, 70, 71, 74, 85	F _{DL_low}	-	F _{DL_high}	-50	1	
	E-UTRA band 22, 42	F _{DL_low}	-	F _{DL_high}	-50	1	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 A1-39 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 measurement bandwidth (MBW).

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 A1-5 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 A1-44. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-44

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 § 1.1. Additional restrictions apply for operations below this point.

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 A1-45. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-45
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 A1-46. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-46
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 A1-47. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-47
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 1 – For measurement conditions at the edge of each frequency range, the lowest frequency of the measurement position in each frequency range should be set at the lowest boundary of the frequency range

plus $MBW/2$. The highest frequency of the measurement position in each frequency range should be set at the highest boundary of the frequency range minus $MBW/2$. MBW denotes the MBW (1 MHz).

NOTE 2 – To improve measurement accuracy, A-MPR values for NS_09 specified in Table A1-5 are derived based on both the above Note 1 and 100 kHz RBW.

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 A1-48. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-48
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 requirement applies for E-UTRA carriers with lower channel edge at or above 814.2 MHz.

NOTE 2 – The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.

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 A1-49. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-49
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 requirement applies for E-UTRA carriers with lower channel edge at or above 819 MHz.

NOTE 2 – The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.

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 A1-50. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-50
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, 2

NOTE 1 – The requirement applies for E-UTRA carriers with lower channel edge at or above 824 MHz.

NOTE 2 – The emissions measurement shall be sufficiently power averaged to ensure a standard deviation < 0.5 dB.

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 A1-51. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-51
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	1

NOTE 1 – 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 A1-52. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-52
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 A1-53. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-53

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 A1-54. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-54

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 A1-55. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

Table A1-55

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	

4.5.13 Requirement (network signalled value “NS_11”)

When “NS 11” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-56. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in A1-37 from the edge of the channel bandwidth.

TABLE A1-56
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
	1.4, 3, 5, 10, 15, 20 MHz	
E-UTRA Band 2	-50	1 MHz
$1998 \leq f \leq 1999$	-21	1 MHz
$1997 \leq f < 1998$	-27	1 MHz
$1996 \leq f < 1997$	-32	1 MHz
$1995 \leq f < 1996$	-37	1 MHz
$1990 \leq f < 1995$	-40	1 MHz

4.5.14 Requirement (network signalled value “NS_20”)

When “NS 20” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-57. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in A1-37 from the edge of the channel bandwidth.

TABLE A1-57
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
	5, 10, 15, 20 MHz	
$1990 \leq f < 1999$	-40	1 MHz
$1999 \leq f \leq 2000$	-40	Note 1

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

4.5.15 Requirement (network signalled value “NS_21”)

When “NS 21” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-58. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-58
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	Measurement bandwidth
	5, 10 MHz	
$2200 \leq f < 2288$	-40	1 MHz
$2288 \leq f < 2292$	-37	1 MHz
$2292 \leq f < 2296$	-31	1 MHz
$2296 \leq f < 2300$	-25	1 MHz
$2320 \leq f < 2324$	-25	1 MHz
$2324 \leq f < 2328$	-31	1 MHz
$2328 \leq f < 2332$	-37	1 MHz
$2332 \leq f \leq 2395$	-40	1 MHz

4.5.16 Requirement (network signalled value “NS_22”)

When “NS 22” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-59. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in A1-37 from the edge of the channel bandwidth.

TABLE A1-59
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	5, 10, 15, 20 MHz	
$3400 \leq f \leq 3800$	-23 (Note 1, Note 3)	5 MHz
	-40 (Note 2)	1 MHz

NOTE 1 – This requirement applies within an offset between 5 MHz and 25 MHz from the lower and from the upper edge of the channel bandwidth.

NOTE 2 – This requirement applies from 3 400 MHz up to 25 MHz below the lower E-UTRA channel edge and from 25 MHz above the upper E-UTRA channel edge up to 3 800 MHz.

NOTE 3 – This emission limit might imply risk of harmful interference to UE(s) operating in the protected operating band

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

4.5.17 Requirement (network signalled value “NS_23”)

When “NS 23” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-60. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-60
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	5, 10, 15, 20 MHz	
$3\,400 \leq f \leq 3\,800$	-23 (Note 1, Note 3)	5 MHz
	-40 (Note 2)	1 MHz

NOTE 1 – This requirement applies within an offset between $5\text{ MHz} + F_{\text{offset_NS_23}}$ and $25\text{ MHz} + F_{\text{offset_NS_23}}$ from the lower and from the upper edges of the channel bandwidth, whenever these frequencies overlap with the specified frequency band.

NOTE 2 – This requirement applies from 3 400 MHz to $25\text{ MHz} + F_{\text{offset_NS_23}}$ below the lower E-UTRA channel edge and from $25\text{ MHz} + F_{\text{offset_NS_23}}$ above the upper E-UTRA channel edge to 3 800 MHz.

NOTE 3 – $F_{\text{offset_NS_23}}$ is:

- 0 MHz for 5 MHz channel BW,
- 5 MHz for 10 MHz channel BW,
- 9 MHz for 15 MHz channel BW and
- 12 MHz for 20 MHz channel BW.

NOTE 4 – This emission limit might imply risk of harmful interference to UE(s) operating in the protected operating band.

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

4.5.18 Requirement (network signalled value “NS_04”)

When “NS 04” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-61. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-61
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	5, 10, 15, 20 MHz	
$2\,490.5 \leq f \leq 2\,495$	-13	1 MHz
$9\text{ kHz} \leq f \leq 2\,490.5\text{ MHz}$	-25	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 measurement bandwidth.

4.5.19 Requirement (network signalled value “NS_24”)

When “NS 24” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-62. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-62
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	5 MHz, 10 MHz, 15 MHz, 20 MHz	
Band 34	-50	MHz

NOTE 1 – This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band.

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

4.5.20 Requirement (network signalled value “NS_25”)

When “NS 25” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-63. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-63
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	5 MHz, 10 MHz, 15 MHz, 20 MHz	
Band 34	-40	MHz

NOTE 1 – This requirement applies at a frequency offset equal or larger than 5 MHz from the upper edge of the channel bandwidth, whenever these frequencies overlap with the specified frequency band.

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

4.5.21 Requirement (network signalled value “NS_27”)

When “NS 27” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-64. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-64
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	5, 10, 15, 20 MHz	
$9 \text{ kHz} \leq f \leq 3\,530 \text{ MHz}$	-40	1 MHz
$3\,720 \text{ MHz} \leq f \leq 5^{\text{th}} \text{ harmonic of the upper frequency edge of the UL operating band}$		

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

4.5.22 Requirement (network signalled value “NS_28”)

When “NS 28” is indicated in the cell, the power of any UE emission for E-UTRA channels assigned within 5 150-5 350 MHz and 5 470-5 725 MHz shall not exceed the levels specified in Table A1-65. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-65
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	20 MHz	
$47 \leq f \leq 74$	-54	100 kHz
$87.5 \leq f \leq 118$	-54	100 kHz
$174 \leq f \leq 230$	-54	100 kHz
$470 \leq f \leq 862$	-54	100 kHz
$1\,000 \leq f \leq 5\,150$	-30	1 MHz
$5\,350 \leq f \leq 5\,470$	-30	1 MHz
$5\,725 \leq f \leq 26\,000$	-30	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 measurement bandwidth.

4.5.23 Requirement (network signalled value “NS_29”)

When “NS 29” is indicated in the cell, the power of any UE emission for E-UTRA channels assigned within 5 150-5 350 and 5 470-5 725 MHz shall not exceed the levels specified in Table A1-66. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-66
Additional requirements

Centre frequency F_c [MHz]	Protected range [MHz]	Frequency difference Δf between centre frequency – 5 240 (for $F_c = 5 180, 5 200, 5 220, 5 240$) 5 260 (for $F_c = 5 260, 5 280, 5 300, 5 320$) (MHz)	Minimum requirement [dBm]	Measurement bandwidth
5 180, 5 200, 5 220, 5 240	$5 135 \leq f \leq 5 142$	-	-26	1 MHz
	$5 142 < f \leq 5 150$	-	-18	
	$5 250 \leq f < 5 251$	≥ 10 and < 11	$10(10 - \Delta f)$	
	$5 251 \leq f < 5 260$	≥ 11 and < 20	$-10 - 8/9(\Delta f - 11)$	
	$5 260 \leq f < 5 266.7$	≥ 20 and < 26.7	$-18 - 1.2(\Delta f - 20)$	
	$5 266.7 \leq f \leq 5 365$	-	-26	
5 260, 5 280, 5 300, 5 320	$5 135 \leq f \leq 5 233.3$	-	-26	
	$5 233.3 < f \leq 5 240$	≥ 20 and < 26.7	$-18 - 1.2(\Delta f - 20)$	
	$5 240 < f \leq 5 249$	≥ 11 and < 20	$-10 - 8/9(\Delta f - 11)$	
	$5 249 < f \leq 5 250$	≥ 10 and < 11	$10(10 - \Delta f)$	
	$5 350 \leq f \leq 5 365$	-	-26	
5 500, 5 520, 5 540, 5 560, 5 580, 5 600, 5 620, 5 640, 5 660, 5 680, 5 700	$5 455 \leq f \leq 5 460$	-	-26	
	$5 460 < f \leq 5 470$	-	-19	
	$5 725 \leq f < 5 740$	-	-19	
	$5 740 \leq f \leq 5 745$	-	-26	

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

4.5.24 Requirement (network signalled value “NS_30”)

When “NS 30” is indicated in the cell, the power of any UE emission for E-UTRA channels assigned within 5 150-5 350 MHz, 5 470-5 725 MHz and 5 725-5 850 MHz shall not exceed the levels specified in Tables A1-67, A1-68 and A1-69, respectively. These requirements also apply for the frequency ranges that are less than Δf_{OoB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-67
Additional requirements for E-UTRA channels assigned within 5 150-5 350 MHz

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	20 MHz	
$4 500 \leq f \leq 5 150$	-41	1 MHz
$5 350 \leq f \leq 5 460$	-41	

TABLE A1-68

Additional requirements for E-UTRA channels assigned within 5 470-5 725 MHz

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	20 MHz	
$4\,500 \leq f \leq 5\,150$	-41	1 MHz
$5\,350 \leq f \leq 5\,460$	-41	
$5\,460 \leq f \leq 5\,470$	-27	
$5\,725 \leq f$	-27	

TABLE A1-69

Additional requirements for E-UTRA channels assigned within 5 725-5 850 MHz

Frequency offset of measurement filter -3 dB point, Δf	Frequency offset of measurement filter centre frequency, f_{offset}	Minimum requirement [dBm]	MBW
$0 \text{ MHz} \leq \Delta f < 5 \text{ MHz}$	$0.5 \text{ MHz} \leq f_{\text{offset}} < 5.5 \text{ MHz}$	$27 - 2.28(f_{\text{offset}}/\text{MHz} - 0.5)$	1 MHz
$5 \text{ MHz} \leq \Delta f < 25 \text{ MHz}$	$5.5 \text{ MHz} \leq f_{\text{offset}} < 25.5 \text{ MHz}$	$15.6 - 0.28(f_{\text{offset}}/\text{MHz} - 0.5)$	1 MHz
$25 \text{ MHz} \leq \Delta f < 75 \text{ MHz}$	$25.5 \text{ MHz} \leq f_{\text{offset}} < 75.5 \text{ MHz}$	$10 - 0.74(f_{\text{offset}}/\text{MHz} - 0.5)$	1 MHz
$75 \text{ MHz} \leq \Delta f$	$75.5 \text{ MHz} \leq f_{\text{offset}}$	-27	1 MHz

NOTE 1 – The frequency offset f_{offset} is below and above the range 5 725-5 850 MHz; the measurement filter -3 dB point is that closest to the range 5 725-5 850 MHz.

NOTE 2 – The requirement applies when the offset of the measurement filter centre frequency is such that both -3 dB points of the measurement filter are confined within the frequency range 5 725-5 850 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 measurement bandwidth.

4.5.25 Requirement (network signalled value “NS_31”)

When “NS 31” is indicated in the cell, the power of any UE emission for E-UTRA channels assigned within 5 150-5 250 MHz, 5 250-5 350 MHz, 5 470-5 725 MHz and 5 725-5 850 MHz shall not exceed the levels specified in Tables A1-70, A1-71, A1-72 and A1-73, respectively. These requirements also apply for the frequency ranges that are less than Δf_{OoB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-70

Additional requirements for E-UTRA channels assigned within 5 150-5 250 MHz

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	20 MHz	
$f \leq 5\ 150$	-27	1 MHz
$f \geq 5\ 250$	-27	

TABLE A1-71

Additional requirements for E-UTRA channels assigned within 5 250-5 350 MHz

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	20 MHz	
$f \leq 5\ 250$	-27	1 MHz
$f \geq 5\ 350$	-27	

TABLE A1-72

Additional requirements for E-UTRA channels assigned within 5 470-5 725 MHz

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	20 MHz	
$f \leq 5\ 470$	-27	1 MHz
$f \geq 5\ 725$	-27	

TABLE A1-73

Additional requirements for E-UTRA channels assigned within 5 725-5 850 MHz

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	20 MHz	
$f \leq 5\ 725$	-27	1 MHz
$f \geq 5\ 850$	-27	

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

4.5.26 Requirement (network signalled value “NS_36”)

When “NS 36” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-74. This requirement also applies for the frequency ranges that are less than Δf_{OoB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-74
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	5 MHz, 10 MHz, and 15 MHz	
$470 \leq f \leq 694$	-42	8 MHz

NOTE – For a 5 MHz E-UTRA carrier confined within 698 MHz and 703 MHz, this requirement shall be met in normal conditions only. The requirement is relaxed to -30 dBm in extreme conditions.

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

4.5.27 Requirement (network signalled value “NS_38”)

When “NS 38” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-75. This requirement also applies for the frequency ranges that are less than Δf_{OoB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-75
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz	
$1\ 400 \leq f \leq 1\ 427$	-32	27 MHz

NOTE – This requirement shall be verified with UE transmission power of 15 dBm.

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

4.5.28 Requirement (network signalled value “NS_39”)

When “NS 39” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-76. This requirement also applies for the frequency ranges that are less than Δf_{OoB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-76
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz	
$1\,475 \leq f \leq 1\,488$	-28	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 measurement bandwidth.

4.5.29 Requirement (network signalled value “NS_44”)

When “NS 44” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-77. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-77
Additional requirements

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW	Note
	5, 10, 15, 20		
$2\,620 \leq f \leq 2\,645$	-15.5	5 MHz	1
$2\,645 \leq f \leq 2\,690$	-40	1 MHz	1

NOTE 1 – This requirement shall be verified with UE transmission power of 15 dBm.

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

4.5.30 Requirement (network signalled value “NS_45”)

When “NS 45” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Tables A1-78 and A1-79. These requirements also apply for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the channel bandwidth.

TABLE A1-78

Additional requirements for 1.4, 3 and 5 MHz channel bandwidths

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	1.4 MHz, 3 MHz, 5 MHz	
$0.009 < f \leq 2\,477.5$	-25	1 MHz
$2\,477.5 < f \leq 2\,478.5$	-13	1 MHz
$2\,478.5 < f \leq 2\,483.5$	-10	1 MHz
$2\,495 \leq f < 2\,501$	-13	1 MHz
$2\,501 \leq f \leq 5^{\text{th}}$ harmonic of the upper frequency edge of the UL operating band	-25	1 MHz

TABLE A1-79

Additional requirements for 10 MHz channel bandwidths

Frequency band (MHz)	Channel bandwidth / Spectrum emission limit (dBm)	MBW
	10 MHz	
$0.009 < f \leq 2\,473.5$	-25	1 MHz
$2\,473.5 < f \leq 2\,478.5$	-13	1 MHz
$2\,478.5 < f \leq 2\,483.5$	-10	1 MHz
$2\,495 \leq f < 2\,505$	-13	1 MHz
$2\,505 \leq f \leq 5^{\text{th}}$ harmonic of the upper frequency edge of the UL operating band	-25	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 measurement bandwidth.

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 A1-80. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the aggregated channel bandwidth.

TABLE A1-80

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 A1-81. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the aggregated channel bandwidth.

TABLE A1-81

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 A1-82. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the aggregated channel bandwidth.

TABLE A1-82
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	1 880 – 1 895	–40	1
Frequency range	1 895 – 1 915	–15.5	5
Frequency range	1 915 – 1 920	+1.6	5

4.6.4 Requirement for CA_38C (network signalled value “CA_NS_05”)

When “CA_NS_05” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-83. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the aggregated channel bandwidth.

TABLE A1-83
Additional requirements

Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)
Frequency range	2 620 – 2 645	–15.5	5
Frequency range	2 645 – 2 690	–40	1

4.6.5 Requirement for CA_7C (network signalled value “CA_NS_06”)

When “CA_NS_06” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-84. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the aggregated channel bandwidth.

TABLE A1-84
Additional requirements

Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)
Frequency range	2 570 – 2 575	+1.6	5
Frequency range	2 575 – 2 595	–15.5	5
Frequency range	2 595 – 2 620	–40	1

4.6.6 Requirement for CA_39C (network signalled value “CA_NS_07”)

When “CA_NS_07” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-85. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the aggregated channel bandwidth.

TABLE A1-85

Additional requirements

Protected band	Frequency range (MHz)	Maximum level (dBm)	MBW (MHz)
Frequency range	1 805 – 1 855	-40 ¹	1
Frequency range	1 855 – 1 880	-15.5 ^{1,2,3}	5

NOTE 1 – This requirement is applicable for carriers with aggregated channel bandwidths confined in 1 885-1 920 MHz.

NOTE 2 – The requirement also applies for the frequency ranges that are less than FOOB (MHz) in Table A1-37 and Table A1-39 from the edge of the channel bandwidth.

NOTE 3 – For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

4.6.7 Requirement for CA_41C (network signalled value “CA_NS_04”)

When “CA_NS_04” is indicated in the cell, the power of any UE emission shall not exceed the levels specified in Table A1-86. This requirement also applies for the frequency ranges that are less than Δf_{oB} (MHz) in Table A1-37 from the edge of the aggregated channel bandwidth.

TABLE A1-86

Additional requirements

Frequency band	Spectrum emission limit (dBm)	MBW
$2\,490.5\text{ MHz} \leq f < 2\,495\text{ MHz}$	-13	1 MHz
$9\text{ kHz} < f < 2\,490.5\text{ MHz}$	-25	1 MHz

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 A1-15.

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

4.8 Spurious emission for ProSe

When UE is configured for E-UTRA ProSe sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA ProSe operating bands specified in § 1, the requirements in § 4 apply.

When UE is configured for simultaneous E-UTRA ProSe sidelink and E-UTRA uplink transmissions for inter-band E-UTRA ProSe / E-UTRA bands specified in § 1, the UE co-existence requirements in Table A1-41 apply as specified for the corresponding inter-band aggregation with uplink assigned to two bands.

4.9 Spurious emission for category NB1 and NB2

When UE is configured for category NB1 or NB2 uplink transmissions the requirements in § 4.4 apply with an exception that boundary between category NB1 or NB2 out of band and spurious emission domain shall be FOOB = 1.7 MHz.

4.10 Spurious emission for V2X Communication

When UE is configured for E-UTRA V2X sidelink transmissions non-concurrent with E-UTRA uplink transmissions for E-UTRA V2X operating bands specified in § 1, the requirements in § 4.4 apply.

When UE is configured for simultaneous E-UTRA V2X sidelink and E-UTRA uplink transmissions for inter-band E-UTRA V2X / E-UTRA bands specified in § 1, the UE-coexistence requirements in Table A1-87 apply as specified for the corresponding inter-band con-current operation with uplink assigned to two bands.

For intra-band contiguous multi-carrier operation, the boundary between E-UTRA out of band and spurious emission domain for intra-band contiguous carrier aggregation shall apply.

For intra-band contiguous multi-carrier operation, the spurious emission requirements in Table A1-88 shall apply for coexistence with protected bands.

TABLE A1-87

Spurious Emission band UE co-existence for V2X Communication / Sidelink simultaneous with E-UTRA uplink transmissions

V2X concurrent band configuration	Spurious emission						
	Protected band	Frequency range (MHz)			Maximum level (dBm)	MBW (MHz)	Note
V2X_3A-47A	E-UTRA band 1, 5, 7, 8, 26, 28, 34, 39, 40, 44, 45, 65, 87, 88 NR band n79	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 3	F _{DL_low}	–	F _{DL_high}	–50	1	3
	E-UTRA band 22, 41, 42, 52 NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	2
	Frequency range	5 925	–	5 950	–30	1	7,8
	Frequency range	5 815	–	5 855	–30	1	7
V2X_5A-47A	E-UTRA band 1, 3, 5, 7, 8, 10, 12, 13, 14, 17, 40, 53, 65, 85	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 26	859	–	869	–27	1	
	E-UTRA band 41, 52 NR band n77, n78, n79	F _{DL_low}	–	F _{DL_high}	–50	1	2
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7

TABLE A1-87 (continued)

V2X concurrent band configuration	Spurious emission						
	Protected band	Frequency range (MHz)			Maximum level (dBm)	MBW (MHz)	Note
V2X_7A-47A	E-UTRA band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 52, 65, 87, 88 NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	2 570	–	2 575	+1.6	5	3, 6, 4
	Frequency range	2 575	–	2 595	–15.5	5	3, 6, 4
	Frequency range	2 595	–	2 620	–40	1	3, 6
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7
V2X_8A-47A	E-UTRA band 1, 5, 26, 28, 34, 39, 40, 44, 45, 65, 87, 88	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 7, 22, 41, 42, 52 NR band n77, n78, n79	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA band 3, 8	F _{DL_low}	–	F _{DL_high}	–50	1	2, 3
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7
V2X_20A-47A	E-UTRA band 1, 3, 7, 8, 22, 31, 32, 33, 34, 40, 43, 65, 67, 87, 88	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 20	F _{DL_low}	–	F _{DL_high}	–50	1	3
	E-UTRA band 38, 42, 52, 69 NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	2
	Frequency range	758	–	788	–50	1	
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7
V2X_28A-47A	E-UTRA band 1, 22, 42, 43, 65 NR band n77, n78, 87, 88	F _{DL_low}	–	F _{DL_high}	–50	1	2
	E-UTRA band 1	F _{DL_low}	–	F _{DL_high}	–50	1	10, 11
	E-UTRA band 3, 7, 8, 20, 31, 38, 40 NR band n79	F _{DL_low}	–	F _{DL_high}	–50	1	
	Frequency range	470	–	694	–42	8	3, 12
	Frequency range	470	–	710	–26.2	6	13
	Frequency range	662	–	694	–26.2	6	3
	Frequency range	758	–	773	–32	1	3
	Frequency range	773	–	803	–50	1	
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7

TABLE A1-87 (continued)

V2X concurrent band configuration	Spurious emission						
	Protected band	Frequency range (MHz)			Maximum level (dBm)	MBW (MHz)	Note
V2X_34A-47A	E-UTRA band 1, 3, 5, 7, 8, 11, 18, 19, 20, 21, 22, 26, 28, 31, 32, 33, 34, 38,39, 40, 41, 42, 43, 44, 45, 52, 65, 67, 69, 87, 88 NR band n78, n79	F _{DL_low}	–	F _{DL_high}	–50	1	9
	NR band n77	F _{DL_low}	–	F _{DL_high}	–50	1	2, 9
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7
V2X_39A-47A	E-UTRA band 1, 3,5,7,8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 52, 65 NR band n79	F _{DL_low}	–	F _{DL_high}	–50	1	
	NR band n77,n78	F _{DL_low}	–	F _{DL_high}	–50	1	2, 9
	Frequency range	1 805	–	1 855	[–40]	1	5
	Frequency range	1 855	–	1 880	[–15.5]	5	3, 4, 5
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7
V2X_41A-47A	E-UTRA band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 52, 65 NR band n77, n78	F _{DL_low}	–	F _{DL_high}	–50	1	
	NR Band n79	F _{DL_low}	–	F _{DL_high}	–50	1	2
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7
V2X_71A-47A	E-UTRA band 5, 26, 53	F _{DL_low}	–	F _{DL_high}	–50	1	
	E-UTRA band 41	F _{DL_low}	–	F _{DL_high}	–50	1	2
	Frequency range	5 925	–	5 950	–30	1	7, 8
	Frequency range	5 815	–	5 855	–30	1	7

NOTE 1 – FDL_low and FDL_high refer to each E-UTRA frequency band specified in Table A1-1

NOTE 2 – As exceptions, measurements with a level up to the applicable requirements defined in Table A1-39 are permitted for each assigned E-UTRA carrier used in the measurement due to 2nd, 3rd, 4th [or 5th] harmonic spurious emissions. In case the exceptions are allowed due to spreading of the harmonic emission the exception is also allowed for the first 1 MHz frequency range immediately outside the harmonic emission on both sides of the harmonic emission. This results in an overall exception interval centred at the harmonic emission of (2 MHz + N × LCRB × 180 kHz), where N is 2, 3 or 4 for the 2nd, 3rd or 4th harmonic respectively. The exception is allowed if the measurement bandwidth (MBW) totally or partially overlaps the overall exception interval.

NOTE 3 – These requirements also apply for the frequency ranges that are less than FOOB (MHz) in Table A1-37 and Table A1-39 from the edge of the aggregated channel bandwidth.

NOTE 4 – For these adjacent bands, the emission limit could imply risk of harmful interference to UE(s) operating in the protected operating band.

Note to Table A1-87 (end):

NOTE 5 – This requirement is only applicable for carriers with bandwidth confined within 1 885-1 920 MHz (requirement for carriers with at least 1RB confined within 1 880-1 885 MHz is not specified). This requirement applies 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 1 892.5-1 894.5 MHz and for carriers of 20 MHz bandwidth when carrier centre frequency is within the range 1 895-1 903 MHz.

NOTE 6 – 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 measurement bandwidth (MBW).

NOTE 7 – Applicable when NS_33 or NS_34 is configured by the pre-configured radio parameters.

NOTE 8 – In the frequency range $x-5$ 950 MHz, SE requirement of -30 dBm/MHz should be applied; where $x = \max(5\ 925, f_c + 15)$, where f_c is the channel centre frequency.

NOTE 9 – For non synchronised TDD operation to meet these requirements some restriction will be needed for either the operating band or protected band

NOTE 10 – 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 11 – 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 measurement bandwidth (MBW).

NOTE 12 – This requirement is applicable in the case of a 10 MHz E-UTRA carrier confined within 703 MHz and 733 MHz, otherwise the requirement of -25 dBm with a measurement bandwidth of 8 MHz applies.

NOTE 13 – This requirement is applicable for 5 and 10 MHz E-UTRA channel bandwidth allocated within 718-728 MHz. For carriers of 10 MHz bandwidth, this requirement applies for an uplink transmission bandwidth less than or equal to 30 RB with $RB_{start} > 1$ and $RB_{start} < 48$.

TABLE A1-88

Requirements for intra-band multi-carrier V2X operation

V2X multi-carrier Configuration	Spurious emission						
	Protected band	Frequency range (MHz)		Maximum level (dBm)	MBW (MHz)	Note	
V2X_47B	E-UTRA Band 1, 3, 5, 7, 8, 22, 26, 28, 34, 39, 40, 41, 42, 44, 45, 50, 51, 52, 65 NR band n77, n78, n79	F_{DL_low}	-	F_{DL_high}	-50	1	

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 A1-89.

TABLE A1-89

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.

Attachment to Annex 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 to Recommendation ITU-R M.1545. In case the core specification value is equal to the test limit (Figure 3 of Annex 1 to 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 are applicable, is the absolute value of $\pm 250\%$ of channel bandwidth size from channel centre 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 subsections of this Annex, the spectrum masks of Tables A2-1 and A2-2 are applicable.

TABLE A2-1

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 A2-2

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 A2-3

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 subsections of this Annex, the default spurious emission specifications of Table A2-4 are applicable.

TABLE A2-4

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

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 A2-5.

TABLE A2-5

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 A2-6.

TABLE A2-6

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 A2-7

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
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 A2-8 through Table A2-10.

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 A2-8

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 A2-9

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 A2-10

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 A2-11 through Table A2-15 are applicable.

TABLE A2-11

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

No	Spurious frequency (<i>f</i>) 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	$-21 - 1.68(\Delta f - 8)$ $12.5 \text{ MHz} < \Delta f < 17.5 \text{ MHz}$ -37 $17.5 \text{ MHz} < \Delta f < 22.5 \text{ MHz}$ -18 $22.5 \text{ MHz} < \Delta f$
4	$2\,630 \leq f < 2\,630.5$	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 A2-12

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

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

NOTE – With respect to Table A2-12, 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 A2-4 is applicable.

TABLE A2-13

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

No	Spurious frequency (<i>f</i>) 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 A2-14

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 A2-14, 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 A2-4 is applicable.

TABLE A2-15

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 A2-16.

TABLE A2-16

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 A2-17.

TABLE A2-17
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 A2-18 are applicable.

TABLE A2-18
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
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 A2-19
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 A2-19. Assuming specific power classes, relative specifications of Table A2-19 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 A2-20
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

Notes to Table A2-20:

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 centre 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 A2-20 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 A2-21 and Table A2-22 specify the spectrum emission for FDD mobile stations with 5 MHz and 10 MHz channel bandwidths.

TABLE A2-21
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 A2-22
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 A2-23 are applicable.

TABLE A2-23
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

Tables A2-24 and A2-25 specify the additional spurious emission limits.

TABLE A2-24
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	$30 \text{ MHz} \leq f < 1 \text{ 000 GHz}$	100 kHz	-36
4	$1 \text{ GHz} \leq f < 9.900 \text{ GHz}$	1 MHz	-30

TABLE A2-25
Additional spurious emissions (BCG 6.E)

No	Spurious frequency (<i>f</i>) 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
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

TABLE A2-25 (*end*)

No	Spurious frequency (<i>f</i>) range (MHz)	MBW	Maximum emission level (dBm)
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 A2-26 specifies the additional spurious emission limits.

TABLE A2-26

Additional spurious emission (BCG 6.F)

No	Transmitter centre frequency (<i>f_c</i>) (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 A2-27 and Table A2-28 specify the spectrum emission for FDD mobile stations with 5 MHz and 10 MHz channel bandwidths.

TABLE A2-27

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 A2-28

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 A2-29 are applicable.

TABLE A2-29

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 A2-30 and Table A2-31 specify the spectrum emission for FDD mobile stations with 5 MHz and 10 MHz channel bandwidths.

TABLE A2-30

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 A2-31

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 A2-32 are applicable.

TABLE A2-32

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 A2-33 and Table A2-34 specify the spectrum emission for FDD mobile stations with 5 MHz and 10 MHz channel bandwidths.

TABLE A2-33

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 A2-34

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 A2-35 are applicable.

TABLE A2-35
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

Tables A2-36 and A2-37 specify the spectrum emission mask with 5 MHz channel bandwidths.

TABLE A2-36
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	$2.5 \leq \Delta f < 2i.6$	30	-13
2	$2.6 \leq \Delta f \leq 12.5$	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 A2-37
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	$7.5 \leq \Delta f \leq 12.5$	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.

Tables A2-38 and A2-39 specify the spectrum emission mask with 10 MHz channel bandwidths.

TABLE A2-38

Channel mask for 10 MHz bandwidth: $703 \leq f_c \leq 793$ (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 A2-39

Channel mask for 10 MHz bandwidth: $802 \leq f_c \leq 857$ (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 A2-40 specifies the additional spurious emission limits.

TABLE A2-40

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 A2-41 specifies the additional spurious emission limits.

TABLE A2-41
Additional spurious emissions (BCG 8.C)

No	Spurious frequency (<i>f</i>) 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 A2-42 specifies the additional spurious emission limits.

TABLE A2-42
Additional spurious emissions (BCG 8.E)

No	Spurious frequency (<i>f</i>) 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 A2-43 specifies the additional spurious emission limits.

TABLE A2-43

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
