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Unwanted emission characteristics of base 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.2070-2

Unwanted emission characteristics of base 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 base stations using radio interfaces for the terrestrial component of IMT-Advanced. The information in this Recommendation on unwanted emissions could also be used as guidance by Administrations. Implementation of unwanted emission characteristics of base stations using radio interfaces for 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, base 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 base stations (BS) 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 complexity of IMT-Advanced BS;

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 the harmonization of unwanted emission limits will facilitate global use and access to a global market; however national/regional variations in unwanted emission limits may exist;

f) that unwanted emission limits are dependent on the transmitter emission characteristics, ITU spurious emission limits and national standards and regulations in addition to depending on services operating in other bands,

noting

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

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 to 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 as well as measurement methods of spurious emissions;

c) that Recommendation ITU-R SM.1541 provides OoB domain emission limits 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.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 base 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 Tables 1-1A and 1-2A[1];

2 that the unwanted emission characteristics of base 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 2[2].

Annex 1: LTE-Advanced[3]

Annex 2: WirelessMAN-Advanced[4]

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[1] For LTE-Advanced base stations in the bands specified in Tables 1-1B and 1-2B, 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, 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

This Annex includes unwanted emission requirements from E-UTRA carriers for E-UTRA and multi standard radio (MSR) base stations.

An E-UTRA base station is characterized by the ability of its receiver and transmitter to process only E-UTRA carriers.

An MSR base station is characterized by the ability of its receiver and transmitter to process two or more carriers in common active RF components simultaneously in a declared RF bandwidth, where at least one carrier is of a different Radio Access Technology (RAT) than the other carrier(s).

This Annex is divided into three parts:

– Chapter 1 specifies the operating bands for which the requirements in this Annex apply.

– Chapter 2.1 and Chapter 2.2 specifies definitions, symbols and abbreviations.

– Chapter 2.3 ff. includes the E-UTRA BS unwanted emission requirements.

– Chapter 3 includes the MSR BS unwanted emission requirements.

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

1 Operating bands

The unwanted emission limits defined in the present Annex are for MSR or E-UTRA BS operating at least one of the bands in Table A1-1 or Table A1-2.

TABLE A1-1

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

MSR and E-UTRA band number (Note 1)	NR band number	UTRA band number	GSM/EDGE band designation	Uplink (UL) BS receive UE transmit			Downlink (DL) BS transmit UE receive			Band category (Note 2)
1	n1	I	–	1 920 MHz	–	1 980 MHz	2 110 MHz	–	2 170 MHz	1
2	n2	II	PCS 1900	1 850 MHz	–	1 910 MHz	1 930 MHz	–	1 990 MHz	2
3	n3	III	DCS 1800	1 710 MHz	–	1 785 MHz	1 805 MHz	–	1 880 MHz	2
4	n4	IV	–	1 710 MHz	–	1 755 MHz	2 110 MHz	–	2 155 MHz	1
5	n5	V	GSM 850	824 MHz	–	849 MHz	869 MHz	–	894 MHz	2
6[(1)]	–	VI	–	830 MHz	–	840 MHz	875 MHz	–	885 MHz	1[(1)]
7	n7	VII	–	2 500 MHz	–	2 570 MHz	2 620 MHz	–	2 690 MHz	1
8	n8	VIII	E-GSM	880 MHz	–	915 MHz	925 MHz	–	960 MHz	2
9	–	IX	–	1 749.9 MHz	–	1 784.9 MHz	1 844.9 MHz	–	1 879.9 MHz	1
10	–	X	–	1 710 MHz	–	1 770 MHz	2 110 MHz	–	2 170 MHz	1
11	–	XI	–	1 427.9 MHz	–	1 447.9 MHz	1 475.9 MHz	–	1 495.9 MHz	1
12	n12	XII	–	699 MHz	–	716 MHz	729 MHz	–	746 MHz	1
13	–	XIII	–	777 MHz	–	787 MHz	746 MHz	–	756 MHz	1
14	n14	XIV	–	788 MHz	–	798 MHz	758 MHz	–	768 MHz	1
17	–	–	–	704 MHz	–	716 MHz	734 MHz	–	746 MHz	1[(2)]
18	n18	–	–	815 MHz	–	830 MHz	860 MHz	–	875 MHz	1[(2)]
19	–	XIX	–	830 MHz	–	845 MHz	875 MHz	–	890 MHz	1
20	n20	XX	–	832 MHz	–	862 MHz	791 MHz	–	821 MHz	1
21	–	XXI	–	1 447.9 MHz	–	1 462.9 MHz	1 495.9 MHz	–	1 510.9 MHz	1
22	–	XXII	–	3 410 MHz	–	3 490 MHz	3 510 MHz	–	3 590 MHz	1
23	–	–	–	2 000 MHz	–	2 020 MHz	2 180 MHz	–	2 200 MHz	1[(2)]

TABLE A1-1 (*end*)

MSR and E-UTRA band number (Note 1)	NR band number	UTRA band number	GSM/EDGE band designation	Uplink (UL) BS receive UE transmit			Downlink (DL) BS transmit UE receive			Band category (Note 2)
25	n25	XXV	–	1 850 MHz	–	1 915 MHz	1 930 MHz	–	1 995 MHz	1
26	n26	XXVI	–	814 MHz	–	849 MHz	859 MHz	–	894 MHz	1
27	–	–	–	807 MHz	–	824 MHz	852 MHz	–	869 MHz	1[2]
28	n28	–	–	703 MHz	–	748 MHz	758 MHz	–	803 MHz	1[2]
29	n29	–	–	N/A			717 MHz	–	728 MHz	1[2, 3]
30	n30	–	–	2305 MHz	–	2 315 MHz	2 350 MHz	–	2 360 MHz	1[2]
31	–	–	–	452.5 MHz	–	4 57.5 MHz	462.5 MHz	–	467.5 MHz	1[2]
32	–	XXXII	–	N/A			1 452 MHz	–	1 496 MHz	1[3, 4]
65	n65	–	–	1 920 MHz	–	2 010 MHz	2 110 MHz	–	2 200 MHz	1[4]
66	n66	–	–	1 710 MHz	–	1 780 MHz	2 110 MHz	–	2 200 MHz	1[4, 7]
67	–	–	–	N/A			738 MHz	–	758 MHz	1[5, 11]
68	–	–	–	698 MHz	–	728 MHz	753 MHz	–	783 MHz	1[11]
69	–	–	–	N/A			2 570 MHz	–	2 620 MHz	1[5, 11]
71	n71	–	–	663 MHz	–	698 MHz	617 MHz	–	652 MHz	1[4]
72	–	–	–	451 MHz	–	456 MHz	461 MHz	–	466 MHz	1[13]
73	–	–	–	450 MHz	–	455 MHz	460 MHz	–	465 MHz	1[13]
74	n74	–	–	1 427 MHz	–	1 470 MHz	1 475 MHz	–	1 518 MHz	1[4]
75	n75	–	–	N/A			1 432 MHz	–	1 517 MHz	1[2, 5]
76	n76	–	–	N/A			1 427 MHz	–	1 432 MHz	1[2, 5]
85	–	–	–	698 MHz – 716 MHz			728 MHz	–	746 MHz	1[13]

TABLE A1-2

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

MSR and E-UTRA band number (Note 1)	NR band number	UTRA band number	GSM/EDGE band designation	Uplink (UL) BS receive UE transmit			Downlink (DL) BS transmit UE receive			Band category (Note 2)
24	–	–	–	1 626.5 MHz	–	1 660.5 MHz	1 525 MHz	–	1 559 MHz	1[(2)]
70	n70	–	–	1 695 MHz	–	1 710 MHz	1 995 MHz	–	2 020 MHz	1[(4), (9)]
87	–	–	–	410 MHz	–	415 MHz	420 MHz	–	425 MHz	1[(13)]
88	–	–	–	412 MHz	–	417 MHz	422 MHz	–	427 MHz	1[(13)]

(1) The band is for UTRA only.

(2) The band is for E-UTRA only.

(3) The band is for E-UTRA and/or UTRA only.

(4) The band is for E-UTRA and/or NB-IoT only.

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

(6) Restricted to UTRA operation when dual band is configured (e.g. DB-DC-HSDPA or dual band 4C-HSDPA). The down link frequency of this band is paired with the uplink frequency of the other FDD band (external) of the dual band configuration.

(7) In E-UTRA operation, the range 2 180-2 200 MHz of the DL operating band is restricted to operation when carrier aggregation is configured.

(8) Band 23 is not applicable.

(9) In E-UTRA operation, the range 2 010-2 020 MHz of the DL operating band is restricted to operation when carrier aggregation is configured and TX-RX separation is 300 MHz. In E-UTRA operation, the range 2 005-2 020 MHz of the DL operating band is restricted to operation when carrier aggregation is configured and TX-RX separation is 295 MHz.

(10) DL operation is restricted to 1 526-1 536 MHz frequency range. UL operation is restricted to 1 627.5-1 637.5 MHz and 1 646.5-1 656.5 MHz.

(11) The band is for E-UTRA only.

(12) The band is for E-UTRA and/or UTRA only.

(13) The band is for E-UTRA and/or NB-IoT only.

NOTE 1 – 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 2 – Band Category 1 (BC1): Bands for E-UTRA FDD and UTRA FDD operation. Bands in this category are also used for NB-IoT operation (all modes).

Band Category 2 (BC2): Bands for E-UTRA FDD, UTRA FDD and GSM/EDGE operation. Bands in this category are also used for NB-IoT operation (all modes).

Band Category 3 (BC3): Bands for E-UTRA TDD and UTRA TDD operation. Bands in this category are also used for NB-IoT operation (all modes).

TABLE A1-3

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

MSR and E-UTRA band number	NR band number	UTRA band number	Uplink (UL) BS receive UE transmit			Downlink (DL) BS transmit UE receive			Band category (Note 1)
33	–	a)	1 900 MHz	–	1 920 MHz	1 900 MHz	–	1 920 MHz	3
34	n34	a)	2 010 MHz	–	2 025 MHz	2 010 MHz	–	2 025 MHz	3
35	–	b)	1 850 MHz	–	1 910 MHz	1 850 MHz	–	1 910 MHz	3
36	–	b)	1 930 MHz	–	1 990 MHz	1 930 MHz	–	1 990 MHz	3
37	–	c)	1 910 MHz	–	1 930 MHz	1 910 MHz	–	1 930 MHz	3
38	n38	d)	2 570 MHz	–	2 620 MHz	2 570 MHz	–	2 620 MHz	3
39	n39	f)	1 880 MHz	–	1 920 MHz	1 880 MHz	–	1 920 MHz	3
40	n40	e)	2 300 MHz	–	2 400 MHz	2 300 MHz	–	2 400 MHz	3
42	–	–	3 400 MHz	–	3 600 MHz	3 400 MHz	–	3 600 MHz	3[(1)]
44	–	–	703 MHz	–	803 MHz	703 MHz	–	803 MHz	3
45	–	–	1 447 MHz	–	1 467 MHz	1 447 MHz	–	1 467 MHz	3
48	n48	–	3 550 MHz	–	3 700 MHz	3 550 MHz	–	3 700 MHz	3
50	n50	–	1 432 MHz	–	1 517 MHz	1 432 MHz	–	1 517 MHz	3
51	n51	–	1 427 MHz	–	1 432 MHz	1 427 MHz	–	1 432 MHz	3
52	n52	–	3 300 MHz	–	3 400 MHz	3 300 MHz	–	3 400 MHz	3

TABLE A1-4

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

MSR and E-UTRA band number	NR band number	UTRA band number	Uplink (UL) BS receive UE transmit			Downlink (DL) BS transmit UE receive			Band category (Note 1)
41	n41	–	2 496 MHz	–	2 690 MHz	2 496 MHz	–	2 690 MHz	3[(1)]
43	–	–	3 600 MHz	–	3 800 MHz	3 600 MHz	–	3 800 MHz	3[(1)]
53	n53	–	2 483.5 MHz	–	2 495 MHz	2 483.5 MHz	–	2 495 MHz	3
77	n77	–	3 300 MHz	–	4 200 MHz	3 300 MHz	–	4 200 MHz	3[(2)]
78	n78	–	3 300 MHz	–	3 800 MHz	3 300 MHz	–	3 800 MHz	3[(2)]

[(1)] The band 41 supports NB-IoT (in certain regions). The bands 42 and 43 support NB-IoT.

[(2)] The band is for NR only.

NOTE 1 – Band Category 1 (BC1): Bands for E-UTRA FDD and UTRA FDD operation. Bands in this category are also used for NB-IoT operation (all modes).
Band Category 2 (BC2): Bands for E-UTRA FDD, UTRA FDD and GSM/EDGE operation. Bands in this category are also used for NB-IoT operation (all modes).
Band Category 3 (BC3): Bands for E-UTRA TDD and UTRA TDD operation. Bands in this category are also used for NB-IoT operation (all modes).

NOTE 2 – For the E-UTRA operating frequency bands in Tables A1-1 and A1-2 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 3 – Band Category 1 (BC1): Bands for E-UTRA FDD and UTRA FDD operation. Bands in this category are also used for NB-IoT operation (all modes).
Band Category 2 (BC2): Bands for E-UTRA FDD, UTRA FDD and GSM/EDGE operation. Bands in this category are also used for NB-IoT operation (all modes).
Band Category 3 (BC3): Bands for E-UTRA TDD and UTRA TDD operation. Bands in this category are also used for NB-IoT operation (all modes).

2 E-UTRA unwanted emission characteristics

2.1 Definitions

Aggregated channel bandwidth: RF bandwidth in which a BS transmits and/or receives multiple contiguously aggregated carriers.

NOTE – The aggregated channel bandwidth is measured in MHz.

Base station RF bandwidth edge: RF frequency of one of the edges of the base station RF bandwidth.

Base station RF bandwidth: the bandwidth in which a BS transmits and/or receives single or multiple carrier(s) within a supported operating band.

NOTE – In single E-UTRA carrier operation, the Base Station RF Bandwidth is equal to the channel bandwidth.

Carrier: modulated waveform conveying the E-UTRA or UTRA (WCDMA) physical channels.

Carrier aggregation: aggregation of two or more E-UTRA 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.

NOTE – Carrier aggregation band(s) for an E-UTRA BS is declared by the manufacturer.

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.

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

Channel edge: lowest or highest frequency of the E-UTRA carrier.

NOTE – Channel edges are separated by the channel bandwidth.

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

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.

Downlink operating band: part of the operating band designated for downlink.

Highest carrier: carrier with the highest carrier centre frequency transmitted/received in a specified operating band.

Inter RF Bandwidth gap: frequency gap between two consecutive Base station RF bandwidths that are placed within two supported operating bands.

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.

NOTE – It is used as a frequency reference point for both transmitter and receiver requirements.

Lowest carrier: carrier with the lowest carrier centre frequency transmitted/received in a specified operating band.

Maximum Base Station RF bandwidth: maximum Base station bandwidth supported by a BS within each supported operating band.

Maximum output power: mean power level per carrier of the base station measured at the antenna connector in a specified reference condition.

Maximum radio bandwidth: maximum frequency difference between the upper edge of the highest used carrier and the lower edge of the lowest used carrier.

Mean power: power measured in the channel bandwidth of the carrier.

NOTE – The period of measurement shall be at least one subframe (1ms), unless otherwise stated.

Multi-band Base Station: Base Station characterized by the ability of its transmitter and/or receiver to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different non-overlapping operating band than the other carrier(s).

Multi-band transmitter: transmitter characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different operating band (which is not a sub-band or superseding-band of another supported operating band) than the other carrier(s).

Multi-band receiver: receiver characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different non-operating band (which is not a sub-band or superseding-band of another supported operating band) than the other carrier(s).

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

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

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

NOTE – The operating band(s) for an E-UTRA BS is declared by the manufacturer according to the designations in Tables A1-1 and A1-2.

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

Rated output power: mean power level per carrier that the manufacturer has declared to be available at the antenna connector.

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

RRC filtered mean power: mean power as measured through a root raised cosine filter with roll-off factor α and a bandwidth equal to the chip rate of the radio access mode.

NOTE – The RRC filtered mean power of a perfectly modulated W-CDMA signal is 0.246 dB lower than the mean power of the same signal.

Sub-block: one contiguous allocated block of spectrum for use by the same base station. There may be multiple instances of sub-blocks within an RF bandwidth.

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

Sub-block gap: 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.

Total RF bandwidth: maximum sum of Base station RF bandwidths in all supported operating bands.

Transmission bandwidth: bandwidth of an instantaneous transmission from a UE or BS, measured in resource block units.

Transmission bandwidth configuration: highest transmission bandwidth allowed for uplink or downlink in a given channel bandwidth, measured in resource block units.

Unsynchronized operation: operation of TDD in two different systems, where the conditions for synchronized operation are not met.

Uplink operating band: part of the operating band designated for uplink.

Upper sub-block edge: frequency at the upper edge of one sub-block.

NOTE – It is used as a frequency reference point for both transmitter and receiver requirements.

2.2 Symbols and abbreviations

2.2.1 Symbols

$BW_{Channel}$	Channel bandwidth
BWConfig	Transmission bandwidth configuration, expressed in MHz, where BWConfig = NRB × 180 kHz in the uplink and BWConfig = 15 kHz + NRB × 180 kHz in the downlink.
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 withinband X where X is the applicable E-UTRA operating band
CA_X-Y	Inter-band CA of component carrier(s) in one sub-blocks within band X and component carrier(s) in one sub-block withinband Y where X and Y are the applicable E-UTRA operating bands
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
f	Frequency
Δf	Separation between the channel edge frequency and the nominal −3 dB point of the measuring filter closest to the carrier frequency
Δf_{max}	The largest value of Δf used for defining the requirement
F_{filter}	Filter centre frequency
f_offset	Separation between the channel edge frequency and the centre of the measuring filter
f_offset_{max}	The maximum value of f_offset used for defining the requirement
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
$P_{EM,N}$	Declared emission level for channel *N*
$P_{EM,B32,B75,B76,ind}$	Declared emission level in Band 32, Band 75 and Band 76, ind=a, b, c
$P_{EM,B32,ind}$	Declared emission level in Band 32, ind=a, b, c, d, e
W_{gap}	Sub-block gap or Inter RF Bandwidth gap size

2.2.2 Abbreviations

ACLR	Adjacent channel leakage ratio
BS	Base station
BW	Bandwidth
CACLR	Cumulative ACLR
DTT	Digital terrestrial television
e.i.r.p.	Effective isotropic radiated power
E-UTRA	Evolved UTRA
FDD	Frequency division duplex
ITU-R	Radiocommunication Sector of the ITU
LA	Local area
MR	Medium range
MSR	Multi standard radio
NB-IoT	Narrowband – Internet of Things
OBUE	Operating Band Unwanted Emissions
OoB	Out-of-band
RAT	Radio access technology
RB	Resource block
RF	Radio frequency
RRC	Root raised cosine
RX	Receiver
SNR	Signal-to-noise ratio
TDD	Time division duplex
TX	Transmitter
UE	User equipment
UEM	Unwanted emission mark
UTRA	Universal Terrestrial Radio Access
WA	Wide area

2.3 Operating band unwanted emissions

The requirements shall apply whatever the type of transmitter considered (single carrier, multi-carrier and/or CA) and for all transmission modes foreseen by the manufacturer’s specification. In addition,

for a BS operating in non-contiguous spectrum, the requirements apply inside any sub-block gap. In addition, for a BS operating in multiple bands, the requirements apply inside any Inter RF Bandwidth gap.

For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the single-band requirements apply and the cumulative evaluation of the emission limit in the Inter RF Bandwidth gap are not applicable.

For a BS supporting E-UTRA with guard band NB-IoT operation, the Operating band unwanted emissions requirements apply to E-UTRA carrier with channel bandwidth larger than or equal to 5 MHz.

The unwanted emission limits in the part of the downlink operating band that falls in the spurious domain are consistent with Recommendation ITU-R SM.329.

For a multicarrier E-UTRA BS or BS configured for intra-band contiguous or non-contiguous carrier aggregation the definitions above apply to the lower edge of the carrier transmitted at the lowest carrier frequency and the upper edge of the carrier transmitted at the highest carrier frequency within a specified operating band.

For wide area BS, the requirements of either § 2.3.1 (category A limits) or § 2.3.2 (category B limits) shall apply.

For local area BS, the requirements of § 2.3.2A shall apply (category A and B).

For home BS, the requirements of § 2.3.2B shall apply (category A and B).

For medium range BS, the requirements in § 2.3.2C shall apply (category A and B).

The application of either category A or category B limits shall be the same as for transmitter spurious emissions (mandatory requirements) in § 2.6.

For category B operating band unwanted emissions, there are two options for the limits that may be applied regionally. Either the limits in § 2.3.2.1 or § 2.3.2.2 shall be applied.

The requirements of § 2.3.1 and § 2.3.2 apply to Wide Area BS that supports E-UTRA with NB-IoT (in band and/or guard band). The requirements for Wide Area BS that supports standalone NB-IoT are in § 2.3.2E.

The requirements of § 2.3.2A apply to Local Area BS that supports E-UTRA with NB-IoT (in band and/or guard band). The requirements for Local Area BS that supports standalone NB-IoT are in § 2.3.2F.

The requirements of § 2.3.2B apply to Home BS that supports E-UTRA with NB-IoT (in band and/or guard band). The requirements for Home BS that supports standalone NB-IoT are in § 2.3.2G.

The requirements of § 2.3.2C apply to Medium Range BS that supports E-UTRA with NB-IoT (in band and/or guard band). The requirements for Medium Range BS that supports standalone NB-IoT are in § 2.3.2H.

Emissions shall not exceed the maximum levels specified in the Tables below, where:

– Δf is the separation between the Base Station RF Bandwidth edge frequency and the nominal −3 dB point of the measuring filter closest to the carrier frequency.

– *f_offset* is the separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter.

– f_offset_{max} is the offset to the frequency 10 MHz outside the downlink operating band.

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

For BS operating in multiple bands, inside any Inter RF Bandwidth gaps with W_{gap} < 20 MHz, emissions shall not exceed the cumulative sum of the test requirements specified at the Base station RF Bandwidth edges on each side of the Inter RF Bandwidth gap. The test requirement for Base Station RF Bandwidth edge is specified in Tables A1-6 to A1-8 below, where in this case:

– Δf is the separation between the Base Station RF Bandwidth edge frequency and the nominal –3 dB point of the measuring filter closest to the RF bandwidth edge.

– *f_offset* is the separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter.

– f_offset_{max} is equal to the Inter RF Bandwidth gap divided by two minus half of the bandwidth of the measuring filter.

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

For BS capable of multi-band operation where multiple bands are mapped on the same antenna connector, the operating band unwanted emission limits apply also in a supported operating band without any carrier transmitted, in the case where there are carrier(s) transmitted in other supported operating band(s). In this case where there is no carrier transmitted in an operating band, the operating band unwanted emission limit, as defined in the tables of the present section for the largest frequency offset (Δf_{max}), of a band where there is no carrier transmitted shall apply from 10 MHz below the lowest frequency, up to 10 MHz above the highest frequency of the supported downlink operating band without any carrier transmitted. And no cumulative limit is applied in the inter-band gap between a supported downlink operating band with carrier(s) transmitted and a supported downlink operating band without any carrier transmitted.

In addition, inside any sub-block gap for a BS operating in non-contiguous spectrum, measurement results shall not exceed the cumulative sum of the test requirements specified for the adjacent sub-blocks on each side of the sub-block gap. The test requirement for each sub-block is specified in Tables A1-6 to A1-8 below, where in this case:

– Δf is the separation between the sub-block edge frequency and the nominal –3 dB point of the measuring filter closest to the sub-block edge.

– *f_offset* is the separation between the sub-block edge frequency and the centre of the measuring filter.

– f_offset_{max} is equal to the sub-block gap bandwidth minus half of the bandwidth of the measuring filter.

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

2.3.1 Operating band unwanted emissions for wide area BS (category A)

For E-UTRA BS operating in Bands 5, 6, 8, 12, 13, 14, 17, 18, 19, 26, 27, 28, 29, 31, 44, 71, 72, 73, 85, 87, 88 emissions shall not exceed the maximum levels specified in Tables A1-6 to A1-8.

TABLE A1-5

Wide area BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (E-UTRA bands < 1 GHz) for category A

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$+0.5\text{dBm} - \frac{10}{1.4} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–9.5 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	2.85 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –13 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter Rf Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-6

Wide area BS operating band unwanted emission limits for 3 MHz channel bandwidth (E-UTRA bands < 1 GHz) for category A

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-3.5\text{dBm} - \frac{10}{3} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–13.5 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.05 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –13 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-7

Wide area BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (E-UTRA bands < 1 GHz) for category A

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-5.5\text{dBm} - \frac{7}{5} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–12.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm (Note 3)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –13 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

For E-UTRA BS operating in Bands 1, 2, 3, 4, 7, 9, 10, 11, 21, 23, 24, 25, 30, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 45, 48, 50, 65, 66, 69, 70, 74, 75 emissions shall not exceed the maximum levels specified in Tables A1-8, A1-10 and A1-12.

For E-UTRA BS operating in Bands 22, 42, 43, 52 emissions shall not exceed the maximum levels specified in Tables A1-9, A1-11 and A1-13.

TABLE A1-8

Wide area BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (1 GHz < E-UTRA bands ≤ 3 GHz) for category A

Frequency offset of measurement filter-3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$+0.5\text{dBm} - \frac{10}{1.4} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–9.5 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	3.3 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm	1 MHz

Notes to Table A1-8:

Note 1: For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –13 dBm/1 MHz.

Note 2: As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

Note 3: For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-9

Wide area BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (E-UTRA bands > 3 GHz) for category A

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 3)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$+0.8\text{dBm} - \frac{10}{1.4} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–9.2 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	3.3 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –13 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-10

Wide area BS operating band unwanted emission limits for 3 MHz channel bandwidth (1 GHz < E-UTRA bands ≤ 3 GHz) for category A

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-3.5\text{dBm} - \frac{10}{3} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–13.5 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.5 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –13 dBm/1 MHz where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-11

Wide area BS operating band unwanted emission limits for 3 MHz channel bandwidth (E-UTRA bands > 3 GHz) for category A

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-3.2\text{dBm} - \frac{10}{3} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–13.2 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.5 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block, where the test requirement within sub-block gaps shall be –13 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-12

Wide area BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (1 GHz < E-UTRA bands ≤ 3 GHz) for category A

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-5.5\text{dBm} - \frac{7}{5} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–12.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm (Note 3)	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block, where the test requirement within sub-block gaps shall be –13 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-13

Wide area BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (E-UTRA bands > 3 GHz) for category A

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-5.2\text{dBm} - \frac{7}{5} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–12.2 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	–13 dBm (Note 3)	1 MHz

Notes to Table A1-13:

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –13 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

2.3.2 Operating band unwanted emissions for wide area BS (category B)

For category B operating band unwanted emissions, there are two options for the limits that may be applied regionally. Either the limits in § 2.3.2.1 or § 2.3.2.2 shall be applied.

2.3.2.1 Operating band unwanted emissions for wide area BS, category B (Option 1)

For E-UTRA BS operating in Bands 5, 8, 12, 13, 14, 17, 20, 26, 27, 28, 29, 31, 44, 67, 68, 71, 72, 73, 85, 87 and 88, emissions shall not exceed the maximum levels specified in Tables A1-14 to A1-16.

TABLE A1-14

Wide area BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (E-UTRA bands < 1 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$+0.5\text{dBm} - \frac{10}{1.4} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–9.5 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	2.85 MHz ≤ *f_offset* < f_offset_{max}	–16 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –16 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-15

Wide area BS operating band unwanted emission limits for 3 MHz channel bandwidth (E-UTRA bands < 1 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-3.5\text{dBm} - \frac{10}{3} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–13.5 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.05 MHz ≤ *f_offset* < f_offset_{max}	–16 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –16 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Banwidth gap < 20 MHz the test requirement within the Inter RF Banwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Banwidth gap.

TABLE A1-16

Wide area BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (E-UTRA bands < 1 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-5.5\text{dBm} - \frac{7}{5} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–12.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	–16 dBm (Note 3)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –16 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with inter RF bandwidth gap < 20 MHz the test requirement within the inter RF bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the inter RF bandwidth gap

For E-UTRA BS operating in Bands 1, 2, 3, 4, 7, 10, 25, 30, 33, 34, 35, 36, 37, 38, 39, 40, 41, 45, 48, 50, 65, 66, 69, 70 and 75, emissions shall not exceed the maximum levels specified in Tables A1-17, A1-19 and A1-21.

For E-UTRA BS operating in Bands 22, 42, 43 and 52, emissions shall not exceed the maximum levels specified in Tables A1-18, A1-20 and A1-22.

TABLE A1-17

Wide area BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (1 GHz < E-UTRA bands ≤ 3 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 3)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$+0.5\text{dBm} - \frac{10}{1.4} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–9.5 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	3.3 MHz ≤ *f_offset* < f_offset_{max}	–15 dBm	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-18

Wide area BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (E-UTRA bands > 3 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 3)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$+0.8\text{dBm} - \frac{10}{1.4} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–9.2 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	3.3 MHz ≤ *f_offset* < f_offset_{max}	–15 dBm	1 MHz

Notes to Table A1-18:

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-19

Wide area BS operating band unwanted emission limits for 3 MHz channel bandwidth (1 GHz < E-UTRA bands ≤ 3 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 3)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-3.5\text{dBm} - \frac{10}{3} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–13.5 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.5 MHz ≤ *f_offset* < f_offset_{max}	–15 dBm	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-20

Wide area BS operating band unwanted emission limits for 3 MHz channel bandwidth (E-UTRA bands > 3 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 3)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-3.2\text{dBm} - \frac{10}{3}\cdot\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–13.2 dBm	100 kHz
6 MHz ≤ $\Delta f \le \Delta f_{max}$	6.5 MHz ≤ *f_offset* < f_offset_{max}	–15 dBm	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions fromadjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \ge 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-21

Wide area BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (1 GHz < E-UTRA bands ≤ 3 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 4)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-5.5\text{dBm} - \frac{7}{5}\cdot\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–12.5 dBm	100 kHz
10 MHz ≤ $\Delta f \le \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	–15 dBm (Note 3)	1 MHz

Notes to Table A1-21:

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

TABLE A1-22

Wide area BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (E-UTRA bands > 3 GHz) for category B

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 4)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-5.2\text{dBm} - \frac{7}{5} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–12.2 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	–15 dBm (Note 3)	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

2.3.2.2 Operating band unwanted emissions for wide area BS, category B (Option 2)

The limits in this section are intended for Europe and may be applied regionally for BS operating in band 1, 3, 7, 8, 32, 33, 34, 38, 65 or 69.

For a BS operating in bands 1, 3, 7, 8, 32, 33, 34, 38, 65 or 69, emissions shall not exceed the maximum levels specified in Table A1-23 for 5, 10, 15 and 20 MHz channel bandwidth.

TABLE A1-23

Regional wide area BS operating band unwanted emission limits in bands 1, 3, 7, 8, 32, 33, 34, 38, 65 or 69 for 5, 10, 15 and 20 MHz channel bandwidth for category B

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 5)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 0.2 MHz	0.015 MHz ≤ *f_offset* < 0.215 MHz	–12.5 dBm	30 kHz
0.2 MHz ≤ Δf < 1 MHz	0.215 MHz ≤ *f_offset* < 1.015 MHz	$-12.5\text{dBm} - 15 \cdot \left(\frac{f_offset}{\text{MHz}} - 0.215 \right) \text{dB}$	30 kHz
(Note 4)	1.015 MHz ≤ *f_offset* < 1.5 MHz	–24.5 dBm	30 kHz
1 MHz ≤ Δf ≤ min(10 MHz, Δf_{max})	1.5 MHz ≤ *f_offset* < min(10.5 MHz, f_offset_{max})	–11.5 dBm	1 MHz
10 MHz ≤ Δf ≤ Δf_{max}	10.5 MHz ≤ *f_offset* < f_offset_{max}	–15 dBm (Note 3)	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 5 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

For a BS operating in bands 3, 8 or 65, emissions shall not exceed the maximum levels specified in Table A1-24 for 3 MHz channel bandwidth.

TABLE A1-24

Regional wide area BS operating band unwanted emission limits in bands 3, 8 or 65 for 3 MHz channel bandwidth for category B

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$6.5\text{dBm} - 60 \cdot \left(\frac{f_{offset}}{\text{MHz}} - 0.015 \right) \text{dB}$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$3.5\text{dBm} - 160 \cdot \left(\frac{f_{offset}}{\text{MHz}} - 0.065 \right) \text{dB}$	30 kHz
0.15 MHz ≤ Δf < 0.2 MHz	0.165 MHz ≤ *f_offset* < 0.215 MHz	–12.5 dBm	30 kHz
0.2 MHz ≤ Δf < 1 MHz	0.215 MHz ≤ *f_offset* < 1.015 MHz	$-12.5\text{dBm} - 15 \cdot \left(\frac{f_offset}{\text{MHz}} - 0.215 \right) \text{dB}$	30 kHz
(Note 3)	1.015 MHz ≤ *f_offset* < 1.5 MHz	–24.5 dBm	30 kHz
1 MHz ≤ Δf ≤ 6 MHz	1.5 MHz ≤ *f_offset* < 6.5 MHz,	–11.5 dBm	1 MHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.5 MHz ≤ *f_offset* < f_offset_{max}	–15 dBm	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth.

For a BS operating in bands 3, 8 or 65, emissions shall not exceed the maximum levels specified in Table A1-25 for 1.4 MHz channel bandwidth.

TABLE A1-25

Regional wide area BS operating band unwanted emission limits in bands 3, 8 or 65 for 1.4 MHz channel bandwidth for category B

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$6.5\text{dBm} - 60 \cdot \left(\frac{f_{offset}}{\text{MHz}} - 0.015 \right) \text{dB}$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0. 065 MHz ≤ *f_offset* < 0.165 MHz	$3.5\text{dBm} - 160 \cdot \left(\frac{f_{offset}}{\text{MHz}} - 0.065 \right) \text{dB}$	30 kHz
0.15 MHz ≤ Δf < 0.2 MHz	0.165 MHz ≤ *f_offset* < 0.215 MHz	–12.5 dBm	30 kHz
0.2 MHz ≤ Δf < 1 MHz	0.215 MHz ≤ *f_offset* < 1.015 MHz	$-12.5\text{dBm} - 15 \cdot \left(\frac{f_offset}{\text{MHz}} - 0.215 \right) \text{dB}$	30 kHz
(Note 3)	1.015 MHz ≤ *f_offset* < 1.5 MHz	–24.5 dBm	30 kHz
1 MHz ≤ Δf ≤ 2.8 MHz	1.5 MHz ≤ *f_offset* < 3.3 MHz	–11.5 dBm	1 MHz
2.8 MHz ≤ Δf ≤ Δf_{max}	3.3 MHz ≤ *f_offset* < *f_offset*$_{max}$	–15 dBm	1 MHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/1 MHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

2.3.2A Operating band unwanted emissions for local area BS (category A and B)

For Local Area BS in E-UTRA bands ≤3 GHz, emissions shall not exceed the maximum levels specified in Tables A1-26, A1-28 and A1-30.

For Local Area BS in E-UTRA bands >3 GHz, emissions shall not exceed the maximum levels specified in Tables A1-27, A1-29 and A1-31.

TABLE A1-26

Local area BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$-19.5\text{dBm} - \frac{10}{1.4}\left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–29.5 dBm	100 kHz
2.8 MHz ≤ Δf ≤ Δf_{max}	2.85 MHz ≤ *f_offset* < *f_offset*$_{max}$	–31 dBm	100 kHz

Notes to Table A1-26:

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –31 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidthon each side of the Inter RF Bandwidth gap.

TABLE A1-27

Local area BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$-19.2\text{dBm} - \frac{10}{1.4}\cdot\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–29.2 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	2.85 MHz ≤ *f_offset* < f_offset_{max}	–31 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –31 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-28

Local area BS operating band unwanted emission limits for 3 MHz channel bandwidth (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-23.5\text{dBm} - \frac{10}{3}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–33.5 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.05 MHz ≤ *f_offset* < f_offset_{max}	–35 dBm	100 kHz

Notes to Table A1-28:

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –35 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-29

Local area BS operating band unwanted emission limits for 3 MHz channel bandwidth (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-23.2\text{dBm} - \frac{10}{3} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–33.2 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.05 MHz ≤ *f_offset* < f_offset_{max}	–35 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –35 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-30

Local area BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-28.5\text{dBm} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–35.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	–37 dBm (Note 3)	100 kHz

Notes to Table A1-30:

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –37 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-31

Local area BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 4)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-28.2\text{dBm} - \frac{7}{5} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05 \right) \text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–35.2 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	–37 dBm (Note 3)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –37 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

2.3.2B Operating band unwanted emissions for home BS (category A and B)

For home BS in E-UTRA bands ≤ 3 GHz, emissions shall not exceed the maximum levels specified in Tables A1-32, A1-34 and A1-36.

For home BS in E-UTRA bands > 3 GHz, emissions shall not exceed the maximum levels specified in Tables A1-33, A1-35 and A1-37.

TABLE A1-32

Home BS operating band unwanted emission limits for 1.4 MHz channel bandwidth (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$-28.5\text{dBm} + \frac{6}{1.4}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–34.5 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	3.3 MHz ≤ *f_offset* < f_offset_{max}	$\begin{cases} P - 52\text{dB}, 2\text{dBm} \leq \text{P} \leq 20\text{dBm} \\ -50\text{dBm}, \text{P} < 2\text{dBm} \end{cases}$	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

TABLE A1-33

Home BS operating band unwanted emission limits for 1.4 MHz channel and width (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$-28.2\text{dBm} - \frac{6}{1.4} \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–34.2 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	3.3 MHz ≤ *f_offset* < f_offset_{max}	$\begin{cases} P - 52\text{dB}, 2\text{dBm} \leq \text{P} \leq 20\text{dBm} \\ -50\text{dBm}, \text{P} < 2\text{dBm} \end{cases}$	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

TABLE A1-34

Home BS operating band unwanted emission limits for 3 MHz channel bandwidth (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-32.5\text{dBm} - 2\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–38.5 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.5 MHz ≤ *f_offset* < f_offset_{max}	$\begin{cases} P - 52\text{dB}, 2\text{dBm} \leq \text{P} \leq 20\text{dBm} \\ -50\text{dBm}, \text{P} < 2\text{dBm} \end{cases}$	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

TABLE A1-35

Home BS operating band unwanted emission limits for 3 MHz channel bandwidth (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-32.2\text{dBm} - 2 \cdot \left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–38.2 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.5 MHz ≤ *f_offset* < f_offset_{max}	$\begin{cases} P - 52\text{dB}, 2\text{dBm} \leq \text{P} \leq 20\text{dBm} \\ -50\text{dBm}, \text{P} < 2\text{dBm} \end{cases}$	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

TABLE A1-36

Home BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-34.5\text{dBm} - \frac{6}{5}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–40.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	$\begin{cases} P - 52\text{dB}, 2\text{dBm} \leq \text{P} \leq 20\text{dBm} \\ -50\text{dBm}, \text{P} < 2\text{dBm} \end{cases}$ (Note 2)	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 2 – The requirement is not applicable when Δf_{max} < 10 MHz.

TABLE A1-37

Home BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-34.2\text{dBm} - \frac{6}{5}\cdot\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–40.2 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	$\begin{cases} P - 52\text{dB}, 2\text{dBm} \leq \text{P} \leq 20\text{dBm} \\ -50\text{dBm}, \text{P} < 2\text{dBm} \end{cases}$ (Note 2)	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 2 – The requirement is not applicable when Δf_{max} < 10 MHz.

2.3.2C Operating band unwanted emissions for medium range BS (category A and B)

For Medium Range BS in E-UTRA bands ≤ 3GHz, emissions shall not exceed the maximum levels specified in Tables A1-38, A1-40, A1-42, A1-44, A1-46 and A1-48.

For Medium Range BS in E-UTRA bands > 3GHz, emissions shall not exceed the maximum levels specified in Tables A1-39, A1-41, A1-43, A1-45, A1-47 and A1-49.

TABLE A1-38

Medium range BS operating band unwanted emission limits for 1.4 MHz channel bandwidth, 31 < $P_{rated,c}$ ≤ 38 dBm (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δ*f*	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δ*f* < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$P_{rated,c} - 43.5\text{dB} - \frac{10}{1.4}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
1.4 MHz ≤ Δ*f* < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	$P_{rated,c}$ – 53.5 dB	100 kHz
2.8 MHz ≤ Δ*f* ≤ Δf_{max}	2.85 MHz ≤ *f_offset* < *f_offset*$_{max}$	−25 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –25 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-39

Medium range BS operating band unwanted emission limits for 1.4 MHz channel bandwidth, 31 < $P_{rated,c}$ ≤ 38 dBm (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δ*f*	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δ*f* < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$P_{rated,c} - 43.2\text{dB} - \frac{10}{1.4}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
1.4 MHz ≤ Δ*f* < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	$P_{rated,c}$ – 53.2 dB	100 kHz
2.8 MHz ≤ Δ*f* ≤ Δf_{max}	2.85 MHz ≤ *f_offset* < *f_offset*$_{max}$	−25 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –25 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-40

Medium range BS operating band unwanted emission limits for 1.4 MHz channel bandwidth, $P_{rated,c} \leq 31$ dBm (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$-12.5\text{dBm} - \frac{10}{1.4}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	−22.5 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	2.85 MHz ≤ *f_offset* < f_offset_{max}	−25 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –25 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-41

Medium range BS operating band unwanted emission limits for 1.4 MHz channel bandwidth, $P_{rated,c} \leq 31$ dBm (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 1.4 MHz	0.05 MHz ≤ *f_offset* < 1.45 MHz	$-12.2\text{dBm} - \frac{10}{1.4}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
1.4 MHz ≤ Δf < 2.8 MHz	1.45 MHz ≤ *f_offset* < 2.85 MHz	–22.2 dBm	100 kHz
2.8 MHz ≤ $\Delta f \leq \Delta f_{max}$	2.85 MHz ≤ *f_offset* < f_offset_{max}	–25 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –25 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-42

Medium range BS operating band unwanted emission limits for 3 MHz channel bandwidth, 31 < $P_{rated,c}$ ≤ 38 dBm (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δ*f*	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δ*f* < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$P_{rated,c} - 47.5\text{dB} - \frac{10}{3}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)$ dB	100 kHz
3 MHz ≤ Δ*f* < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	$P_{rated,c}$ – 57.5 dB	100 kHz
6 MHz ≤ Δ*f* ≤ Δf_{max}	6.05 MHz ≤ *f_offset* < f_offset_{max}	Min($P_{rated,c}$ – 59 dB, –25 dBm)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be Min($P_{rated,c}$ – 59 dB, –25 dBm)/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-43

Medium range BS operating band unwanted emission limits for 3 MHz channel bandwidth, 31 < $P_{rated,c}$ ≤ 38 dBm (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δ*f*	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δ*f* < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$P_{rated,c} - 47.2\text{dB} - \frac{10}{3}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)$ dB	100 kHz
3 MHz ≤ Δ*f* < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	$P_{rated,c}$ – 57.2 dB	100 kHz
6 MHz ≤ Δ*f* ≤ Δf_{max}	6.05 MHz ≤ *f_offset* < f_offset_{max}	Min($P_{rated,c}$ – 59 dB, –25 dBm)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be Min($P_{rated,c}$ – 59 dB, –25 dBm)/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-44

Medium range BS operating band unwanted emission limits for 3 MHz channel bandwidth, $P_{rated,c} \leq 31$ dBm (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-16.5\text{dBm} - \frac{10}{3}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–26.5 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.05 MHz ≤ *f_offset* < f_offset_{max}	–28 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –28 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-45

Medium range BS operating band unwanted emission limits for 3 MHz channel bandwidth, $P_{rated,c} \leq 31$ dBm (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 3)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 3 MHz	0.05 MHz ≤ *f_offset* < 3.05 MHz	$-16.2\text{dBm} - \frac{10}{3}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
3 MHz ≤ Δf < 6 MHz	3.05 MHz ≤ *f_offset* < 6.05 MHz	–26.2 dBm	100 kHz
6 MHz ≤ $\Delta f \leq \Delta f_{max}$	6.05 MHz ≤ *f_offset* < f_offset_{max}	–28 dBm	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –28 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-46

Medium range BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth, 31< $P_{rated,c}$ ≤ 38 dBm (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$P_{rated,c}$ − 51.5 dB − $\frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)$ dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	$P_{rated,c}$ – 58.5 dB	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	Min($P_{rated,c}$ – 60 dB, –25 dBm) (Note 3)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be Min($P_{rated,c}$ – 60 dB, –25 dBm)/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when Δf_{max} < 10 MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-47

Medium range BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth, 31 < $P_{rated,c}$ ≤ 38 dBm (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$P_{rated,c}$ − 51.2 dB − $\frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)$ dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	$P_{rated,c}$ – 58.2 dB	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	Min($P_{rated,c}$ – 60 dB, –25 dBm) (Note 3)	100 kHz

Notes to Table A1-47:

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be Min($P_{rated,c}$ – 60 dB, –25 dBm)/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-48

Medium range BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth, $P_{rated,c} \leq 31$ dBm (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 4)**	**Measurement bandwidth (Note 2)**
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-20.5\,\text{dBm} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–27.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	–29 dBm (Note 3)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –29 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE 4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the Inter RF Bandwidth gap.

TABLE A1-49

Medium range BS operating band unwanted emission limits for 5, 10, 15 and 20 MHz channel bandwidth, $P_{rated,c} \leq 31$ dBm (E-UTRA bands > 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 4)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-20.2\ \text{dBm} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–27.2 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	–29 dBm (Note 3)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –29 dBm/100 kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 3 – The requirement is not applicable when $\Delta f_{max} < 10$ MHz.

NOTE4 – For BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

2.3.2D Minimum requirements for Local Area and Medium Range BS in Band 46 (Category A and B)

For Local Area and Medium Range BS operating in Band 46, emissions shall not exceed the maximum levels specified in Tables A1-50 and A1-51.

TABLE A1-50

Local Area and Medium Range BS operating band unwanted emission limits in Band 46 for 20 MHz channel bandwidth

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (Note 1)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 1 MHz	0.05 MHz ≤ *f_offset* < 1.05 MHz	$P_{rated,c} - 32.6\text{dB} - 10\left(\frac{f_offset}{MHz} - 0.05\right)dB$	100 kHz
1 MHz ≤ Δf < min(10 MHz, Δf_{max})	1.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	$P_{rated,c} - 42.6\text{dB} - \frac{8}{9}\left(\frac{f_offset}{MHz} - 1.05\right)dB$	100 kHz
10 MHz ≤ Δf < min(20 MHz, Δf_{max})	10.05 MHz ≤ *f_offset* < min(20.05 MHz, f_offset_{max})	$P_{rated,c} - 50.6\text{dB} - \frac{12}{10}\left(\frac{f_offset}{MHz} - 10.05\right)dB$	100 kHz
20 MHz ≤ Δf < min(170 MHz, Δf_{max})	20.05 MHz ≤ *f_offset* < min(170.05 MHz, f_offset_{max})	Max($P_{rated,c}$ - 62.6 dB, -40 dBm)	100 kHz
170 MHz ≤ Δf < min(206 MHz, Δf_{max})	170.05 MHz ≤ *f_offset* < min(206.05 MHz, f_offset_{max})	Max($P_{rated,c}$ - 64.6dB, -40dBm)	100 kHz

TABLE A1-50 (*end*)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (Note 1)	Measurement bandwidth (Note 2)
206 MHz ≤ $\Delta f \le \Delta f_{max}$	206.05 MHz ≤ *f_offset* < *f_offsetmax*	Max($P_{rated,c}$ - 69.6dB, -40dBm)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band, the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \ge 20$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be Max ($P_{rated,c}$ - 62.6dB, −40 dBm)/100kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

TABLE A1-51

Local Area and Medium Range BS operating band unwanted emission limits in Band 46 for 20 MHz channel bandwidth

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Note 1)	Measurement bandwidth (Note 2)
0 MHz ≤ Δf < 0.5 MHz	0.05 MHz ≤ *f_offset* < 0.55 MHz	$P_{rated,c}$ - 27.3dB – $20\left(\frac{f_offset}{MHz} - 0.05\right) dB$	100 kHz
0.5 MHz ≤ Δf < 5 MHz	0.55 MHz ≤ *f_offset* < min(5.05 MHz, f_offset_{max})	$P_{rated,c}$ - 37.3dB – $\frac{16}{9}\left(\frac{f_offset}{MHz} - 0.55\right) dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	$P_{rated,c}$ - 45.3dB – $\frac{12}{5}\left(\frac{f_offset}{MHz} - 5.05\right) dB$	100 kHz
10 MHz ≤ Δf < min(85 MHz, Δf_{max})	10.05 MHz ≤ *f_offset* < min(85.05 MHz, f_offset_{max})	Max($P_{rated,c}$ – 57.3dB, -40 dBm)	100 kHz
85 MHz ≤ Δf < min(103 MHz, Δf_{max})	85.05 MHz ≤ *f_offset* < min(103.05 MHz, f_offset_{max})	Max($P_{rated,c}$ – 59.3dB, -40 dBm)	100 kHz
103 MHz ≤ $\Delta f \le \Delta f_{max}$	103.05 MHz ≤ *f_offset* < f_offset_{max}	Max($P_{rated,c}$ – 64.3dB, -40 dBm)	100 kHz

NOTE 1 – For a BS supporting non-contiguous spectrum operation within any operating band, the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is $\Delta f \ge 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be Max ($P_{rated,c}$ – 57.3dB, −40 dBm)/100kHz.

NOTE 2 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

2.3.2E Minimum requirements for stand-alone NB-IoT Wide Area BS

For stand-alone NB-IoT BS in E-UTRA bands ≤ 3GHz, emissions shall not exceed the maximum levels specified in Table A1-52.

TABLE A1-52

Stand-alone NB-IoT BS operating band unwanted emission limits (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2, 3, 4)	Measurement bandwidth (Note 8)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(6.5dBm - 60 \cdot \left(\frac{f_{offset}}{MHz} - 0.015 \right) dB + XdB, -12.5dBm)$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$Max(3.5dBm - 160 \cdot \left(\frac{f_{offset}}{MHz} - 0.065 \right) dB + XdB, -12.5dBm)$	30 kHz
0.15 MHz ≤ Δf < 0.2 MHz	0.165 MHz ≤ *f_offset* < 0.215 MHz	−12.5 dBm	30 kHz
0.2 MHz ≤ Δf < 1 MHz	0.215 MHz ≤ *f_offset* < 1.015 MHz	$-12.5dBm - 15 \cdot \left(\frac{f_offset}{MHz} - 0.215 \right) dB$	30 kHz
(Note 6)	1.015 MHz ≤ *f_offset* < 1.5 MHz	−24.5 dBm	30 kHz
1 MHz ≤ Δf ≤ min(Δf_{max}, 10 MHz)	1.5 MHz ≤ *f_offset* < min(*f_offset*$_{max}$, 10.5 MHz)	−11.5 dBm	1 MHz
10 MHz ≤ Δf ≤ Δf_{max}	10.5 MHz ≤ *f_offset* < *f_offset*$_{max}$	−15 dBm (Note 7)	1 MHz

NOTE 1 – The limits in this table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – For a BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 3 – For a BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 4 – In case the carrier adjacent to the RF bandwidth edge is a standalone NB-IoT carrier, the value of X = PNB-IoTcarrier – 43, where PNB-IoTcarrier is the power level of the standalone NB-IoT carrier adjacent to the RF bandwidth edge. In other cases, X = 0.

NOTE 5 – For BS that only support E-UTRA and NB-IoT multi-carrier operation, the requirements in this table do not apply to an E-UTRA BS from Release 8, which is upgraded to support E-UTRA and NB-IoT multi-carrier operation, where the upgrade does not affect existing RF parts of the radio unit related to the requirements in this table. In this case, the requirements in § 2.3.1 and § 2.3.2 shall apply.

NOTE 6 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 7 – The requirement is not applicable when Δf_{max} < 10 MHz.

NOTE 8 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

2.3.2F Minimum requirements for stand-alone NB-IoT Local Area BS

For stand-alone NB-IoT BS in E-UTRA bands ≤ 3 GHz, emissions shall not exceed the maximum levels specified in Table A1-53.

TABLE A1-53

Stand-alone NB-IoT BS operating band unwanted emission limits (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter −3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Minimum requirement (Notes 1, 2, 3, 4)**	**Measurement bandwidth (Note 5)**
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(-12.5dBm - 60.\left(\frac{f_offset}{MHz} - 0.015\right)dB + XdB, -33.5dBm)$	30 kHz
0.05 MHz ≤ Δf < 0.16 MHz	0.065 MHz ≤ *f_offset* < 0.175 MHz	$Max(-15.5dBm - 160.\left(\frac{f_offset}{MHz} - 0.065\right)dB + XdB, -33.5dBm)$	30 kHz
0.16 MHz ≤ Δf < 5 MHz (Note 6)	0.175 MHz ≤ *f_offset* < 5.05 MHz	$-28.5dBm - \frac{7}{5}\left(\frac{f_offset}{MHz} - 0.05\right)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−35.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	−37 dBm (Note 7)	100 kHz

NOTE 1 – The limits in this table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – For a BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 3 – For a BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 4 – In case the carrier adjacent to the RF bandwidth edge is a standalone NB-IoT carrier, the value of X = PNB-IoTcarrier – 24, where PNB-IoTcarrier is the power level of the standalone NB-IoT carrier adjacent to the RF bandwidth edge. In other cases, X = 0.

NOTE 5 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 6 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 7 – The requirement is not applicable when Δf_{max} < 10 MHz.

2.3.2G Minimum requirements for stand-alone NB-IoT Home BS

For stand-alone NB-IoT BS in E-UTRA bands ≤ 3GHz, emissions shall not exceed the maximum levels specified in Table A1-54.

TABLE A1-54

Stand-alone NB-IoT BS operating band unwanted emission limits (E-UTRA bands ≤ 3 GHz)

Frequency offset of measurement filter −3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Minimum requirement (Notes 1, 2)	Measurement bandwidth (Note 3)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(-16.5dBm - 60.\left(\frac{f_offset}{MHz} - 0.015\right)dB + XdB, -37.5dBm)$	30 kHz
0.05 MHz ≤ Δf < 0.16 MHz	0.065 MHz ≤ *f_offset* < 0.175 MHz	$Max(-19.5dBm - 160.\left(\frac{f_offset}{MHz} - 0.065\right)dB + XdB, -37.5dBm)$	30 kHz
0.16 MHz ≤ Δf < 5 MHz (Note 4)	0.175 MHz ≤ *f_offset* < 5.05 MHz	$-32.5dBm - \frac{7}{5}\left(\frac{f_offset}{MHz} - 0.05\right)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−39.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	−41 dBm (Note 5)	100 kHz

NOTE 1 – The limits in this Table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – In case the carrier adjacent to the RF bandwidth edge is a standalone NB-IoT carrier, the value of X = PNB-IoTcarrier – 20, where PNB-IoTcarrier is the power level of the standalone NB-IoT carrier adjacent to the RF bandwidth edge. In other cases, X = 0.

NOTE 3 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 4 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 5 – The requirement is not applicable when Δf_{max} < 10 MHz.

2.3.2H Minimum requirements for stand-alone NB-IoT Medium Range BS

For stand-alone NB-IoT BS in E-UTRA bands ≤ 3GHz, emissions shall not exceed the maximum levels specified in Tables A1-55 and A1-56.

TABLE A1-55

Stand-alone NB-IoT BS operating band unwanted emission limits (E-UTRA bands ≤ 3 GHz), BS maximum output power 31 < $P_{rated,c}$ ≤ 38 dBm

Frequency offset of measurement filter −3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Minimum requirement (Notes 1, 2, 3, 4)	Measurement bandwidth (Note 4)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$P_{rated,c}$ - 36.5dB – $60\left(\frac{f_offset}{MHz} - 0.015\right)dB$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$P_{rated,c}$ - 39.5dB – $160\left(\frac{f_offset}{MHz} - 0.065\right)dB$	30 kHz
0.15 MHz ≤ Δf < 0.6 MHz (Note 1)	0.165 MHz ≤ *f_offset* < 0.615 MHz	$P_{rated,c}$ - 56.5dB – $\frac{7}{5}\left(\frac{f_offset}{MHz} - 0.015\right)dB$	30 kHz
0.6 MHz ≤ Δf < 1 MHz	0.615 MHz ≤ *f_offset* < 1.015 MHz	$P_{rated,c}$ - 51.5dB – $15\left(\frac{f_offset}{MHz} - 0.215\right)dB$	30 kHz
(Note 5)	1.015 MHz ≤ *f_offset* < 1.5 MHz	$P_{rated,c}$ – 63.5 dB	30 kHz
1 MHz ≤ Δf ≤ 2.8 MHz	1.5 MHz ≤ *f_offset* < 3.3 MHz	$P_{rated,c}$ – 50.5 dB	1 MHz
2.8 MHz ≤ Δf ≤ 5 MHz	3.3 MHz ≤ *f_offset* < 5.5 MHz	min($P_{rated,c}$ – 50.5 dB, –13.5 dBm)	1 MHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.5 MHz ≤ *f_offset* < min(10.5 MHz, f_offset_{max})	$P_{rated,c}$ – 54.5 dB	1 MHz
10 MHz ≤ Δf ≤ Δf_{max}	10.5 MHz ≤ *f_offset* < f_offset_{max}	$P_{rated,c}$ −56 dB (Note 6)	1 MHz

NOTE 1 – The limits in this Table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – For a BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 3 – For a BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 4 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 5 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 6 – The requirement is not applicable when Δf_{max} < 10 MHz.

TABLE A1-56

Stand-alone NB-IoT BS operating band unwanted emission limits (E-UTRA bands ≤ 3 GHz), BS maximum output power $P_{rated,c}$ ≤ 31 dBm

Frequency offset of measurement filter −3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Minimum requirement (Notes 1, 2, 3, 4)	Measurement bandwidth (Note 5)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(-5.5dBm - 60.\left(\frac{f_offset}{MHz} - 0.015\right)dB + XdB, -25.5dBm)$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$Max(-8.5dBm - 160.\left(\frac{f_offset}{MHz} - 0.065\right)dB + XdB, -25.5dBm)$	30 kHz
0.15 MHz ≤ Δf < 0.6 MHz (Note 1)	0.165 MHz ≤ *f_offset* < 0.615 MHz	$-25.5dBm - \frac{7}{5}\left(\frac{f_offset}{MHz} - 0.015\right)dB$	30 kHz
0.6 MHz ≤ Δf < 1 MHz	0.615 MHz ≤ *f_offset* < 1.015 MHz	$-20.5dBm - 15 \cdot \left(\frac{f_offset}{MHz} - 0.215\right)dB$	30 kHz
(Note 6)	1.015 MHz ≤ *f_offset* < 1.5 MHz	−32.5 dBm	30 kHz
1 MHz ≤ Δf ≤ 5 MHz	1.5 MHz ≤ *f_offset* < 5.5 MHz	−19.5 dBm	1 MHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.5 MHz ≤ *f_offset* < min(10.5 MHz, f_offset_{max})	−23.5 dBm	1 MHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	−25 dBm (Note 7)	1 MHz

NOTE 1 – The limits in this Table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – For a BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 3 – For a BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 4 – In case the carrier adjacent to the RF bandwidth edge is a standalone NB-IoT carrier, the value of X = PNB-IoTcarrier – 31, where PNB-IoTcarrier is the power level of the standalone NB-IoT carrier adjacent to the RF bandwidth edge. In other cases, X = 0.

NOTE 5 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 6 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 7 – The requirement is not applicable when Δf_{max} < 10 MHz.

2.3.3 Additional requirements

In certain regions the following requirement may apply. For E-UTRA, E-UTRA with NB-IoT and NB-IoT BS operating in Bands 5, 26, 27 or 28, emissions shall not exceed the maximum levels specified in Table A1-57.

TABLE A1-57

Additional operating band unwanted emission limits for E-UTRA bands < 1 GHz

Channel bandwidth	Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
200 kHz	0 MHz ≤ Δf < 1 MHz	0.005 MHz ≤ *f_offset* < 0.995 MHz	−6 dBm	10 kHz
1.4 MHz	0 MHz ≤ Δf < 1 MHz	0.005 MHz ≤ *f_offset* < 0.995 MHz	–14 dBm	10 kHz
3 MHz	0 MHz ≤ Δf < 1 MHz	0.015 MHz ≤ *f_offset* < 0.985 MHz	–13 dBm	30 kHz
5 MHz	0 MHz ≤ Δf < 1 MHz	0.015 MHz ≤ *f_offset* < 0.985 MHz	–15 dBm	30 kHz
10 MHz	0 MHz ≤ Δf < 1 MHz	0.05 MHz ≤ *f_offset* < 0.95 MHz	–13 dBm	100 kHz
15 MHz	0 MHz ≤ Δf < 1 MHz	0.05 MHz ≤ *f_offset* < 0.95 MHz	–13 dBm	100 kHz
20 MHz	0 MHz ≤ Δf < 1 MHz	0.05 MHz ≤ *f_offset* < 0.95 MHz	–13 dBm	100 kHz
All	1 MHz ≤ Δf < Δf_{max}	1.05 MHz ≤ *f_offset* < *f_offset*$_{max}$	–13 dBm	100 kHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

In certain regions the following requirement may apply. For E-UTRA E-UTRA with NB-IoT and NB-IoT BS operating in Bands 2, 4, 10, 23, 25, 30, 35, 36, 41, 66 and 70, emissions shall not exceed the maximum levels specified in Table A1-58.

TABLE A1-58

Additional operating band unwanted emission limits for E-UTRA bands > 1 GHz

Channel bandwidth	Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
200 kHz	0 MHz ≤ Δf < 1 MHz	0.005 MHz ≤ *f_offset* < 0.995 MHz	−6 dBm	10 kHz
1.4 MHz	0 MHz ≤ Δf < 1 MHz	0.005 MHz ≤ *f_offset* < 0.995 MHz	–14 dBm	10 kHz
3 MHz	0 MHz ≤ Δf < 1 MHz	0.015 MHz ≤ *f_offset* < 0.985 MHz	–13 dBm	30 kHz
5 MHz	0 MHz ≤ Δf < 1 MHz	0.015 MHz ≤ *f_offset* < 0.985 MHz	–15 dBm	30 kHz
10 MHz	0 MHz ≤ Δf < 1 MHz	0.05 MHz ≤ *f_offset* < 0.95 MHz	–13 dBm	100 kHz
15 MHz	0 MHz ≤ Δf < 1 MHz	0.05 MHz ≤ *f_offset* < 0.95 MHz	–15 dBm	100 kHz
20 MHz	0 MHz ≤ Δf < 1 MHz	0.05 MHz ≤ *f_offset* < 0.95 MHz	–16 dBm	100 kHz
All	1 MHz ≤ Δf < Δf_{max}	1.5 MHz ≤ *f_offset* < *f_offset*$_{max}$	–13 dBm	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

In certain regions the following requirement may apply. For E-UTRA, E-UTRA with NB-IoT and NB-IoT BS operating in Bands 12, 13, 14, 17, 29, 71 and 85, emissions shall not exceed the maximum levels specified in Table A1-59.

TABLE A1-59

Additional operating band unwanted emission limits for E-UTRA (bands 12, 13, 14, 17, 29, 71 and 85)

Channel bandwidth	Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement	Measurement bandwidth (Note 1)
All	0 MHz ≤ Δf < 100 kHz	0.015 MHz ≤ *f_offset* < 0.085 MHz	–13 dBm	30 kHz
All	100 kHz ≤ Δf < Δf_{max}	150 kHz ≤ *f_offset* < *f_offset*$_{max}$	–13 dBm	100 kHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

In certain regions, the following requirements may apply to an E-UTRA TDD BS operating in the same geographic area and in the same operating band as another E-UTRA TDD system without synchronization. For this case the emissions shall not exceed −52 dBm/MHz in each supported downlink operating band except in:

– The frequency range from 10 MHz below the lower channel edge to the frequency 10 MHz above the upper channel edge of each supported band.

In certain regions the following requirement may apply for protection of DTT. For E-UTRA BS operating in Band 20, the level of emissions in the band 470-790 MHz, measured in an 8 MHz filter bandwidth on centre frequencies F_{filter} according to Table A1-60, shall not exceed the maximum emission level $P_{EM,N}$ declared by the manufacturer. This requirement applies in the frequency range 470-790 MHz even though part of the range falls in the spurious domain.

TABLE A1-60

Declared emissions levels for protection of DTT

Filter centre frequency, F_{filter}	Measurement bandwidth	Declared emission level (dBm)
F_{filter} = 8*N + 306 (MHz); 21 ≤ N ≤ 60	8 MHz	$P_{EM,N}$

NOTE – The regional requirement is defined in terms of effective isotropic radiated power (e.i.r.p.), which is dependent on both the BS emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The requirement defined above provides the characteristics of the basestation needed to verify compliance with the regional requirement.

In regions where Federal Communication Commission (FCC) regulation applies, requirements for protection of GPS according to FCC Order DA 20-48 applies for operation in Band 24. The following normative requirement covers the base station, to be used together with other information about the site installation to verify compliance with the requirement in FCC Order DA 20-48. The requirement applies to BS operating in Band 24 to ensure that appropriate interference protection is provided to the 1 541-1 650 MHz band. This requirement applies to the frequency range 1 541-1 650 MHz, even though part of this range falls within the spurious domain.

The level of emissions in the 1 541-1 650 MHz band, measured in measurement bandwidth according to Table A1-61 shall not exceed the maximum emission levels $P_{EM,B24,a}$, $P_{EM,B24,b}$, $P_{EM,B24,c}$, $P_{EM,B24,d}$, $P_{EM,B24,e}$ and $P_{EM,B24,f}$ declared by the manufacturer.

TABLE A1-61

Declared emissions levels for protection of the 1 559-1 610 MHz band

Operating band	**Frequency range**	**Declared emission level (dBW) (Measurement bandwidth = 1 MHz)**	**Declared emission level (dBW) of discrete emissions of less than 700 Hz bandwidth** (Measurement bandwidth = 1 kHz)	**Declared emission level (dBW) of discrete emissions of less than 2 kHz bandwidth** (Measurement bandwidth = 1 kHz)
24	1 541-1 559 MHz	$P_{EM,B24,a}$		$P_{EM,B24,f}$
24	1 559-1 610 MHz	$P_{EM,B24,b}$	$P_{EM,B24,d}$	
24	1 610-1 650 MHz	$P_{EM,B24,c}$		

NOTE – The regional requirement in FCC Order DA 20-48 is defined in terms of e.i.r.p., which is dependent on both the BS emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The e.i.r.p. level is calculated using: $P_{e.i.r.p.} = P_E + G_{ant}$ where P_E denotes the BS unwanted emission level at the antenna connector, G_{ant} equals the BS antenna gain minus feeder loss. The requirement defined above provides the characteristics of the base station needed to verify compliance with the regional requirement.

In certain regions, the following requirements may apply to E-UTRA BS operating in Band 32 within 1 452-1 492 MHz, in Band 75 within 1 432-1 517 MHz and in Band 76 within 1 427-1 432 MHz. The level of operating band unwanted emissions, measured on centre frequencies *f_offset* with filter bandwidth, according to Table A1-62, shall neither exceed the maximum emission level $P_{EM,B32,B75,B76a}$, $P_{EM,B32,B75,B76,b}$ nor $P_{EM,B32,B75,B76,c}$ declared by the manufacturer.

For Band 32, this requirement applies in the frequency range 1 452-1 492 MHz when non-Mobile/Fixed Communications Network (MFCN) services are deployed in adjacent frequency ranges, while it applies also within 1 427-1 452 MHz and/or 1 492-1 517 MHz when MFCN services are deployed in such frequency ranges, even though part of the ranges falls in the spurious domain. For Band 75, this requirement applies in the frequency range 1 427-1 517 MHz. For Band 76, this requirement applies in the frequency range 1 432-1 517 MHz even though part of the range falls in the spurious domain.

TABLE A1-62

Declared operating band 32, 75 and 76 unwanted emission within 1 427-1 517 MHz

Frequency offset of measurement filter centre frequency, *f_offset*	Declared emission level (dBm)	Measurement bandwidth
2.5 MHz	$P_{EM,B32,B75,B76,a}$	5 MHz
7.5 MHz	$P_{EM,B32,B75,B76,b}$	5 MHz
12.5 MHz ≤ *f_offset* ≤ $f_offset_{max,B32}$	$P_{EM,B32,B75,B76,c}$	5 MHz

NOTE – For Band 32, when non-MFCN services are deployed in the adjacent bands, f_offset_{max} denotes the frequency difference between the lower channel edge and 1 454.5 MHz, and the frequency difference between the upper channel edge and 1 489.5 MHz for the set channel position. For Band 32, when MFCN services are deployed in the adjacent frequencies, Band 75 and Band 76, f_offset_{max} denotes the frequency difference between the lower channel edge and 1 429.5 MHz, and the frequency difference between the upper channel edge and 1 514.5 MHz for the set channel position.

In certain regions, the following requirement may apply to E-UTRA BS operating in Band 32 within 1 452-1 492 MHz for the protection of non-MFCNservices in spectrum adjacent to the frequency range 1 452-1 492 MHz. The level of emissions, measured on centre frequencies F_{filter} with filter bandwidth according to Table A1-63, shall neither exceed the maximum emission level $P_{EM,B32,d}$ nor $P_{EM,B32,e}$ declared by the manufacturer. This requirement applies in the frequency range 1 429-1 518 MHz even though part of the range falls in the spurious domain.

TABLE A1-63

Operating band 32 declared emission outside 1 452-1 492 MHz

Filter centre frequency, F_{filter}	Declared emission level (dBm)	Measurement bandwidth
1 429.5 MHz ≤ F_{filter} ≤ 1 448.5 MHz	$P_{EM,B32,d}$	1 MHz
F_{filter} = 1 450.5 MHz	$P_{EM,B32,e}$	3 MHz
F_{filter} = 1 493.5 MHz	$P_{EM,B32,e}$	3 MHz
1 495.5 MHz ≤ F_{filter} ≤ 1 517.5 MHz	$P_{EM,B32,d}$	1 MHz

In certain regions, the following requirement may apply to BS operating in Band 50 and Band 75 within 1 492-1 517 MHz and in Band 74 within 1 492-1 518 MHz. The level of emissions, measured on centre frequencies F_{filter} with filter bandwidth according to Table A1-64, shall neither exceed the maximum emission level $P_{EM,B50,B74,B75,a}$ nor $P_{EM,B50,B74,B75,b}$ declared by the manufacturer.

TABLE A1-64

Operating band 50, 74 and 75 declared emission above 1 518 MHz

Filter centre frequency, F_{filter}	Declared emission level (dBm)	Measurement bandwidth
518.5 MHz ≤ F_{filter} ≤ 1 519.5 MHz	$P_{EM,B50,B74,B75,a}$	1 MHz
1 520.5 MHz ≤ F_{filter} ≤ 1 558.5 MHz	$P_{EM,B50,B74,B75,b}$	1 MHz

In certain regions, the following requirement may apply to E-UTRA BS operating in Band 50 and Band 75 within 1 432-1 452 MHz, and in Band 51 and Band 76. Emissions shall not exceed the maximum levels specified in Table A1-65.

TABLE A1-65

Additional operating band unwanted emission limits for BS operating in Band 50 and 75 within 1 432-1 452 MHz, and in Band 51 and 76

Filter centre frequency, F_{filter}	Maximum Level (dBm)	Measurement Bandwidth
F_{filter} = 1 413.5 MHz	−42	27 MHz

In certain regions the following requirement may apply to E-UTRA BS operating in Band 45. Emissions shall not exceed the maximum levels specified in Table A1-66.

TABLE A1-66

Emissions limits for protection of adjacent band services

Operating Band	Filter centre frequency, F_{filter}	Maximum Level (dBm)	Measurement Bandwidth
45	F_{filter} = 1 467.5 MHz	−20	1 MHz
	F_{filter} = 1 468.5 MHz	−23	1 MHz
	F_{filter} = 1 469.5 MHz	–26	1 MHz
	F_{filter} = 1 470.5 MHz	–33	1 MHz
	F_{filter} = 1 471.5 MHz	–40	1 MHz
	1 472.5 MHz ≤ F_{filter} ≤ 1 491.5 MHz	–47	1 MHz

In addition for Band 46 operation, the BS may have to comply with the applicable operating band unwanted emission limits established regionally, when deployed in regions where those limits apply and under the conditions declared by the manufacturer. The regional requirements may be in the form of conducted power, power spectral density, e.i.r.p. and other types of limits.

The following requirement may apply to E-UTRA BS operating in Band 48 and Band 49 in certain regions. Emissions shall not exceed the maximum levels specified in Table A1-67.

TABLE A1-67

Additional operating band unwanted emission limits for Band 48 and Band 49

Channel bandwidth	Frequency offset of measurement filter −3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Minimum requirement	Measurement bandwidth (Note 1)
All	0 MHz ≤ Δf < 10 MHz	0.5 MHz ≤ *f_offset* < 9.5 MHz	–13 dBm	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The following requirement may apply to E-UTRA BS operating in Band 53 in certain regions. Emissions shall not exceed the maximum levels specified in Table A1-68.

TABLE A1-68

Additional operating band unwanted emission limits for Band 53

Channel bandwidth (MHz)	Frequency range (MHz)	Frequency offset of measurement filter −3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Minimum require-ment	Measure ment bandwidth (Note 1)
1.4, 3, 5	2 400-2 477.5	6 MHz ≤ Δf < 83.5 MHz	6.5 MHz ≤ *f_offset* < 83 MHz	–25 dBm	1 MHz
10	2 400-2 473.5	10 MHz ≤ Δf < 83.5 MHz	10.5 MHz ≤ *f_offset* < 83 MHz	–25 dBm	1 MHz
1.4, 3, 5	2 477.5-2 478.5	5 MHz ≤ Δf < 6 MHz	5.5 MHz	–13 dBm	1 MHz
10	2 473.5-2 478.5	5 MHz ≤ Δf < 10 MHz	5.5 MHz ≤ *f_offset* < 9.5 MHz	–13 dBm	1 MHz
All	2 478.5-2 483.5	0 MHz ≤ Δf < 5 MHz	0.5 MHz ≤ *f_offset* < 4.5 MHz	–10 dBm	1 MHz
1.4, 3, 5	2 495-2 501	0 MHz ≤ Δf < 6 MHz	0.5 MHz ≤ *f_offset* < 5.5 MHz	–13 dBm	1 MHz
10	2 495-2 505	0 MHz ≤ Δf < 10 MHz	0.5 MHz ≤ *f_offset* < 9.5 MHz	–13 dBm	1 MHz
1.4, 3, 5	2 501-2 690	6 MHz ≤ Δf < 195 MHz	6.5 MHz ≤ *f_offset* < 194.5 MHz	–25 dBm	1 MHz
10	2 505-2 690	10 MHz ≤ Δf < 195 MHz	10.5 MHz ≤ *f_offset* < 194.5 MHz	–25 dBm	1 MHz

NOTE 1 – As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth can be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

The following Note is common to all Tables in § 2.3:

NOTE – If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero.

2.4 Adjacent channel leakage ratio (ACLR)

The ACLR is defined with a square filter of bandwidth equal to the transmission bandwidth configuration of the transmitted signal (BW_{Config}) centred on the assigned channel frequency and a filter centred on the adjacent channel frequency according to the Tables below.

For category A wide area BS, either the ACLR limits in the Tables below or the absolute limit of −13 dBm/MHz shall apply, whichever is less stringent.

For category B wide area BS, either the ACLR limits in The tables below or the absolute limit of −15 dBm/MHz shall apply, whichever is less stringent.

For medium range BS, either the ACLR limits in the Tables below or the absolute limit of −25 dBm/MHz shall apply, whichever is less stringent.

For local area BS, either the ACLR limits in the Tables below or the absolute limit of −32 dBm/MHz shall apply, whichever is less stringent.

For home BS, either the ACLR limits in the Tables below or the absolute limit of −50 dBm/MHz apply, whichever is less stringent.

For operation in paired spectrum, the ACLR shall be higher than the value specified in Table A1-70.

The ACLR requirements in Tables A1-69 to A1-74 (except Table A1-72) apply to BS that supports E-UTRA or E-UTRA with NB-IoT (in band and/or guard band), in any operating band, except for Band 46. The ACLR requirements for Band 46 are in Tables A1-71 and A1-75. The ACLR requirements in Table A1-72 apply to BS that supports standalone NB-IoT.

TABLE A1-69

Base station ACLR in paired spectrum

Channel bandwidth of E-UTRA lowest (highest) carrier transmitted $BW_{Channel}$ (MHz)	**BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted**	**Assumed adjacent channel carrier (informative)**	**Filter on the adjacent channel frequency and corresponding filter bandwidth**	**ACLR limit (dB)**
1.4, 3.0, 5, 10, 15, 20	$BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	44.2
	$2 \times BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	44.2
	$BW_{Channel}$ /2 + 2.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2
	$BW_{Channel}$ /2 + 7.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2

NOTE 1 – $BW_{Channel}$ and BW_{Config} are the channel bandwidth and transmission bandwidth configuration of the E-UTRA lowest (highest) carrier transmitted on the assigned channel frequency.

NOTE 2 – The root raised cosine (RRC) filter shall be equivalent to the transmit pulse shape filter defined in 3GPP TS 25.104, with a chip rate as defined in this Table.

For operation in unpaired spectrum, the ACLR shall be higher than the value specified in Table A1-70.

TABLE A1-70

Base station ACLR in unpaired spectrum with synchronized operation

Channel bandwidth of E-UTRA lowest (highest) carrier transmitted $BW_{Channel}$ (MHz)	BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted	Assumed adjacent channel carrier	Filter on the adjacent channel frequency and corresponding filter bandwidth	ACLR limit (dB)
1.4, 3.0	$BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	44.2
	$2 \times BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	44.2
	$BW_{Channel}$ /2 + 0.8 MHz	1.28 Mcps UTRA	RRC (1.28 Mcps)	44.2
	$BW_{Channel}$ /2 + 2.4 MHz	1.28 Mcps UTRA	RRC (1.28 Mcps)	44.2
5, 10, 15, 20	$BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	44.2
	$2 \times BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	44.2
	$BW_{Channel}$ /2 + 0.8 MHz	1.28 Mcps UTRA	RRC (1.28 Mcps)	44.2
	$BW_{Channel}$ /2 + 2.4 MHz	1.28 Mcps UTRA	RRC (1.28 Mcps)	44.2
	$BW_{Channel}$ /2 + 2.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2
	$BW_{Channel}$ /2 + 7.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2
	$BW_{Channel}$ /2 + 5 MHz	7.68 Mcps UTRA	RRC (7.68 Mcps)	44.2
	$BW_{Channel}$ /2 + 15 MHz	7.68 Mcps UTRA	RRC (7.68 Mcps)	44.2

NOTE 1 – $BW_{Channel}$ and BW_{Config} are the channel bandwidth and transmission bandwidth configuration of the E-UTRA lowest (highest) carrier transmitted on the assigned channel frequency.

NOTE 2 – The RRC filter shall be equivalent to the transmit pulse shape filter defined in 3GPP TS 25.104, with a chip rate as defined in this Table.

For operation in Band 46, the ACLR shall be higher than the value specified in Table A1-71.

TABLE A1-71

Base Station ACLR in Band 46

Channel bandwidth of E-UTRA lowest/highest carrier transmitted $BW_{Channel}$ [MHz]	BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	ACLR limit (dB)
10	$BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	34.2
	$2 \times BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	39.2
20	$BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	35
	$2 \times BW_{Channel}$	E-UTRA of same BW	Square (BW_{Config})	40

NOTE 1 – $BW_{Channel}$ and BW_{Config} are the channel bandwidth and transmission bandwidth configuration of the E-UTRA lowest/highest carrier transmitted on the assigned channel frequency.

For stand-alone NB-IoT operation in paired spectrum, the ACLR shall be higher than the value specified in Table A1-72.

TABLE A1-72

Base Station ACLR for stand-alone NB-IoT operation in paired spectrum

Channel bandwidth of NB-IoT lowest/highest carrier transmitted $BW_{Channel}$ [kHz]	BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	ACLR limit (dB)
200	300 kHz	Stand-alone NB-IoT	Square (180 kHz)	39.2
	500 kHz	Stand-alone NB-IoT	Square (180 kHz)	49.2

For operation in non-contiguous paired spectrum or multiple bands, the ACLR shall be higher than the value specified in Table A1-73.

TABLE A1-73

Base station ACLR in non-contiguous paired spectrum or multiple bands

Sub-block or Inter RF Bandwidth gap size (W_{gap}) where the limit applies	BS adjacent channel centre frequency offset below or above the sub-block edge or the RF bandwidth edge (inside the gap)	Assumed adjacent channel carrier	Filter on the adjacent channel frequency and corresponding filter bandwidth	ACLR limit (dB)
$W_{gap} \geq 15$ MHz	2.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2
$W_{gap} \geq 20$ MHz	7.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2

NOTE – The RRC filter shall be equivalent to the transmit pulse shape filter defined in 3GPP TS 25.104, with a chip rate as defined in this table.

For operation in non-contiguous unpaired spectrum or multiple bands, the ACLR shall be higher than the value specified in Table A1-74.

TABLE A1-74

Base Station ACLR in non-contiguous unpaired spectrum or multiple bands

Sub-block or Inter RF Bandwidth gap size (W_{gap}) where the limit applies	BS adjacent channel centre frequency offset below or above the sub-block edge or the RF bandwidth edge (inside the gap)	Assumed adjacent channel carrier	Filter on the adjacent channel frequency and corresponding filter bandwidth	ACLR limit (dB)
$W_{gap} \geq 15$ MHz	2.5 MHz	5 MHz E-UTRA	Square (BW_{Config})	44.2
$W_{gap} \geq 20$ MHz	7.5 MHz	5 MHz E-UTRA	Square (BW_{Config})	44.2

For operation in non-contiguous spectrum in Band 46, the ACLR shall be higher than the value specified in Table A1-75.

TABLE A1-75

Base Station ACLR in non-contiguous spectrum in Band 46

Sub-block gap size (W_{gap}) where the limit applies	BS adjacent channel centre frequency offset below or above the sub-block edge (inside the gap)	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	ACLR limit (dB)
$W_{gap} \geq 60$ MHz	10 MHz	20 MHz E-UTRA	Square (BW_{Config})	35
$W_{gap} \geq 80$ MHz	30 MHz	20 MHz E-UTRA	Square (BW_{Config})	40

2.5 Cumulative adjacent channel leakage ratio (CACLR)

The following test requirement applies for the sub-block or Inter RF Bandwidth gap sizes listed in Tables A1-76, A1-77 and A1-78:

– Inside a sub-block gap within an operating band for a BS operating in non-contiguous spectrum.

– Inside an Inter RF Bandwidth gap for a BS operating in multiple bands, where multiple bands are mapped on the same antenna connector.

The cumulative adjacent channel leakage power ratio (CACLR) in a sub-block gap or Inter RF Bandwidth gap is the ratio of:

a) the sum of the filtered mean power centred on the assigned channel frequencies for the two carriers adjacent to each side of the sub-block gap or Inter RF Bandwidth gap, and

b) the filtered mean power centred on a frequency channel adjacent to one of the respective sub-block edges or Base Station RF Bandwidth edges.

The assumed filter for the adjacent channel frequency is defined in Table A1-76 and A1-77. Filters on the assigned channels are defined in Table A1-79.

For Wide Area category A BS, either the CACLR limits in Tables A1-76 and A1-77 or the absolute limit of −13 dBm/MHz shall apply, whichever is less stringent.

For Wide Area category B BS, either the CACLR limits in Tables A1-76 and A1-77 or the absolute limit of −15 dBm/MHz shall apply, whichever is less stringent.

For Medium Range BS, either the CACLR limits in Table A1-76 and A1-77 or the absolute limit of −25 dBm/MHz shall apply, whichever is less stringent.

For Local Area BS, either the CACLR limits in Table A1-76 and A1-77 or the absolute limit of −32 dBm/MHz shall apply, whichever is less stringent.

The ACLR requirements in Tables A1-76 and A1-77 apply to BS that supports E-UTRA, in any operating band, except for Band 46. The ACLR requirements for Band 46 are in Table A1-78.

For operation in non-contiguous spectrum or multiple bands, the CACLR for E-UTRA carriers located on either side of the sub-block gap or Inter RF Bandwidth gap shall be higher than the value specified in Table A1-76 or A1-77.

TABLE A1-76

Base station CACLR in non-contiguous paired spectrum or multiple bands

Sub-block or Inter RF Bandwidth gap size (W_{gap}) where the limit applies	BS adjacent channel centre frequency offset below or above the sub-block edge or the Base Station RF Bandwidth edge (inside the gap)	Assumed adjacent channel carrier	Filter on the adjacent channel frequency and corresponding filter bandwidth	CACLR limit (dB)
5 MHz ≤ W_{gap} < 15 MHz	2.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2
10 MHz < W_{gap} < 20 MHz	7.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2

NOTE – The RRC filter shall be equivalent to the transmit pulse shape filter defined in 3GPP TS 25.104, with a chip rate as defined in this Table.

TABLE A1-77

Base station CACLR in non-contiguous unpaired spectrum or multiple bands

Sub-block or Inter RF Bandwidth gap size (W_{gap}) where the limit applies	BS adjacent channel centre frequency offset below or above the sub-block edge or the Base Station RF Bandwidth edge (inside the gap)	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	CACLR limit (dB)
5 MHz ≤ W_{gap} < 15 MHz	2.5 MHz	5 MHz E-UTRA carrier	Square (BW_{Config})	44.2
10 MHz < W_{gap} < 20 MHz	7.5 MHz	5 MHz E-UTRA carrier	Square (BW_{Config})	44.2

For operation in non-contiguous spectrum in Band 46, the CACLR for E-UTRA carriers located on either side of the sub-block gap shall be higher than the value specified in Table A1-78.

TABLE A1-78

Base station CACLR in non-contiguous spectrum in Band 46

Sub-block gap size (W_{gap}) where the limit applies	BS adjacent channel centre frequency offset below or above the sub-block edge (inside the gap)	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	CACLR limit (dB)
20 MHz ≤ W_{gap} < 60 MHz	10 MHz	20 MHz E-UTRA carrier	Square (BW_{Config})	34.2 dB
40 MHz < W_{gap} < 80 MHz	30 MHz	20 MHz E-UTRA carrier	Square (BW_{Config})	34.2 dB

TABLE A1-79

Filter parameters for the assigned channel

RAT of the carrier adjacent to the sub-block or Inter RF Bandwidth gap	Filter on the assigned channel frequency and corresponding filter bandwidth
E-UTRA	E-UTRA of same BW

2.6 Transmitter spurious emissions

Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude OoB emissions. This is measured at the base station antenna connector.

The transmitter spurious emission limits apply from 9 kHz to 12.75 GHz, excluding the frequency range from 10 MHz below the lowest frequency of the downlink operating band up to 10 MHz above the highest frequency of the downlink operating band (see Table A1-1). For BS capable of multi-band operation where multiple bands are mapped on the same antenna connector, this exclusion applies for each supported operating band. For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the single-band requirements apply and the multi-band exclusions and provisions are not applicable.

Exceptions are the requirements in Table A1-84, Table A1-85, Table A1-86, and specifically stated exceptions in Table A1-83 that apply also closer than 10 MHz from the downlink operating band. For some operating bands the upper frequency limit is higher than 12.75 GHz.

The requirements shall apply to BS that supports E-UTRA or E-UTRA with NB-IoT in-band/guard band operation or NB-IoT standalone operation.

The requirements shall apply whatever the type of transmitter considered (single carrier or multi-carrier) and for all transmission modes foreseen by the manufacturer's specification.

2.6.1 Spurious emissions (category A)

The power of any spurious emission shall not exceed the limits in Table A1-80.

TABLE A1-80

BS spurious emission limits, category A

Frequency range	Maximum level	Measurement bandwidth	Note
9 kHz – 150 kHz	–13 dBm	1 kHz	Note 1
150 kHz – 30 MHz		10 kHz	Note 1
30 MHz – 1 GHz		100 kHz	Note 1
1 GHz – 12.75 GHz		1 MHz	Note 2
12.75 GHz – 5th harmonic of the upper frequency edge of the DL operating band in GHz		1 MHz	Notes 2, 3
12.75 GHz – 26 GHz		1 MHz	Notes 2, 4

Notes to Table A1-80:

NOTE 1 – Bandwidth as in Recommendation ITU-R SM.329, § 4.1.

NOTE 2 – Bandwidth as in Recommendation ITU-R SM.329, § 4.1. Upper frequency as in Recommendation ITU-R SM.329, § 2.5 Table 1.

NOTE 3 – Applies only for Bands 22, 42, 43, 48 and 49.

NOTE 4 – Applies only for Band 46.

2.6.2 Spurious emissions (category B)

The power of any spurious emission shall not exceed the limits in Table A1-81.

TABLE A1-81

BS spurious emissions limits, category B

Frequency range	Maximum level (dBm)	Measurement bandwidth	Note
9 kHz ↔ 150 kHz	–36	1 kHz	Note 1
150 kHz ↔ 30 MHz	–36	10 kHz	Note 1
30 MHz ↔ 1 GHz	–36	100 kHz	Note 1
1 GHz ↔ 12.75 GHz	–30	1 MHz	Note 2
12.75 GHz ↔ 5th harmonic of the upper frequency edge of the DL operating band in GHz	–30	1 MHz	Notes 2, 3
12.75 GHz ↔ 26 GHz	–30	1 MHz	Notes 2, 4

NOTE 1 – Bandwidth as in Recommendation ITU-R SM.329, § 4.1.

NOTE 2 – Bandwidth as in Recommendation ITU-R SM.329, § 4.1. Upper frequency as in Recommendation ITU-R SM.329, § 2.5 Table 1.

NOTE 3 – Applies only for Bands 22, 42, 43, 48 and 49.

NOTE 4 – Applies only for Band 46.

2.6.3 Protection of the BS receiver of own or different BS

This requirement shall be applied for E-UTRA FDD operation in paired operating bands in order to prevent the receivers of the BSs being desensitized by emissions from a BS transmitter. It is measured at the transmit antenna port for any type of BS which has common or separate Tx/Rx antenna ports.

The power of any spurious emission shall not exceed the limits in Table A1-82.

TABLE A1-82

BS spurious emissions limits for protection of the BS receiver

	Frequency range	Maximum level (dBm)	Measurement bandwidth	Note
Wide Area BS	$F_{UL_low} – F_{UL_high}$	–96	100 kHz	–
Medium Range BS	$F_{UL_low} – F_{UL_high}$	–91	100 kHz	–
Local Area BS	$F_{UL_low} – F_{UL_high}$	–88	100 kHz	–
Home BS	$F_{UL_low} – F_{UL_high}$	–88	100 kHz	–

NOTE 1 – For E-UTRA Band 28 BS operating in regions where Band 28 is only partially allocated for E-UTRA operations, this requirement only applies in the UL frequency range of the partial allocation.

2.6.4 Co-existence with other systems in the same geographical area

These requirements may be applied for the protection of system operating in frequency ranges other than the E-UTRA or NB-IoTBS operating band. The limits may apply as an optional protection of such systems that are deployed in the same geographical area as the E-UTRA BS, or they may be set by local or regional regulation as a mandatory requirement for an E-UTRA operating band. It is in some cases not stated in the present document whether a requirement is mandatory or under what exact circumstances that a limit applies, since this is set by local or regional regulation. An overview of regional requirements in the present document is given in § 4.3.

Some requirements may apply for the protection of specific equipment (UE, MS and/or BS) or equipment operating in specific systems (GSM, CDMA, UTRA, E-UTRA, NR, etc.) as listed below. The power of any spurious emission shall not exceed the limits of Table A1-83 for a BS where requirements for co-existence with the system listed in the first column apply. For BS capable of multi-band operation the exclusions and conditions in the Note column of Table A1-83 apply for each supported operating band. For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the exclusions and conditions in the Note column of Table A1-83 apply for the operating band supported at that antenna connector.

TABLE A1-83

BS spurious emissions limits for E-UTRA BS for co-existence with systems operating in other frequency bands

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
GSM900	921-960 MHz	–57 dBm	100 kHz	This requirement does not apply to E-UTRA BS operating in Band 8.
	876-915 MHz	–61 dBm	100 kHz	For the frequency range 880-915 MHz, this requirement does not apply to E-UTRA BS operating in Band 8.
DCS1800	1 805-1 880 MHz	–47 dBm	100 kHz	This requirement does not apply to E-UTRA BS operating in Band 3.
	1 710-1 785 MHz	–61 dBm	100 kHz	This requirement does not apply to E-UTRA BS operating in Band 3.
PCS1900	1 930-1 990 MHz	–47 dBm	100 kHz	This requirement does not apply to E-UTRA BS operating in frequency Band 2, Band 25, Band 36 or Band 70.
	1 850-1 910 MHz	–61 dBm	100 kHz	This requirement does not apply to E-UTRA BS operating in frequency Band 2 or 25. This requirement does not apply to E-UTRA BS operating in frequency Band 35.
GSM850 or CDMA850	869-894 MHz	–57 dBm	100 kHz	This requirement does not apply to E-UTRA BS operating in frequency Band 5 or 26. This requirement applies to E-UTRA BS operating in Band 27 for the frequency range 879-894 MHz.
	824-849 MHz	–61 dBm	100 kHz	This requirement does not apply to E-UTRA BS operating in frequency Band 5 or 26. For E-UTRA BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band.
UTRA FDD Band I or E-UTRA Band 1 or NR band n1	2 110-2 170 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 1 or 65.
	1 920-1 980 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 1 or 65.
UTRA FDD Band II or E-UTRA Band 2 or NR band n2	1 930-1 990 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 2, 25 or 70.
	1 850-1 910 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 2 or 25.

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
UTRA FDD Band III or E-UTRA Band 3 or NR band n3	1 805-1 880 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 3.
	1 710-1 785 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 3 or 9. For E-UTRA BS operating in Band 9, it applies for 1710 MHz to 1749.9 MHz and 1784.9 MHz to 1785 MHz.
UTRA FDD Band IV or E-UTRA Band 4	2 110-2 155 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 4, 10 or 66.
	1 710-1 755 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 4, 10 or 66.
UTRA FDD Band V or E-UTRA Band 5 or NR band n5	869-894 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 5 or 26. This requirement applies to E-UTRA BS operating in Band 27 for the frequency range 879-894 MHz.
	824-849 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 5 or 26. For E-UTRA BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band.
UTRA FDD Band VI, XIX or E-UTRA Band 6, 18, 19	860-890 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 6, 18, 19.
	815-830 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 18.
	830-845 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 6, 19.
UTRA FDD Band VII or E-UTRA Band 7 or NR band n7	2 620-2 690 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 7.
	2 500-2 570 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 7.

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
UTRA FDD Band VIII or E-UTRA Band 8 or NR band n8	925-960 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 8.
	880-915 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 8.
UTRA FDD Band IX or E-UTRA Band 9	1 844.9-1 879.9 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 3 or 9.
	1 749.9-1 784.9 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 3 or 9.
UTRA FDD Band X or E-UTRA Band 10	2 110-2 170 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 4, 10 or 66
	1 710-1 770 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 10 or 66. For E-UTRA BS operating in Band 4, it applies for 1755 MHz to 1770 MHz.
UTRA FDD Band XI or XXI E-UTRA Band 11 or 21	1 475.9-1 510.9 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 50, 74 or 75
	1 427.9-1 447.9 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11 or 74. This requirement does not apply to BS operating in band 32,50, 51, 75 or 76.
	1 447.9-1 462.9 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 21 or 74. This requirement does not apply to BS operating in band 32, 50 or 75.
UTRA FDD Band XII or E-UTRA Band 12 or NR band n12	729-746 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 12 or 85.
	699-716 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 12 or 85. For E-UTRA BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 6)

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
UTRA FDD Band XIII or E-UTRA Band 13	746-756 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 13.
	777-787 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 13.
UTRA FDD Band XIV or E-UTRA Band 14 or NR Band n14	758-768 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 14.
	788-798 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 14
E-UTRA Band 17	734-746 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in band 17.
	704-716 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 17. For E-UTRA BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 6)
UTRA FDD Band XX or E-UTRA Band 20 or NR band n20	791-821 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 20.
	832-862 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 20 or 28.
UTRA FDD Band XXII or E-UTRA Band 22	3 510-3 590 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 22, 42, 48 or 49.
	3 410-3 490 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 22. This requirement does not apply to E-UTRA BS operating in Band 42.

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
E-UTRA Band 24	1 525-1 559 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 24.
	1 626.5-1 660.5 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 24.
UTRA FDD Band XXV or E-UTRA Band 25 or NR Band n25	1 930-1 995 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 2, 25 or 70.
	1 850-1 915 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 25. For E-UTRA BS operating in Band 2, it applies for 1 910 MHz to 1 915 MHz.
UTRA FDD Band XXVI or E-UTRA Band 26 or NR Band n26	859-894 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in band 5 or 26. This requirement applies to E-UTRA BS operating in Band 27 for the frequency range 879-894 MHz.
	814-849 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 26. For E-UTRA BS operating in Band 5, it applies for 814 MHz to 824 MHz. For E-UTRA BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band.
E-UTRA Band 27	852-869 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 5, 26 or 27.
	807-824 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 27. For E-UTRA BS operating in Band 26, it applies for 807 MHz to 814 MHz. This requirement also applies to E-UTRA BS operating in Band 28, starting 4 MHz above the Band 28 downlink operating band (Note 5).

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
E-UTRA Band 28 or NR Band n28	758-803 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 20, 28, 44, 67 or 68.
	703-748 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 28. This requirement does not apply to E-UTRA BS operating in Band 44. For E-UTRA BS operating in Band 67, it applies for 703 MHz to 736 MHz. For E-UTRA BS operating in Band 68, it applies for 728 MHz to 733 MHz.
E-UTRA Band 29 or NR Band n29	717-728 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 29 or 85.
E-UTRA Band 30 or NR Band n30	2 350- 2 360 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 30 or 40.
	2 305- 2 315 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 30. This requirement does not apply to E-UTRA BS operating in Band 40.
E-UTRA Band 31	462.5- 467.5 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 31, 72 or 73.
	452.5- 457.5 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 31, 72 or 73.
UTRA FDD band XXXII or E-UTRA Band 32	1 452- 1 496 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 50, 74 or 75.
UTRA TDD Band a) or E-UTRA Band 33	1 900- 1 920 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 33.
UTRA TDD Band a) or E-UTRA Band 34 or NR Band n34	2 010- 2 025 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 34.

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
UTRA TDD Band b) or E-UTRA Band 35	1 850-1 910 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 35.
UTRA TDD Band b) or E-UTRA Band 36	1 930-1 990 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 2 and 36.
UTRA TDD Band c) or E-UTRA Band 37	1 910-1 930 MHz	–52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 37. This unpaired band is defined in Recommendation ITU-R M.1036, pending any future deployment.
UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38	2 570-2 620 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 38 or 69.
UTRA TDD Band f) or E-UTRA Band 39 or NR Band n39	1 880-1 920 MHz	–52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 39.
UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40	2 300-2 400 MHz	–52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 30 or 40.
E-UTRA Band 41 or NR Band n41	2 496-2 690 MHz	–52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 41 or 53.
E-UTRA Band 42	3 400-3 600 MHz	–52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 42 or 43.
E-UTRA Band 43	3 600-3 800 MHz	–52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48, 49 or 52.
E-UTRA Band 44	703-803 MHz	–52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 28 or 44
E-UTRA Band 45	1 447-1 467 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 45.
E-UTRA Band 46 or NR Band n46	5 150-5 925 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 46.
E-UTRA Band 47	5 855-5 925 MHz	−52 dBm	1 MHz	

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
E-UTRA Band 48 or NR band n48	3 550-3 700 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48 or 49.
E-UTRA Band 49	3 550-3 700 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48 or 49.
E-UTRA Band 50 or NR band n50	1 432-1 517 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 45, 50, 51, 74, 75 or 76.
E-UTRA Band 51 or NR band n51	1 427-1 432 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 50, 51, 75 or 76.
E-UTRA Band 52	3 300-3 400 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 42 or 52.
E-UTRA Band 53 or NR Band n53	2 483.5-2 495 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 41 or 53.
E-UTRA Band 65 or NR band n65	2 110-2 200 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in band 1 or 65,
	1 920-2 010 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 65. For E-UTRA BS operating in Band 1, it applies for 1 980 MHz to 2 010 MHz.
E-UTRA Band 66 or NR band n66	2 110-2 200 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 4, 10, 23 or 66.
E-UTRA Band 68	753-783 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 28, or 68.
	698-728 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 68. For E-UTRA BS operating in Band 28, it applies between 698 MHz and 703 MHz.
E-UTRA Band 69	2 570-2 620 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 38 or 69.

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
E-UTRA Band 70 or NR band n70	1 995-2 020 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 2, 25 or 70
	1 695-1 710 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 70, since it is already covered by the requirement in § 6.6.4.5.3.
E-UTRA Band 71 or NR band n71	617-652 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 71.
	663-698 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 71.
E-UTRA Band 72	461-466 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 31, 72 or 73.
	451-456 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 72. This requirement does not apply to E-UTRA BS operating in Band 73.
E-UTRA Band 73	460-465 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 31, 72 or 73.
	450-455 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 73.
E-UTRA Band 74 or NR band n74	1 475-1 518 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 50, 74 or 75.
	1 427-1 470 MHz	−49 dBm	1MHz	This requirement does not apply to E-UTRA BS operating in Band 74. This requirement does not apply to BS operating in Band 32, 45, 50, 51, 75 or 76.
E-UTRA Band 75 or NR band n75	1 432-1 517 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 45, 50, 51, 74, 75 or 76.
E-UTRA Band 76 or NR band n76	1 427-1 432 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 50, 51, 75 or 76.
NR band n77	3 300-4 200 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48, 49 or 52.

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
NR Band n78	3 300-3 800 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48, 49 or 52.
NR Band n79	4.4-5.0 GHz	−52 dBm	1 MHz	
NR Band n80	1 710-1 785 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 3. For E-UTRA BS operating in Band 9, it applies for 1 710 MHz to 1 749.9 MHz and 1 784.9 MHz to 1 785 MHz.
NR Band n81	880-915 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Nand 8, since it is already covered by the requirement in § 6.6.4.2.
NR Band n82	832-862 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 20, since it is already covered by the requirement in § 6.6.4.2.
NR Band n83	703-748 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 28 or 44. For E-UTRA BS operating in Band 67, it applies for 703 MHz to 736 MHz. For E-UTRA BS operating in Band 68, it applies for 728 MHz to 733 MHz.
NR Band n84	1 920-1 980 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 1 or 65.

TABLE A1-83 (*continued*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
E-UTRA Band 85	728-746 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 12, 29 or 85.
	698-716 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 85. For E-UTRA BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 6).
NR Band n86	1 710-1 780 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 66. For E-UTRA BS operating in Band 4, it applies for 1 755 MHz to 1 780 MHz. For E-UTRA BS operating in Band 10, it applies for 1 770 MHz to 1 780 MHz.
E-UTRA Band 87	420-425 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 87 or 88.
	410-415 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 87.
E-UTRA Band 88	422-427 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 87 or 88.
	412-417 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 87 or 88.
NR Band n89	824-849 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 5 or 26. For E-UTRA BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band.
NR Band n91	1 427-1 432 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 50, 51, 75 or 76.
	832-862 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 20.

TABLE A1-83 (*end*)

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
NR Band n92	1 432-1 517 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 45, 50, 51, 74, 75 or 76.
	832-862 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 20.
NR Band n93	1 427-1 432 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 50, 51, 75 or 76.
	880-915 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 8.
NR Band n94	1 432-1 517 MHz	−52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 45, 50, 51, 74, 75 or 76.
	880-915 MHz	−49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 8.
NR Band n95	2 010-2 025 MHz	−52 dBm	1 MHz	
NR Band n96	5 925-7 125 MHz	−52 dBm	1 MHz	This is not applicable to E-UTRA BS operating in Band 46.

NOTE 1 – As defined in the scope for spurious emissions in this clause, except for the cases where the noted requirements apply to a BS operating in Band 25, Band 27, Band 28 or Band 29, the co-existence requirements in Table A1-83 do not apply for the 10 MHz frequency range immediately outside the downlink operating band (see Table A1-1). Emission limits for this excluded frequency range may be covered by local or regional requirements.

NOTE 2 – Table A1-83 assumes that two operating bands, where the frequency ranges in Table A1-1 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-existence requirements may apply that are not covered by the 3GPP specifications.

NOTE 3 – TDD base stations deployed in the same geographical area, that are synchronized and use the same or adjacent operating bands can transmit without additional co-existence requirements. For unsynchronized base stations (except for Band 46), special co-existence requirements may apply that are not covered by the 3GPP specifications.

NOTE 4 – Void.

NOTE 5 – For E-UTRA Band 28 BS, specific solutions may be required to fulfil the spurious emissions limits for E-UTRA BS for co-existence with E-UTRA Band 27 UL operating band.

NOTE 6 – For E-UTRA Band 29 BS, specific solutions may be required to fulfil the spurious emissions limits for E-UTRA BS for co-existence with UTRA Band XII or E-UTRA Band 12 UL operating band, E-UTRA Band 17 UL operating band or E-UTRA Band 85 UL operating band.

The power of any spurious emission shall not exceed the limits of Table A1-84 for a home BS where requirements for co-existence with a home BS type listed in the first column apply.

TABLE A1-84

Home BS spurious emissions limits for co-existence with home BS operating in other frequency bands

Type of coexistence BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
UTRA FDD Band I or E-UTRA Band 1	1 920-1 980 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 1 or 65.
UTRA FDD Band II or E-UTRA Band 2	1 850-1 910 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 2 or 25.
UTRA FDD Band III or E-UTRA Band 3	1 710-1 785 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 3. For home BS operating in Band 9, it applies for 1 710 MHz to 1 749.9 MHz and 1 784.9 MHz to 1 785 MHz.
UTRA FDD Band IV or E-UTRA Band 4	1 710-1 755 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 4, 10 or 66.
UTRA FDD Band V or E-UTRA Band 5	824-849 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 5 or 26.
UTRA FDD Band VI, XIX or E-UTRA Band 6, 18, 19	815-830 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 18.
	830-845 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 6, 19.
UTRA FDD Band VII or E-UTRA Band 7	2 500-2 570 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 7
UTRA FDD Band VIII or E-UTRA Band 8	880-915 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 8.
UTRA FDD Band IX or E-UTRA Band 9	1 749.9- 1 784.9 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 3 or 9
UTRA FDD Band X or E-UTRA Band 10	1 710-1 770 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 10 or 66. For home BS operating in Band 4, it applies for 1 755 MHz to 1 770 MHz.
UTRA FDD Band XI, XXI or E-UTRA Band 11, 21	1 427.9- 1 447.9 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 11 or 74. this requirement does not apply toHome BS operating in band 32, 50, 51, 75 or 76.
	1 447.9- 1 462.9 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 21 or 74. this requirement does not apply to Home BS operating in band 32, 50 or 75.

TABLE A1-84 (*continued*)

Type of coexistence BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
UTRA FDD Band XII or E-UTRA Band 12	699-716 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 12 or 85. For home BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 5).
UTRA FDD Band XIII or E-UTRA Band 13	777-787 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 13.
UTRA FDD Band XIV or E-UTRA Band 14	788-798 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 14.
E-UTRA Band 17	704-716 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 17. For home BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 5).
UTRA FDD Band XX or E-UTRA Band 20	832-862 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 20.
UTRA FDD Band XXII or E-UTRA Band 22	3 410-3 490 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 22. This requirement does not apply to home BS operating in Band 42.
E-UTRA Band 24	1 626.5-1 660.5 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 24.
UTRA FDD Band XXV or E-UTRA Band 25	1 850-1 915 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 25.
UTRA FDD Band XXVI or E-UTRA Band 26	814-849 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 26. For home BS operating in Band 5, it applies for 814 MHz to 824 MHz.
E-UTRA Band 27	807-824 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 27. For home BS operating in Band 26, it applies for 807 MHz to 814 MHz. This requirement also applies to E-UTRA BS operating in Band 28, starting 4 MHz above the Band 28 downlink operating band (Note 4).
E-UTRA Band 28	703-748 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 28. This requirement does not apply to home BS operating in Band 44. For E-UTRA BS operating in Band 67, it applies for 703 MHz to 736 MHz. For E-UTRA BS operating in Band 68, it applies for 728 MHz to 733 MHz.
E-UTRA Band 30	2 305-2 315 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 30. This requirement does not apply to Home BS operating in Band 40.
UTRA TDD Band a) or E-UTRA Band 33	1 900-1 920 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 33.

TABLE A1-84 (*continued*)

Type of coexistence BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
UTRA TDD Band a) or E-UTRA Band 34	2 010-2 025 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 34.
UTRA TDD Band b) or E-UTRA Band 35	1 850-1 910 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 35.
UTRA TDD Band b) or E-UTRA Band 36	1 930-1 990 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 2 and 36.
UTRA TDD Band c) or E-UTRA Band 37	1 910-1 930 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 37. This unpaired band is defined in Recommendation ITU-R M.1036, pending any future deployment.
UTRA TDD Band d) or E-UTRA Band 38	2 570-2 620 MHz	–71 dBm	100 kHz	This requirement does not apply to home BS operating in Band 38.
UTRA TDD Band f) or E-UTRA Band 39	1 880-1 920 MHz	–71 dBm	100 kHz	This is not applicable to home BS operating in Band 39.
UTRA TDD Band e) or E-UTRA Band 40	2 300-2 400 MHz	–71 dBm	100 kHz	This is not applicable to home BS operating in Band 40.
E-UTRA Band 41	2 496-2 690 MHz	–71 dBm	100 kHz	This is not applicable to home BS operating in Band 41.
E-UTRA Band 42	3 400-3 600 MHz	–71 dBm	100 kHz	This is not applicable to home BS operating in Band 22, 42, 43 or 48.
E-UTRA Band 43	3 600-3 800 MHz	–71 dBm	100 kHz	This is not applicable to home BS operating in Band 42, 43 or 48.
E-UTRA Band 44	703-803 MHz	–71 dBm	100 kHz	This is not applicable to home BS operating in Band 28 or 44.
E-UTRA Band 48	3 550-3 700 MHz	–71 dBm	100 kHz	This is not applicable to Home BS operating in Band 22, 42, 43 or 48.
E-UTRA Band 50	1 432-1 517 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 11, 21, 32, 50, 51, 74, 75 or 76.
E-UTRA Band 51	1 427-1 432 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 50, 51, 75 or 76.
E-UTRA Band 52	3 300-3 400 MHz	–71 dBm	100 kHz	This is not applicable to Home BS operating in Band 42 or 52.
E-UTRA Band 65	1 920-2 010 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 65. For Home BS operating in Band 1, it applies for 1 980 MHz to 2 010 MHz.
E-UTRA Band 66	1 710-1 780 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 66. For Home BS operating in Band 4, it applies for 1 755 MHz to 1 780 MHz. For Home BS operating in Band 10, it applies for 1 770 MHz to 1 780 MHz.

TABLE A1-84 (*end*)

Type of coexistence BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
E-UTRA Band 68	698-728 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 68. For Home BS operating in Band 28, it applies between 698 MHz and 703 MHz.
E-UTRA Band 70	1 695-1 710 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 70.
E-UTRA Band 71	663-698 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 71.
E-UTRA Band 74	1 427-1 470 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 74. This requirement does not apply to BS operating in Band 32, 50, 51, 75 or 76.
E-UTRA Band 85	698-716 MHz	–71 dBm	100 kHz	This requirement does not apply to Home BS operating in Band 85. For Home BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 5).

NOTE 1 – As defined in the scope for spurious emissions in this clause, except for the cases where the noted requirements apply to a BS operating in Band 27, Band 28 or Band 29, the coexistence requirements in Table A1-84 do not apply for the 10 MHz frequency range immediately outside the home BS transmit frequency range of a downlink operating band (see Table A1-1). Emission limits for this excluded frequency range may be covered by local or regional requirements.

NOTE 2 – Table A1-84 assumes that two operating bands, where the frequency ranges in Table A1-1 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-existence requirements may apply that are not covered by these specifications.

NOTE 3 – TDD base stations deployed in the same geographical area, that are synchronized and use the same or adjacent operating bands can transmit without additional co-existence requirements. For unsynchronized base stations, special co-existence requirements may apply that are not covered by these specifications.

NOTE 4 – For E-UTRA Band 28 BS, specific solutions may be required to fulfil the spurious emissions limits for E-UTRA BS for co-existence with E-UTRA Band 27 UL operating band.

NOTE 5 – For E-UTRA Band 29 BS, specific solutions may be required to fulfil the spurious emissions limits for E-UTRA BS for co-existence with UTRA Band XII or E-UTRA Band 12 UL operating band, E-UTRA Band 17 UL operating band or E-UTRA Band 85 UL operating band.

Additional co-existence requirements in Table A1-85 may apply for some regions.

TABLE A1-85

BS spurious emissions limits for E-UTRA BS for co-existence with systems operating in Band 46

System type for E-UTRA to co-exist with	Frequency range for co-existence requirement	Maximum Level	Measurement Bandwidth	Note
E-UTRA Band 46a	5 150-5 250 MHz	−40 dBm	1 MHz	This is only applicable to E-UTRA BS operating in Band 46c or 46d.
E-UTRA Band 46b	5 250-5 350 MHz	−40 dBm	1 MHz	This is only applicable to E-UTRA BS operating in Band 46c or 46d.
E-UTRA Band 46c	5 470-5 725 MHz	−40 dBm	1 MHz	This is only applicable to E-UTRA BS operating in Band 46a or 46b.
E-UTRA Band 46d	5 725-5 925 MHz	−40 dBm	1 MHz	This is only applicable to E-UTRA BS operating in Band 46a or 46b.

NOTE 1 – This requirement may apply to E-UTRA BS operating in certain regions.

The following requirement may be applied for the protection of personal handyphone system (PHS). This requirement is also applicable at specified frequencies falling between 10 MHz below the lowest BS transmitter frequency of the downlink operating band and 10 MHz above the highest BS transmitter frequency of the downlink operating band (see Table A1-1).

The power of any spurious emission shall not exceed:

TABLE A1-86

E-UTRA BS spurious emissions limits for BS for co-existence with PHS

Frequency range	Maximum level	Measurement bandwidth	Note
1 884.5-1 915.7 MHz	–41 dBm	300 kHz	Applicable when co-existence with PHS system operating in 1 884.5-1 915.7 MHz

The following requirement shall be applied to BS operating in Bands 13 and 14 to ensure that appropriate interference protection is provided to 700 MHz public safety operations. This requirement is also applicable at the frequency range from 10 MHz below the lowest frequency of the BS transmitter operating band up to 10 MHz above the highest frequency of the BS transmitter operating band. The power of any spurious emission shall not exceed:

TABLE A1-87

BS spurious emissions limits for protection of 700 MHz public safety operations

Operating band	Band	Maximum level	Measurement bandwidth	Note
13	763-775 MHz	–46 dBm	6.25 kHz	–
13	793-805 MHz	–46 dBm	6.25 kHz	–
14	769-775 MHz	–46 dBm	6.25 kHz	–
14	799-805 MHz	–46 dBm	6.25 kHz	–

The following requirement shall be applied to BS operating in Band 26 to ensure that appropriate interference protection is provided to 800 MHz public safety operations. This requirement is also applicable at the frequency range from 10 MHz below the lowest frequency of the BS downlink operating band up to 10 MHz above the highest frequency of the BS downlink operating band.

The power of any spurious emission shall not exceed:

TABLE A1-88

BS spurious emissions limits for protection of 800 MHz public safety operations

Operating band	Frequency range	Maximum level	Measurement bandwidth	Note
26	851-859 MHz	–13 dBm	100 kHz	Applicable for offsets > 37.5 kHz from the channel edge

The following requirement may apply to E-UTRA BS operating in Band 41 in certain regions. This requirement is also applicable at the frequency range from 10 MHz below the lowest frequency of the BS downlink operating band up to 10 MHz above the highest frequency of the BS downlink operating band.

The power of any spurious emission shall not exceed:

TABLE A1-89

Additional E-UTRA BS spurious emissions limits for Band 41

Frequency range	Maximum level	Measurement bandwidth	Note
2 505 MHz – 2 535 MHz	–42dBm	1 MHz	–

NOTE – This requirement applies for 10 or 20 MHz E-UTRA carriers allocated within 2 545-2 645 MHz.

The following requirement may apply to E-UTRA BS operating in Band 30 in certain regions. This requirement is also applicable at the frequency range from 10 MHz below the lowest frequency of the BS downlink operating band up to 10 MHz above the highest frequency of the BS downlink operating band.

The power of any spurious emission shall not exceed:

TABLE A1-90

Additional E-UTRA BS spurious emissions limits for Band 30

Frequency range	Maximum level	Measurement bandwidth	Note
2 200 MHz-2 345 MHz	–45 dBm	1 MHz	
2 362.5 MHz-2 365 MHz	–25 dBm	1 MHz	
2 365 MHz-2 367.5 MHz	–40 dBm	1 MHz	
2 367.5 MHz-2 370 MHz	–42 dBm	1 MHz	
2 370 MHz-2 395 MHz	–45 dBm	1 MHz	

In addition for Band 46 operation, the BS may have to comply with the applicable spurious emission limits established regionally, when deployed in regions where those limits apply and under the conditions declared by the manufacturer. The regional requirements may be in the form of conducted power, power spectral density, e.i.r.p. and other types of limits. In case of regulatory limits based on e.i.r.p., assessment of the e.i.r.p. level is described in Annex H of TS 36.104.

The following requirement may apply to E-UTRA BS operating in Band 48 and Band 49 in certain regions. The power of any spurious emission shall not exceed:

TABLE A1-91

Additional E-UTRA BS spurious emissions limits for Band 48 and Band 49

Frequency range	Maximum Level	Measurement Bandwidth	Note
3 530 MHz – 3 720 MHz	−25 dBm	1 MHz	Applicable 10 MHz from the assigned channel edge
3 100 MHz – 3 530 MHz 3 720 MHz – 4 200 MHz	−40 dBm	1 MHz	

2.6.5 Co-location with other base stations

These requirements may be applied for the protection of other BS receivers when GSM900, DCS1800, PCS1900, GSM850, CDMA850, UTRA FDD, UTRA TDD, E-UTRA and/or NR BS are co-located with an E-UTRA or NB-IoT BS.

The requirements assume a 30 dB coupling loss between transmitter and receiver and are based on co-location with base stations of the same class.

The power of any spurious emission shall not exceed the limits of Table A1-92 for a wide area BS where requirements for co-location with a BS type listed in the first column apply. For BS capable of multi-band operation, the exclusions and conditions in the Note column of Table A1-92 apply for each supported operating band. For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the exclusions and conditions in the Note column of Table A1-92 apply for the operating band supported at that antenna connector.

TABLE A1-92

BS spurious emissions limits for wide area BS co-located with another BS

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
Macro GSM900	876-915 MHz	–98 dBm	100 kHz	–
Macro DCS1800	1 710-1 785 MHz	–98 dBm	100 kHz	_
Macro PCS1900	1 850-1 910 MHz	–98 dBm	100 kHz	_
Macro GSM850 or CDMA850	824-849 MHz	–98 dBm	100 kHz	_
WA UTRA FDD Band I or E-UTRA Band 1 or NR band n1	1 920-1 980 MHz	–96 dBm	100 kHz	_

TABLE A1-92 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
WA UTRA FDD Band II or E-UTRA Band 2 or NR band n2	1 850-1 910 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band III or E-UTRA Band 3 or NR band n3	1 710-1 785 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band IV or E-UTRA Band 4	1 710-1 755 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band V or E-UTRA Band 5 or NR band n5	824-849 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band VI, XIX or E-UTRA Band 6, 19	830-845 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band VII or E-UTRA Band 7 or NR band n7	2 500-2 570 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band VIII or E-UTRA Band 8 or NR band n8	880-915 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band IX or E-UTRA Band 9	1 749.9-1 784.9 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band X or E-UTRA Band 10	1 710-1 770 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band XI or E-UTRA Band 11	1 427.9-1 447.9 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 50 or 75
WA UTRA FDD Band XII or E-UTRA Band 12 or NR band n12	699-716 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band XIII or E-UTRA Band 13	777-787 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band XIV or E-UTRA Band 14 or NR band n14	788-798 MHz	–96 dBm	100 kHz	_
WA E-UTRA Band 17	704-716 MHz	–96 dBm	100 kHz	_
WA E-UTRA Band 18	815-830 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band XX E-UTRA Band 20 or NR band n20	832-862 MHz	–96 dBm	100 kHz	_

TABLE A1-92 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
WA E-UTRA Band 24	1 626.5-1 660.5 MHz	–96 dBm	100 kHz	_
WA UTRA FDD Band XXI or E-UTRA Band 21	1 447.9-1 462.9 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 32, 50 or 75
WA UTRA FDD Band XXII or E-UTRA Band 22	3 410-3 490 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42
WA E-UTRA Band 23	2 000-2 020 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 24	1 626.5-1 660.5 MHz	–96 dBm	100 kHz	–
WA UTRA FDD Band XXV or E-UTRA Band 25 or NR Band n25	1 850-1 915 MHz	–96 dBm	100 kHz	–
WA UTRA FDD Band XXVI or E-UTRA Band 26 or NR Band n26	814-849 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 27	807-824 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 28 or NR Band n28	703-748 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 44
WA E-UTRA Band 30	2 305-2 315 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 40
WA E-UTRA Band 31	452.5-457.5 MHz	–96 dBm	100 kHz	
WA UTRA TDD Band a) or E-UTRA Band 33	1 900-1 920 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 33
WA UTRA TDD Band a) or E-UTRA Band 34 or NR band n34	2 010-2 025 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 34
WA UTRA TDD Band b) or E-UTRA Band 35	1 850-1 910 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 35
WA UTRA TDD Band b) or E-UTRA Band 36	1 930-1 990 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Bands 2 and 36
WA UTRA TDD Band c) or E-UTRA Band 37	1 910-1 930 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 37. This unpaired band is defined in ITU-R M.1036, pending any future deployment.

TABLE A1-92 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
WA UTRA TDD Band d) or E-UTRA Band 38 or NR band n38	2 570-2 620 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 38
WA UTRA TDD Band f) or E-UTRA Band 39	1 880-1 920 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Bands 33 and 39
WA UTRA TDD Band e) or E-UTRA Band 40 or NR band n40	2 300-2 400 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 30 or 40
WA E-UTRA Band 41 or NR band n41	2 496-2 690 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 41
WA E-UTRA Band 42	3 400-3 600 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48 or 52
WA E-UTRA Band 43	3 600-3 800 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42 or 43
WA E-UTRA Band 44	703-803 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 28 or 44
WA E-UTRA Band 45	1 447-1 467 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 45
WA E-UTRA Band 48 or NR band n48	3 550-3 700 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42, 43 or 48
WA E-UTRA Band 50 or NR band n50	1 432-1 517 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 11, 21, 32, 74 or 75
WA E-UTRA Band 52	3 300-3 400 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42 or 52
WA E-UTRA Band 65 or NR band n65	1 920-2 010 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 66 or NR band n66	1 710-1 780 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 68	698-728 MHz	–96 dBm	100 kHz	–

TABLE A1-92 (*end*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
WA E-UTRA Band 70 or NR band n70	1 695-1 710 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 71 or NR band n71	663-698 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 72	451-456 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 73	450-455 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 74 or NR band n74	1 427-1 470 MHz	–96 dBm	100 kHz	This is not applicabe to E-UTRA BS operating in Band 50
WA NR band n77	3 300-4 200 MHz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48 or 52
WA NR band n78	3 300-3 800 Mz	–96 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48 or 52
WA NR Band n79	4.4-5.0 GHz	–96 dBm	100 kHz	–
WA NR Band n80	1 710-1 785 MHz	–96 dBm	100 kHz	–
WA NR Band n81	880-915 MHz	–96 dBm	100 kHz	–
WA NR Band n82	832-862 MHz	–96 dBm	100 kHz	–
WA NR Band n83	703-748 MHz	–96 dBm	100 kHz	–
WA NR Band n84	1 920-1 980 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 85	698-716 MHz	–96 dBm	100 kHz	–
WA NR Band n86	1 710-1 780 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 87	410-415 MHz	–96 dBm	100 kHz	–
WA E-UTRA Band 88	412-417 MHz	–96 dBm	100 kHz	–
WA NR Band n89	824-849 MHz	–96 dBm	100 kHz	–
WA NR Band n92	832-862 MHz	–96 dBm	100 kHz	–
WA NR Band n94	880-915 MHz	–96 dBm	100 kHz	–
WA NR Band n95	2 010-2 025 MHz	–96 dBm	100 kHz	–

The power of any spurious emission shall not exceed the limits of Table A1-93 for a local area BS where requirements for co-location with a BS type listed in the first column apply. For BS capable of multi-band operation, the exclusions and conditions in the Note column of Table A1-93 apply for each supported operating band. For BS capable of multi-band operation where multiple bands are

mapped on separate antenna connectors, the exclusions and conditions in the Note column of Table A1-93 apply for the operating band supported at that antenna connector.

TABLE A1-93

BS spurious emissions limits for local area BS co-located with another BS

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
Pico GSM900	876-915 MHz	–70 dBm	100 kHz	–
Pico DCS1800	1 710-1 785 MHz	–80 dBm	100 kHz	_
Pico PCS1900	1 850-1 910 MHz	–80 dBm	100 kHz	_
Pico GSM850	824-849 MHz	–70 dBm	100 kHz	_
LA UTRA FDD Band I or E-UTRA Band 1 or NR band n1	1 920-1 980 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band II or E-UTRA Band 2 or NR band n2	1 850-1 910 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band III or E-UTRA Band 3 or NR band n3	1 710-1 785 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band IV or E-UTRA Band 4	1 710-1 755 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band V or E-UTRA Band 5 or NR band n5	824-849 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band VI, XIX or E-UTRA Band 6, 19	830-845 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band VII or E-UTRA Band 7 or NR band n7	2 500-2 570 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band VIII or E-UTRA Band 8 or NR band n8	880-915 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band IX or E-UTRA Band 9	1 749.9-1 784.9 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band X or E-UTRA Band 10	1 710-1 770 MHz	–88 dBm	100 kHz	_

TABLE A1-93 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
LA UTRA FDD Band XI or E-UTRA Band 11	1 427.9-1 447.9 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 50, 51, 75 or 76
LA UTRA FDD Band XII or E-UTRA Band 12 or NR band n12	699-716 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band XIII or E-UTRA Band 13	777-787 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band XIV or E-UTRA Band 14 or NR band n14	788-798 MHz	–88 dBm	100 kHz	_
LA E-UTRA Band 17	704-716 MHz	–88 dBm	100 kHz	_
LA E-UTRA Band 18	815-830 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band XX or E-UTRA Band 20 or NR band n20	832-862 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band XXI or E-UTRA Band 21	1 447.9-1 462.9 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 32, 50 or 75
LA UTRA FDD Band XXII or E-UTRA Band 22	3 410-3 490 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42
LA E-UTRA Band 23	2 000-2 020 MHz	–88 dBm	100 kHz	_
LA E-UTRA Band 24	1 626.5-1 660.5 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band XXV or E-UTRA Band 25 or NR band n25	1 850-1 915 MHz	–88 dBm	100 kHz	_
LA UTRA FDD Band XXVI or E-UTRA Band 26 or NR band n26	814-849 MHz	–88 dBm	100 kHz	_
LA E-UTRA Band 27	807-824 MHz	–88 dBm	100 kHz	_
LA E-UTRA Band 28 or NR band n28	703-748 MHz	–88 dBm	100 KHz	This is not applicable to E-UTRA BS operating in Band 44
LA E-UTRA Band 30 or NR band n30	2 305-2 315 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 40
LA E-UTRA Band 31	452.5-457.5 MHz	–88 dBm	100 kHz	

TABLE A1-93 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
LA UTRA TDD Band a) or E-UTRA Band 33	1 900-1 920 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 33
LA UTRA TDD Band a) or E-UTRA Band 34 or NR band n34	2 010-2 025 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 34
LA UTRA TDD Band b) or E-UTRA Band 35	1 850-1 910 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 35
LA UTRA TDD Band b) or E-UTRA Band 36	1 930-1 990 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Bands 2 and 36
LA UTRA TDD Band c) or E-UTRA Band 37	1 910-1 930 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 37. This unpaired band is defined in ITU-R M.1036, pending any future deployment.
LA UTRA TDD Band d) or E-UTRA Band 38 or NR band n38	2 570-2 620 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 38
LA UTRA TDD Band f) or E-UTRA Band 39 or NR band n39	1 880-1 920 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Bands 33 and 39
LA UTRA TDD Band e) or E-UTRA Band 40 or NR band n40	2 300-2 400 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 30 or 40
LA E-UTRA Band 41 or NR band n41	2 496-2 690 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 41 or 53
LA E-UTRA Band 42	3 400-3 600 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48, 49 or 52
LA E-UTRA Band 43	3 600-3 800 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42, 43, 48 or 49
LA E-UTRA Band 44	703-803 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 28 or 44
LA E-UTRA Band 45	1 447-1 467 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 45
LA E-UTRA Band 46 or NR Band n46	5 150-5 925 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 46

TABLE A1-93 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
LA E-UTRA Band 48 or NR band n48	3 550-3 700 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42, 43, 48 or 49
LA E-UTRA Band 49	3 550-3 700 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42, 43, 48 or 49
LA E-UTRA Band 50 or NR band n50	1 432-1 517 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 11, 21, 32, 51, 74, 75 or 76
LA E-UTRA Band 51 or NR band n51	1 427-1 432 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 50, 75 or 76
LA E-UTRA Band 52	3 300-3 400 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42 or 52
LA E-UTRA Band 53 or NR Band n53	2 483.5-2 495 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 41 or 53
LA E-UTRA Band 65 or NR band n65	1 920-2 010 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 66 or NR band n66	1 710-1 780 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 68	698-728 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 70 or NR band n70	1 695-1 710 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 71 or NR band n71	663-698 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 72	451-456 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 73	450-455 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 74 or NR band n74	1 427-1 470 MHz	–88 dBm	100 kHz	This is not applicabe to E-UTRA BS operating in Band 50 or 51
LA NR band n77	3 300-4 200 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48, 49 or 52
LA NR band n78	3 300-3 800 MHz	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48, 49 or 52
LA NR Band n79	4.4-5.0 GHz	–88 dBm	100 kHz	–
LA NR Band n80	1 710-1 785 MHz	–88 dBm	100 kHz	–
LA NR Band n81	880-915 MHz	–88 dBm	100 kHz	–
LA NR Band n82	832-862 MHz	–88 dBm	100 kHz	–

TABLE A1-93 (*end*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
LA NR Band n83	703-748 MHz	–88 dBm	100 kHz	–
LA NR Band n84	1 920-1 980 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 85	698-716 MHz	–88 dBm	100 kHz	–
LA NR Band n86	1 920-1 980 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 87	410-415 MHz	–88 dBm	100 kHz	–
LA E-UTRA Band 88	412-417 MHz	–88 dBm	100 kHz	–
LA NR Band n89	824-849 MHz	–88 dBm	100 kHz	–
LA NR Band n91	832-862 MHz	–88 dBm	100 kHz	–
LA NR Band n92	832-862 MHz	–88 dBm	100 kHz	–
LA NR Band n93	880-915 MHz	–88 dBm	100 kHz	–
LA NR Band n94	880-915 MHz	–88 dBm	100 kHz	–
LA NR Band n95	2 010-2 025 MHz	–88 dBm	100 kHz	–
LA NR Band n96	5 925-7 125 MHz	–87 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 46

The power of any spurious emission shall not exceed the limits of Table A1-94 for a medium range BS where requirements for co-location with a BS type listed in the first column apply. For BS capable of multi-band operation, the exclusions and conditions in the Note column of Table A1-94 apply for each supported operating band. For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the exclusions and conditions in the Note column of Table A1-94 apply for the operating band supported at that antenna connector.

TABLE A1-94

BS spurious emissions limits for Medium range BS co-located with another BS

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
Micro/MR GSM900	876-915 MHz	–91 dBm	100 kHz	–
Micro/MR DCS1800	1 710-1 785 MHz	–91 dBm	100 kHz	_
Micro/MR PCS1900	1 850-1 910 MHz	–91 dBm	100 kHz	_
Micro/MR GSM850	824-849 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band I or E-UTRA Band 1 or NR band n1	1 920-1 980 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band II or E-UTRA Band 2 or NR band n2	1 850-1 910 MHz	–91 dBm	100 kHz	_

TABLE A1-94 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
MR UTRA FDD Band III or E-UTRA Band 3 or NR band n3	1 710-1 785 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band IV or E-UTRA Band 4	1 710-1 755 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band V or E-UTRA Band 5 or NR band n5	824-849 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band VI, XIX or E-UTRA Band 6, 19	830-850 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band VII or E-UTRA Band 7	2 500-2 570 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band VIII or E-UTRA Band 8 or NR band n8	880-915 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band IX or E-UTRA Band 9	1 749.9-1 784.9 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band X or E-UTRA Band 10	1 710-1 770 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band XI or E-UTRA Band 11	1 427.9-1 447.9 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 50 or 75
MR UTRA FDD Band XII or E-UTRA Band 12 or NR band n12	699-716 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band XIII or E-UTRA Band 13	777-787 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band XIV or E-UTRA Band 14 or NR band n14	788-798 MHz	–91 dBm	100 kHz	_
MR E-UTRA Band 17	704-716 MHz	–91 dBm	100 kHz	_
MR E-UTRA Band 18	815-830 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band XX or E-UTRA Band 20 or NR band n20	832-862 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band XXI or E-UTRA Band 21	1 447.9-1 462.9 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 32, 50 or 7

TABLE A1-94 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
MR UTRA FDD Band XXII or E-UTRA Band 22	3 410-3 490 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42
MR E-UTRA Band 23	2 000-2 020 MHz	–91 dBm	100 kHz	_
MR E-UTRA Band 24	1 626.5-1 660.5 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band XXV or E-UTRA Band 25 or NR band n25	1 850-1 915 MHz	–91 dBm	100 kHz	_
MR UTRA FDD Band XXVI or E-UTRA Band 26 or NR band n26	814-849 MHz	–91 dBm	100 kHz	_
MR E-UTRA Band 27	807-824 MHz	–91 dBm	100 kHz	_
MR E-UTRA Band 28 or NR band n28	703-748 MHz	–91 dBm	100 KHz	This is not applicable to E-UTRA BS operating in Band 44
MR E-UTRA Band 30 or NR band n30	2 305-2 315 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 40
MR E-UTRA Band 31	452.5-457.5 MHz	–91 dBm	100 kHz	
MR E-UTRA Band 33	1 900-1 920 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 33
MR E-UTRA Band 34 or NR band n34	2 010-2 025 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 34
MR E-UTRA Band 35	1 850-1 910 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 35
MR E-UTRA Band 36	1 930-1 990 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Bands 2 and 36
MR E-UTRA Band 37	1 910-1 930 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 37. This unpaired band is defined in ITU-R M.1036, pending any future deployment.
MR E-UTRA Band 38 or NR band n38	2 570-2 620 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 38.

TABLE A1-94 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
MR E-UTRA Band 39 or NR band n39	1 880-1 920 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Bands 33 and 39
MR E-UTRA Band 40 or NR band n40	2 300-2 400 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 30 or 40
MR E-UTRA Band 41 or NR band n41	2 496-2 690 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 41 or 53
MR E-UTRA Band 42	3 400-3 600 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48 or 52
MR E-UTRA Band 43	3 600-3 800 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42, 43 or 48
MR E-UTRA Band 44	703-803 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 28 or 44
MR E-UTRA Band 45	1 447-1 467 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 45
MR E-UTRA Band 46 or NR Band n46	5 150-5 925 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 46
MR E-UTRA Band 48 or NR band n48	3 550-3 700 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42, 43 or 48
MR E-UTRA Band 50 or NR band n50	1 432-1 517 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 11, 21, 32, 51, 74, 75 or 76
MR E-UTRA Band 52	3 300-3 400 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 42 or 52
MR E-UTRA Band 53 or NR Band n53	2 483.5-2 495 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 41 or 53
MR E-UTRA Band 65 or NR band n65	1 920-2 010 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 66 or NR band n66	1 710-1 780 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 68	698-728 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 70 or NR band n70	1695-1 710 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 71	663-698 MHz	–91 dBm	100 kHz	–

TABLE A1-94 (*end*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level	Measurement bandwidth	Note
MR E-UTRA Band 72	451-456 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 73	450-455 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 74 or NR band n74	1 427-1 470 MHz	–91 dBm	100 kHz	This is not applicabe to E-UTRA BS operating in Band 50
MR NR band n77	3 300-4 200 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48 or 52
MR NR band n78	3 300-3 800 MHz	–91 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 22, 42, 43, 48 or 52
MR NR Band n79	4.4-5.0 GHz	–91 dBm	100 kHz	–
MR NR Band n80	1 710-1 785 MHz	–91 dBm	100 kHz	–
MR NR Band n81	880-915 MHz	–91 dBm	100 kHz	–
MR NR Band n82	832-862 MHz	–91 dBm	100 kHz	–
MR NR Band n83	703-748 MHz	–91 dBm	100 kHz	–
MR NR Band n84	1 920-1 980 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 85	698-716 MHz	–91 dBm	100 kHz	–
MR NR Band n86	1 710-1 780 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 87	410-415 MHz	–91 dBm	100 kHz	–
MR E-UTRA Band 88	412-417 MHz	–91 dBm	100 kHz	–
MR NR Band n89	824-849 MHz	–91 dBm	100 kHz	–
MR NR Band n92	832-862 MHz	–91 dBm	100 kHz	–
MR NR Band n94	880-915 MHz	–91 dBm	100 kHz	–
MR NR Band n95	2 010-2 025 MHz	–91 dBm	100 kHz	–
MR NR Band n96	5 925-7 125 MHz	–90 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 46

NOTE 1 – As defined in the scope for spurious emissions in this clause, the co-location requirements in Table A1-92 to Table A1-94 do not apply for the 10 MHz frequency range immediately outside the BS transmit frequency range of a downlink operating band (see Table A1-1). The current state-of-the-art technology does not allow a single generic solution for co-location with other system on adjacent frequencies for 30dB BS-BS minimum coupling loss.
However, there are certain site-engineering solutions that can be used. These techniques are addressed in 3GPP TR 25.942.

NOTE 2 – Tables A1-92 to A1-94 assume that two operating bands, where the corresponding eNode B transmit and receive frequency ranges in Table A1-1 would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-location requirements may apply that are not covered by this specifications.

NOTE 3 – Co-located TDD base stations that are synchronized and using the same or adjacent operating band can transmit without special co-locations requirements. For unsynchronized base stations, special co-location requirements may apply that are not covered by these specifications.

2.7 Receiver spurious emissions

The power of any spurious emission shall not exceed the levels in Table A1-95.

In addition to the requirements in Table A1-95, the power of any spurious emission shall not exceed the levels specified for Protection of the E-UTRA FDD BS receiver of own or different BS in § 2.6.3 and for Co-existence with other systems in the same geographical area in § 2.6.4. In addition, the co-existence requirements for co-located base stations specified in § 2.6.5 may also be applied.

Unless otherwise stated, a BS declared to be capable of E-UTRA with NB-IoT in-band and guard band operations is only required to pass the receiver spurious emissions tests for E-UTRA with guard band operation; it is not required to perform the receiver spurious emissions tests again for E-UTRA with in-band operation.

TABLE A1-95

General spurious emission test requirement

Frequency range	Maximum level	Measurement bandwidth	Note
30 MHz-1 GHz	–57 dBm	100 kHz	–
1 GHz-12.75 GHz	–47 dBm	1 MHz	–
12.75 GHz – 5th harmonic of the upper frequency edge of the UL operating band in GHz	–47 dBm	1 MHz	Applies only for Bands 22, 42, 43, 48 and 49.
12.75 GHz-26 GHz	–47 dBm	1 MHz	Applies only for Band 46.

NOTE – The frequency range between 2.5 * $BW_{Channel}$ below the first carrier frequency and 2.5 * $BW_{Channel}$ above the last carrier frequency transmitted by the BS, where $BW_{Channel}$ is the channel bandwidth, may be excluded from the requirement. However, frequencies that are more than 10 MHz below the lowest frequency of any of the BS supported downlink operating band or more than 10 MHz above the highest frequency of any of the BS supported downlink operating band (see Table A1-1) shall not be excluded from the requirement.

For BS capable of multi-band operation, the excluded frequency range applies for all supported operating bands. For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the single-band requirements apply and the excluded frequency range is only applicable for the operating band supported on each antenna connector.

3 MSR unwanted emission characteristics

MSR requirements in the present document cover multi-RAT operation as well as single RAT E-UTRA operation. For the purpose of defining the MSR BS requirements, the operating bands are divided into three band categories as follows:

– Band category 1 (BC1): Bands for NR FDD, E-UTRA FDD and/or UTRA FDD operation. Bands in this category are also used for NB-IoT operation (all modes).

– Band category 2 (BC2): Bands for NR FDD, E-UTRA FDD, UTRA FDD and/or GSM/EDGE operation. Bands in this category are also used for NB-IoT operation (all modes).

– Band category 3 (BC3): Bands for NR TDDE-UTRA TDD and/or UTRA TDD operation. Bands in this category are also used for NB-IoT operation (all modes).

Band category 1 aspects (BC1)

For each BC1 band, BC1 requirements for receiver and transmitter shall apply with a frequency offset $\mathbf{F_{offset,\,RAT}}$ from the lowest and highest carriers to the Base Station RF Bandwidth edges and sub-block edges (if any) as defined in Table A1-96.

TABLE A1-96

$F_{offset,\ RAT}$ for band category 1

RAT	$F_{offset,\ RAT}$
1.4, 3 MHz E-UTRA	$BW_{Channel}/2$ + 200 kHz
NR and 5, 10, 15, 20 MHz E-UTRA	$BW_{Channel}/2$
UTRA FDD	2.5 MHz
Standalone NB-IoT	200 kHz

Band category 2 aspects (BC2)

For each BC2 band, BC2 requirements for receiver and transmitter shall apply with a frequency offset $\mathbf{F_{offset,\ RAT}}$ from the lowest and highest carriers to the Base Station RF Bandwidth edges and sub-block edges (if any) as defined in Table A1-97.

TABLE A1-97

$F_{offset,\ RAT}$ for band category 2

RAT	$F_{offset,\ RAT}$
E-UTRA and NR	$BW_{Channel}/2$
UTRA FDD	2.5 MHz
GSM/EDGE	200 kHz
Standalone NB-IoT	200 kHz

Band category 3 aspects (BC3)

For each BC3 band, BC3 requirements for receiver and transmitter shall apply with a frequency offset $\mathbf{F_{offset,\ RAT}}$ from the lowest and highest carriers to the Base Station RF Bandwidth edges and sub-block edges (if any) as defined in Table A1-98.

TABLE A1-98

$F_{offset,\ RAT}$ for band category 3

RAT	$F_{offset,\ RAT}$
1.4, 3 MHz E-UTRA	$BW_{Channel}/2$ + 200 kHz
NR and 5, 10, 15, 20 MHz E-UTRA	$BW_{Channel}/2$
1.28 Mcps UTRA TDD	1 MHz
Standalone NB-IoT	200 kHz

3.1 Definitions

Band category: group of operating bands for which the same MSR scenarios apply.

Base Station RF Bandwidth: RF bandwidth in which a base station transmits and/or receives single or multiple carrier(s) and/or RATs simultaneously within a supported operating band.

NOTE – In single carrier operation, the Base Station RF Bandwidth is equal to the channel bandwidth.

Base Station RF bandwidth edge: frequency of one of the edges of theBase Station RF Bandwidth.

Carrier: modulated waveform conveying the NR, E-UTRA, UTRA or GSM/EDGE physical channels.

Carrier aggregation: aggregation of two or more NR or E-UTRA component carriers in order to support wider transmission bandwidths.

Channel bandwidth: RF bandwidth supporting a single NR, E-UTRA, UTRA or GSM/EDGE RF carrier with the transmission bandwidth configured in the uplink or downlink of a cell.

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

NOTE 2 – The term channel bandwidth is referred to as BS channel bandwidth in the NR specifications, since for NR the BS and UE may operate with differing bandwidths.

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

Carrier power: power at the antenna connector in the channel bandwidth of the carrier averaged over at least one subframe for NR or E-UTRA, at least one slot for UTRA and the useful part of the burst for GSM/EDGE.

Contiguous spectrum: spectrum consisting of a contiguous block of spectrum with no sub-block gap(s).

Downlink operating band: part of the operating band designated for downlink.

Highest carrier: carrier with the highest carrier centre frequency transmitted/received in the specified operating band(s).

Inter RF Bandwidth gap: frequency gap between two consecutive Base Station RF Bandwidths that are placed within two supported operating bands.

Inter-band carrier aggregation: carrier aggregation of NR or E-UTRA component carriers in different operating bands**.**

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

Inter-band gap: frequency gap between two supported consecutive operating bands.

Intra-band contiguous carrier aggregation: contiguous NR or E-UTRA carriers aggregated in the same operating band.

Intra-band non-contiguous carrier aggregation: non-contiguous NR or E-UTRA carriers aggregated in the same operating band.

Lowest carrier: carrier with the lowest carrier centre frequency transmitted/received in the specified operating band(s).

Lower Base Station RF Bandwidth edge: frequency of the lower Base Station RF Bandwidth edge, used as a frequency reference point for transmitter and receiver requirements.

Lower sub-block edge: frequency at the lower edge of one sub-block.

NOTE – It is used as a frequency reference point for both transmitter and receiver requirements.

Maximum Base Station RF Bandwidth: maximum RF bandwidth supported by a BS within each supported operating band.

NOTE – The maximum Base Station RF Bandwidth for BS configured for contiguous and non-contiguous operation within each supported operating band is declared separately.

Maximum carrier output power: carrier power available at the antenna connector for a specified reference condition.

Maximum Radio Bandwidth: maximum frequency difference between the upper edge of the highest used carrier and the lower edge of the lowest used carrier.

Maximum total output power: sum of the power of all carriers available at the antenna connector for a specified reference condition.

MB-MSR base station: MSR base station characterized by the ability of its transmitter and/or receiver to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different operating band (which is not a sub-band or superseding-band of another supported operating band) than the other carrier(s).

Mean power: power measured in the bandwidth and period of measurement applicable for each RAT

NOTE – Mean power for an E-UTRA carrier is defined in TS 36.141 and mean power for a UTRA carrier is defined in TS 25.141. In case of multiple carriers, the mean power is the sum of the mean power of all carriers.

Measurement bandwidth: RF bandwidth in which an emission level is specified.

MSR base station: base station characterized by the ability of its receiver and transmitter to process two or more carriers in common active RF components simultaneously in a declared Base Station RF Bandwidth, where at least one carrier is of a different RAT than the other carrier(s).

Multi-band connector: *antenna* connector of the *BS type 1-C* associated with a transmitter or receiver that is characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different *operating band* than the other carrier(s) and where this different *operating band* is not a sub-band or superseding-band of another supported operating band.

Multi-band transmitter: transmitter characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different operating band (which is not a sub-band or superseding-band of another supported operating band) than the other carrier(s).

Multi-band receiver: receiver characterized by the ability to process two or more carriers in common active RF components simultaneously, where at least one carrier is configured at a different operating band (which is not a sub-band or superseding-band of another supported operating band) than the other carrier(s).

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

NB-IoT In-band operation: NB-IoT is operating in-band when it utilizes the resource block(s) within a normal E-UTRA carrier.

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

NB-IoT standalone operation: NB-IoT is operating standalone when it utilizes its own spectrum, for example the spectrum currently being used by GERAN systems as a replacement of one or more GSM carriers, as well as scattered spectrum for potential IoT deployment.

NB-IoT operation in NR in-band: NB-IoT is operating in-band when it is located within a NR transmission bandwidth configuration plus 15 kHz at each edge but not within the NR minimum guard band $GB_{Channel}$.

NB-IoT operation in NR guard band: NB-IoT is operating in guard band when it is located within a NR BS channel bandwidth but is not NB-IoT operation in NR in-band.

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

Operating band: a frequency range in which NR, E-UTRA, UTRA or GSM/EDGE operates (paired or unpaired), that is defined with a specific set of technical requirements**.**

NOTE – The operating band(s) for a base station is declared by the manufacturer.

Sub-band: sub-band of an operating band contains a part of the uplink and downlink frequency range of the operating band.

Sub-block: one contiguous allocated block of spectrum for use by the same base station.

NOTE – There may be multiple instances of sub-blocks within a Base Station RF Bandwidth.

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

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

Superseding-band: superseding-band of an operating band includes the whole of the uplink and downlink frequency range of the operating band.

Single-RAT operation: operation of a base station in an operating band with only one RAT configured in that operating band.

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

Total output power: sum of all carrier powers for all carriers transmitted by the base station.

Transmission bandwidth: bandwidth of an instantaneous NR or E-UTRA transmission from a UE or base station, measured in resource block units.

Transmission bandwidth configuration: highest NR or E-UTRA transmission bandwidth allowed for uplink or downlink in a given channel bandwidth, measured in resource block units.

Transmitter OFF period: time period during which the base station transmitter is not allowed to transmit.

Unsynchronized operation: operation of TDD in two different systems, where the conditions for synchronized operation are not met.

Uplink operating band: part of the operating band designated for uplink.

Upper Base Station RF Bandwidth edge: frequency of the upper Base Station RF Bandwidth edge, used as a frequency reference point for transmitter and receiver requirements.

Upper sub-block edge: frequency at the upper edge of one sub-block.

NOTE – It is used as a frequency reference point for both transmitter and receiver requirements.

3.2 Symbols and abbreviations

$BW_{Channel}$	Channel bandwidth (for E-UTRA and NR).
BW_{Config}	Transmission bandwidth configuration (for E-UTRA), expressed in MHz, where $BW_{Config} = N_{RB} \times 180$ kHz in the uplink and $BW_{Config} = 15$ kHz + $N_{RB} \times 180$ kHz in the downlink. Transmission bandwidth configuration (for NR), where $BW_{Config} = N_{RB} \times SCS \times 12$.
f	Frequency

Δf Separation between the Base Station RF Bandwidth frequency and the nominal −3 dB point of the measuring filter closest to the carrier frequency.

Δf_{max} The largest value of Δf used for defining the requirement.

Δf_{OBUE} Maximum offset of the operating band unwanted emissions mask from the downlink operating band edge.

Δf_{OOB} Maximum offset of the out-of-band boundary from the uplink operating band edge.

F_{filter} Filter centre frequency.

f_offset Separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter.

f_offset_{max} The maximum value of *f_offset* used for defining the requirement.

$F_{BW\ RF,high}$ Upper Base Station RF Bandwidth edge, where $F_{BW\ RF,high} = F_{C,high} + F_{offset,\ RAT}$

$F_{BW\ RF,low}$ Lower Base Station RF Bandwidth edge, where $F_{BW\ RF,low} = F_{C,low} - F_{offset,\ RAT}$

$F_{offset,\ RAT}$ Frequency offset from the centre frequency of the *highest* transmitted/received carrier to the Upper Base Station RF Bandwidth edge, sub-block edge or Inter RF Bandwidth edge, or from the centre frequency of the *lowest* transmitted/received carrier to the Lower Base Station RF Bandwidth edge, sub-block edge or Inter RF Bandwidth edge for a specific RAT.

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.

$GB_{Channel}$ Minimum guard band defined in TS 38.104.

$P_{EM,B32,ind}$ Declared emission level in Band 32, Band 75 and Band 76, ind = a, b, c.

$P_{EM,B32,ind}$ Declared emission level in Band 32, ind= d, e.

$P_{EM,B50,B74,B75,ind}$ Declared emission level for Band 50, Band 74 and Band 75, ind=a, b.

$P_{Rated,c}$ Rated carrier output power.

W_{gap} Sub-block gap size or Inter RF Bandwidth gap size.

3.2.1 Abbreviations

ACLR Adjacent channel leakage ratio

BC Band Category

BS Base station

BW Bandwidth

DTT Digital terrestrial television

e.i.r.p. Effective isotropic radiated power

E-UTRA Evolved UTRA

FDD Frequency division duplex

ITU-R Radiocommunication Sector of the ITU

LA Local area

MR Medium range

MSR Multi standard radio

NB-IoT Narrowband – Internet of Things

OBUE Operating Band Unwanted Emissions
OoB Out-of-band
RAT Radio access technology
RB Resource block
RF Radio frequency
RRC Root raised cosine
RX Receiver
SNR Signal-to-noise ratio
TDD Time division duplex
TX Transmitter
UE User equipment
UEM Unwanted emission mark
UTRA Universal Terrestrial Radio Acccess
WA Wide area

3.3 Operating band unwanted emissions

The Operating band unwanted emission limits are defined from Δf_{OBUE} below the lowest frequency of each supported downlink operating band to the Lower Base Station RF Bandwidth edge located at $F_{BW\ RF,low}$ and from the Upper Base Station RF Bandwidth edge located at $F_{BW\ RF,high}$ up to Δf_{OBUE} above the highest frequency of each supported downlink operating band. In addition, for a BS operating in non-contiguous spectrum, it applies inside any sub-block gap. In addition, for a BS operating in multiple bands, it applies inside any Inter RF Bandwidth gap. The values of Δf_{OBUE} are defined in Table A1-99.

The requirements shall apply whatever the type of transmitter considered and for all transmission modes foreseen by the manufacturer's specification.

For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the single-band requirements apply and the cumulative evaluation of the emission limit in the Inter RF Bandwidth gap are not applicable.

The out-of-band emissions requirement for the BS transmitter is specified in terms of an Operating band unwanted emissions requirement that defines limits for emissions in each supported downlink operating band plus the frequency ranges Δf_{OBUE} above and Δf_{OBUE} below each band. Emissions outside of this frequency range are limited by a spurious emissions requirement. The values of Δf_{OBUE} are defined in Table A1-99. For a BS with multi-RAT operation where the individual RATs are in different RAT specific bands that partially or fully overlap; Δf_{OBUE} is according to the combined frequency range occupied by the overlapping bands.

TABLE A1-99

Maximum offset of OBUE outside the downlink operating band

Operating band characteristics	**Δf_{OBUE} (MHz)**
$FDL_{_high} - FDL_{_low} \leq 200$ MHz	10
200 MHz < $FDL_{_high} - FDL_{_low} \leq 900$ MHz	40

3.3.1 Operating band unwanted emissions for band categories 1 and 3

For a wide area BS operating in band category 1 or band category 3, the requirement applies outside the Base Station RF Bandwidth edges. In addition, for a wide area BS operating in non-contiguous spectrum, it applies inside any sub-block gap. In addition, for a wide area BS operating in multiple bands, it applies inside any Inter RF Bandwidth gap.

For a medium range BS operating in band category 1 the requirement applies outside the Base Station RF Bandwidth edges. In addition, for a medium range BS operating in non-contiguous spectrum, it applies inside any sub-block gap. In addition, for a medium range BS operating in multiple bands, it applies inside any Inter RF Bandwidth gap.

For a local area BS operating in band category 1 the requirement applies outside the Base Station RF Bandwidth edges. In addition, for a local area BS operating in non-contiguous spectrum, it applies inside any sub-block gap. In addition, for a local area BS operating in multiple bands, it applies inside any Inter RF Bandwidth gap.

Outside the Base Station RF Bandwidth edges, emissions shall not exceed the maximum levels specified in Tables A1-101 to A1-117 below, where:

– Δf is the separation between the Base Station RF Bandwidth edge frequency and the nominal −3 dB point of the measuring filter closest to the carrier frequency.

– *f_offset* is the separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter.

– f_offset_{max} is the offset to the frequency Δf_{OBUE} outside the downlink operating band.

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

For a BS operating in multiple bands, inside any Inter RF Bandwidth gaps with $W_{gap} < 2 * \Delta f_{OBUE}$, emissions shall not exceed the cumulative sum of the test requirements specified at the Base Station RF Bandwidth edges on each side of the Inter RF Bandwidth gap. The test requirement for Base Station RF Bandwidth edge is specified in Tables A1-101 to A1-117 below, where in this case:

– Δf is the separation between the Base Station RF Bandwidth edge frequency and the nominal −3 dB point of the measuring filter closest to the carrier frequency.

– *f_offset* is the separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter.

– f_offset_{max} is equal to the Inter RF Bandwidt gap.

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

For BS capable of multi-band operation where multiple bands are mapped on the same antenna connector, the operating band unwanted emission limits apply also in a supported operating band without any carriers transmitted, in the case where there are carriers transmitted in other supported operating band(s). In this case where there is no carrier transmitted in an operating band the operating band unwanted emission limit, as defined in the tables of the present clause for the largest frequency offset (Δf_{max}), of a band where there are no carriers transmitted shall apply from Δf_{OBUE} below the lowest frequency, up to Δf_{OBUE} above the highest frequency of the supported downlink operating band without any carrier transmitted. And no cumulative limits are applied in the inter-band gap between a supported downlink band with carrier(s) transmitted and a downlink band without any carrier transmitted.

Inside any sub-block gap for a BS operating in non-contiguous spectrum, emissions shall not exceed the cumulative sum of the test requirements specified for the adjacent sub-blocks on each side of the sub-block gap. The test requirement for each sub-block is specified in Tables A1-101 to A1-117 below, where in this case:

– Δf is the separation between the sub-block edge frequency and the nominal −3 dB point of the measuring filter closest to the sub-block edge frequency.

– *f_offset* is the separation between the sub-block edge frequency and the centre of the measuring filter.

– f_offset_{max} is equal to the sub-block gap bandwidth minus half of the bandwidth of the measuring filter.

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

For Band 41 NR operation in Japan, the operating band unwanted emissions limits shall be applied to the sum of the emission power over all antenna connectors.

Applicability of wide area operating band unwanted emission requirements in Tables A1-101/A1-102, A1-104 and A1-105/A1-106 is specified in Table A1-100.

NOTE – Option 1 and Option 2 correspond to the Category B option 1/2 operating band unwanted emissions defined in the E-UTRA and NR specifications TS 36.104 and TS 38.104. Option 2 also corresponds to the UTRA spectrum emission mask as defined in TS 25.104.

TABLE A1-100

Applicability of operating band unwanted emission requirements for BC1 and BC3 WA BS

NR band operation	Standalone NB-IoT carrier adjacent to the BS RF bandwidth edge or UTRA supported	Applicable requirement table
None	Y/N	3.3.1-1/1a (option 2)
In certain regions (Note 1), Bands 1, 7, 38, 65	N	3.3.1-1/1a (option 2)
Any	Y	3.3.1-1/1a (option 2)
Any below 1GHz	N	3.3.1-1c (option 1)
Any above 1GHz except for, in certain regions (Note 1), Bands 1, 7, 38, 65	N	3.3.1-1d/1e (option 1)

NOTE 1 – Applicable only for operation in regions where Category B limits as defined in Recommendation ITU-R SM.329 are used for which category B option 2 operating band unwanted emissions requirements as defined in TS 36.104 and TS 38.104 are applied.

TABLE A1-101

WA BS OBUEin BC1 and BC3 bands ≤ 3 GHz – option 2

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 6)**
0 MHz ≤ Δf < 0.2 MHz	0.015 MHz ≤ *f_offset* < 0.215MHz	–12.5 dBm	30 kHz
0.2 MHz ≤ Δf < 1 MHz	0.215 MHz ≤ *f_offset* < 1.015MHz	$-12.5\,\text{dBm} - 15 \cdot \left(\frac{f_offset}{\text{MHz}} - 0.215 \right) \text{dB}$ (Note 4)	30 kHz
(Note 5)	1.015 MHz ≤ *f_offset* < 1.5 MHz	–24.5 dBm (Note 4)	30 kHz
1 MHz ≤ $\Delta f \leq$ min(Δf_{max}, 10 MHz)	1.5 MHz ≤ *f_offset* < min(*f_offset*$_{max}$, 10.5 MHz)	–11.5 dBm (Note 4)	1 MHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < *f_offset*$_{max}$	–15 dBm (Note 4, 7)	1 MHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/MHz (for MSR BS supporting multi-band operation, either this limit or −16 dBm/100 kHz with correspondingly adjusted *f*_offset shall apply for this frequency offset range for operating bands < 1 GHz).

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2 \times \Delta f_{OBUE}$ the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

NOTE 3 – For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-104 apply for 0 MHz ≤ Δf < 0.15 MHz.

NOTE 4 – For MSR BS supporting multi-band operation, either this limit or −16 dBm/100 kHz with correspondingly adjusted f_offset shall apply for this frequency offset range for operating bands < 1 GHz.

TABLE A1-102

WA BS OBUE in BC1 and BC3 bands > 3 GHz– option 2

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 4)**
0 MHz ≤ Δf < 0.2 MHz	0.015 MHz ≤ *f_offset* < 0.215 MHz	–12.2 dBm	30 kHz
0.2 MHz ≤ Δf < 1 MHz	0.215 MHz ≤ *f_offset* < 1.015 MHz	$-12.2\,\text{dBm} - 15 \cdot \left(\frac{f_offset}{\text{MHz}} - 0.215 \right) \text{dB}$	30 kHz
(Note 3)	1.015 MHz ≤ *f_offset* < 1.5 MHz	–24.2 dBm	30 kHz
1 MHz ≤ Δf ≤ min(Δf_{max}, 10 MHz)	1.5 MHz ≤ *f_offset* < min(*f_offset*$_{max}$, 10.5 MHz)	–11.2 dBm	1 MHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < *f_offset*$_{max}$	–15 dBm (Note 5)	1 MHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –15 dBm/MHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2 \times \Delta f_{OBUE}$ the test requirement within the inter RF bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

TABLE A1-103

WA BS OBUE in BC1 and BC3 bands ≤ 3 GHz applicable for: BS with standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2, 3, 4)**	**Measurement bandwidth (Note 6)**
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(6.5dBm - 60 \cdot \left(\frac{f_{offset}}{MHz} - 0.015 \right) dB + X - 12.5dBm)$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$Max(3.5dBm - 160 \cdot \left(\frac{f_{offset}}{MHz} - 0.065 \right) dB + -12.5dBm)$	30 kHz

Notes to Table A1-103:

NOTE 1 – The limits in this Table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 3 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 4 – In case the carrier adjacent to the Base Station RF Bandwidth edge is a standalone NB-IoT carrier, the value of X = PNB-IoTcarrier – 43, where PNB-IoTcarrier is the power level of the standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge. In other cases, X = 0.

TABLE A1-104

WA BS OBUE in BC1 and BC3 bands ≤ 1 GHz - option 1

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 6)**
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	−5.5 dBm − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−12.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	−16 dBm (Note 7)	100 kHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band, the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be −16 dBm/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter Base Station RF Bandwidth gap < $2\times\Delta f$OBUE the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

TABLE A1-105

WA BS OBUE in BC1 and BC3 bands > 1 GHz and ≤ 3 GHz - option 1

Frequency offset of measurement filter –3 dB point, Δ*f*	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 6)**
0 MHz ≤ Δ*f* < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	−5.5dBm − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δ*f* < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−12.5 dBm	100 kHz
10 MHz ≤ Δ*f* ≤ Δf_{max}	10.5 MHz ≤ *f_offset* < f_offset_{max}	−15 dBm (Note 7)	1MHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band, the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be −15 dBm/1 MHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×Δ*f*OBUE the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

TABLE A1-106

WA BS OBUE in BC1 and BC3 bands above 3 GHz – option 1

Frequency offset of measurement filter –3 dB point, Δ*f*	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 6)**
0 MHz ≤ Δ*f* < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	−5.2 dBm − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δ*f* < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−12.2 dBm	100 kHz
10 MHz ≤ Δ*f* ≤ Δf_{max}	10.5 MHz ≤ *f_offset* < f_offset_{max}	−15 dBm (Note 7)	1 MHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band, the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be −15 dBm/1 MHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×Δ*f*OBUE the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

TABLE A1-107

MR BS OBUE in BC1 bands ≤ 3 GHz applicable for: BS with maximum output power $31 < P_{Rated,c} \leq 38$ dBm and not supporting NR; or BS with maximum output power $31 < P_{Rated,c} \leq 38$ dBm, supporting NR, and supporting UTRA

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 6)
0 MHz ≤ Δf < 0.6 MHz	0.015 MHz ≤ *f_offset* < 0.615 MHz	$P - 56.5\,\text{dB} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.015\right)\text{dB}$	30 kHz
0.6 MHz ≤ Δf < 1 MHz	0.615 MHz ≤ *f_offset* < 1.015 MHz	$P - 51.5\,\text{dB} - 15\cdot\left(\frac{f_offset}{\text{MHz}} - 0.215\right)\text{dB}$	30 kHz
(Note 5)	1.015 MHz ≤ *f_offset* < 1.5 MHz	P – 63.5 dB	30 kHz
1 MHz ≤ Δf ≤ 2.6 MHz	1.5 MHz ≤ *f_offset* < 3.1 MHz	P – 50.5 dB	1 MHz
2.6 MHz ≤ Δf ≤ 5 MHz	3.1 MHz ≤ *f_offset* < 5.5 MHz	min(P – 50.5 dB, –13.5 dBm)	1 MHz
5 MHz ≤ Δf ≤ min(Δf_{max}, 10MHz)	5.5 MHz ≤ *f_offset* < min (*f_offset*$_{max}$, 10.5 MHz)	P – 54.5 dB	1 MHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < *f_offset*$_{max}$	P – 56 dB (Note 7)	1 MHz

NOTE 1– For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq$ 10MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be (P – 56 dB)/MHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

NOTE 3 – For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-109 apply for 0 MHz ≤ Δf < 0.15 MHz.

TABLE A1-108

MR BS OBUE in BC1 for bands > 3 GHz applicable for: BS with maximum output power 31 < $P_{Rated,c}$ ≤ 38 dBm and not supporting NR; or BS with maximum output power 31 < $P_{Rated,c}$ ≤ 38 dBm supporting NR, and supporting UTRA

Frequency offset of measurement filter –3 dB point, Δ*f*	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 6)
0 MHz ≤ Δ*f* < 0.6 MHz	0.015 MHz ≤ *f_offset* < 0.615 MHz	$P - 56.2\ \text{dB} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.015\right)\text{dB}$	30 kHz
0.6 MHz ≤ Δ*f* < 1 MHz	0.615 MHz ≤ *f_offset* < 1.015 MHz	$P - 51.2\ \text{dB} - 15\cdot\left(\frac{f_offset}{\text{MHz}} - 0.215\right)\text{dB}$	30 kHz
(Note 5)	1.015 MHz ≤ *f_offset* < 1.5 MHz	*P* – 63.2 dB	30 kHz
1 MHz ≤ Δ*f* ≤ 2.6 MHz	1.5 MHz ≤ *f_offset* < 3.1 MHz	*P* – 50.2 dB	1 MHz
2.6 MHz ≤ Δ*f* ≤ 5 MHz	3.1 MHz ≤ *f_offset* < 5.5 MHz	min(*P* – 50.2 dB, −13.2 dBm)	1 MHz
5 MHz ≤ Δ*f* ≤ min(Δf_{max}, 10MHz)	5.5 MHz ≤ *f_offset* < min(*f_offset*$_{max}$,10.5 MHz)	*P* – 54.2 dB	1 MHz
10 MHz ≤ Δ*f* ≤ Δf_{max}	10.5 MHz ≤ *f_offset* < *f_offset*$_{max}$	*P* – 56 dB (Note 7)	1 MHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be (*P* – 56) dB/MHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×Δf_{OBUE} the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

TABLE A1-109

MR BS OBUE in BC1 bands ≤ 3 GHz applicable for: BS with maximum output power 31 < $P_{Rated,c}$ ≤ 38 dBm and with standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge

Frequency offset of measurement filter –3 dB point, Δ*f*	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2, 3)	Measurement bandwidth (Note 7)
0 MHz ≤ Δ*f* < 0.05 MHz (Note 1)	0.015 MHz ≤ *f_offset* < 0.065 MHz	$P_{Rated,c}$ − 36.5 dB − 60(*f_offset*/MHz-0.015) dB	30 kHz
0.05 MHz ≤ Δ*f* < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$P_{Rated,c}$ − 39.5 dB − 160(*f_offset*/MHz-0.065) dB	30 kHz

Notes to Table A1-109:

NOTE 1 – The limits in this Table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 3 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-110

MR BS OBUE in BC1 bands ≤ 3 GHz applicable for: BS with maximum output power 31 < $P_{Rated,c}$ ≤ 38 dBm, supporting NR, and not supporting UTRA

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 6)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$P_{Rated,c}$ – 51.5 dB - 7/5(*f_offset*/MHz-0.05)dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	$P_{Rated,c}$-58.5 dB	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	Min($P_{Rated,c}$−60 dB, −25 dBm) (Note 7)	100 kHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be Min($P_{Rated,c}$-60dB, −25 dBm)/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block.

NOTE 3 – For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-109 apply for 0 MHz ≤ Δf < 0.15 MHz

TABLE A1-111

MR BS OBUE in BC1 bands >3 GHz applicable for: BS with maximum output power 31 < $P_{Rated,c}$ ≤ 38 dBm, supporting NR, and not supporting UTRA

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 6)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$P_{Rated,c}$ − 51.2 dB − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	$P_{Rated,c}$−58.2 dB	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	Min($P_{Rated,c}$−60 dB, −25 dBm) (Note 7)	100 kHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be Min($P_{Rated,c}$-60 dB, −25 dBm)/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block.

TABLE A1-112

MR BS OBUE in BC1 for bands ≤ 3 GHz applicable for: BS with maximum output power $P_{Rated,c}$ ≤ 31 dBm and not supporting NR; or BS with maximum output power $P_{Rated,c}$ ≤ 31 dBm supporting NR, and supporting UTRA

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 6)
0 MHz ≤ Δf < 0.6 MHz	0.015MHz ≤ *f_offset* < 0.615 MHz	$-25.5\,\text{dBm} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.015\right)\text{dB}$	30 kHz
0.6 MHz ≤ Δf < 1 MHz	0.615MHz ≤ *f_offset* < 1.015 MHz	$-20.5\,\text{dBm} - 15\cdot\left(\frac{f_offset}{\text{MHz}} - 0.215\right)\text{dB}$	30 kHz
(Note 5)	1.015MHz ≤ f_offset < 1.5 MHz	–32.5 dBm	30 kHz
1 MHz ≤ Δf ≤ 5 MHz	1.5 MHz ≤ f_offset < 5.5 MHz	–19.5 dBm	1 MHz
5 MHz ≤ Δf ≤ min(Δf_{max},10 MHz)	5.5 MHz ≤ *f_offset* < min(f_offset_{max},10.5 MHz)	–23.5 dBm	1 MHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	–25 dBm (Note 5)	1 MHz

Notes to Table A1-112:

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –25 dBm/MHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

NOTE 3 – For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-114 apply for 0 MHz ≤ Δf < 0.15 MHz.

TABLE A1-113

MR BS OBUE in BC1 for bands > 3 GHz applicable for: BS with maximum output power $P_{Rated,c} \leq 31$ dBm and not supporting NR; or BS with maximum output power $P_{Rated,c} \leq 31$ dBm supporting NR, and supporting UTRA

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 6)
0 MHz ≤ Δf < 0.6 MHz	0.015 MHz ≤ *f_offset* < 0.615 MHz	$-25.2\ \text{dBm} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.015\right)\text{dB}$	30 kHz
0.6 MHz ≤ Δf < 1 MHz	0.615 MHz ≤ *f_offset* < 1.015 MHz	$-20.2\ \text{dBm} - 15\cdot\left(\frac{f_offset}{\text{MHz}} - 0.215\right)\text{dB}$	30 kHz
(Note 5)	1.015 MHz ≤ *f_offset* < 1.5 MHz	–32.2 dBm	30 kHz
1 MHz ≤ Δf ≤ 5 MHz	1.5 MHz ≤ *f_offset* < 5.5 MHz	–19.2 dBm	1 MHz
5 MHz ≤ Δf ≤ min(Δf_{max},10 MHz)	5.5 MHz ≤ *f_offset* < min(f_offset_{max},10.5 MHz)	–23.2 dBm	1 MHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	–25 dBm (Note 7)	1 MHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –25 dBm/MHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 20 MHz the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

TABLE A1-114

MR BS OBUE in BC1 bands ≤ 3 GHz applicable for: BS with maximum output power $P_{Rated,c}$ ≤ 31 dBm BS and standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge

Frequency offset of measurement filter –3 dB point, Δ*f*	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2, 3, 4)	Measurement bandwidth (Note 7)
0 MHz ≤ Δ*f* < 0.05 MHz (Note 1)	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(-5.5dBm - 60 \cdot \left(\frac{f_{offset}}{MHz} - 0.015 \right) dB + XdB, -25.5dBm)$	30 kHz
0.05 MHz ≤ Δ*f* < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$Max(-8.5dBm - 160 \cdot \left(\frac{f_{offset}}{MHz} - 0.065 \right) dB + XdB, -25.5dBm)$	30 kHz

NOTE 1 – The limits in this Table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 3 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 4 – In case the carrier adjacent to the Base Station RF Bandwidth edge is a standalone NB-IoT carrier, the value of X = PNB-IoTcarrier – 31, where PNB-IoTcarrier is the power level of the standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge. In other cases, X = 0.

TABLE A1-115

MR BS OBUE in BC1 bands ≤ 3 GHz applicable for: BS with maximum output power $P_{Rated,c}$ ≤ 31 dBm, supporting NR, and not supporting UTRA

Frequency offset of measurement filter –3 dB point, Δ*f*	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 6)
0 MHz ≤ Δ*f* < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	−20.5dBm − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δ*f* < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−27.5 dBm	100 kHz
10 MHz ≤ Δ*f* ≤ Δf_{max}	10.05 MHz ≤ *f_offset* < f_offset_{max}	−29 dBm (Note 7)	100 kHz

Notes to Table A1-115:

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq$ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be −29 dBm/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block.

NOTE 3 – For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-114 apply for 0 MHz ≤ Δf < 0.15 MHz.

TABLE A1-116

MR BS OBUE in BC1 bands >3 GHz applicable for: BS with maximum output power $P_{Rated,c} \leq$ 31 dBm, supporting NR, and not supporting UTRA

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 6)**
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	−20.2dBm − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−27.2 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	−29 dBm (Note 7)	100 kHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum *requirement* within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq$ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be −29 dBm/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block.

TABLE A1-117

LA BS OBUE in BC1 for bands ≤ 3 GHz

Frequency offset of measurement filter –3 dB point, Δ*f*	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 6)**
0 MHz ≤ Δ*f* < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-28.5\,\text{dBm} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
5 MHz ≤ Δ*f* < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–35.5 dBm	100 kHz
10 MHz ≤ Δ*f* ≤ Δf_{max}	10.05 MHz ≤ *f_offset* < f_offset_{max}	–37 dBm (Note 7)	100 kHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –37 dBm/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×Δf_{OBUE} 2×Δf_{OBUE} the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 3 – For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-119 apply for 0 MHz ≤ Δ*f* < 0.15 MHz

TABLE A1-118

LA BS OBUE in BC1 for bands > 3 GHz

Frequency offset of measurement filter –3 dB point, Δ*f*	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 6)**
0 MHz ≤ Δ*f* < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-28.2\,\text{dBm} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.05\right)\text{dB}$	100 kHz
5 MHz ≤ Δ*f* < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	–35.2 dBm	100 kHz
10 MHz ≤ Δ*f* ≤ Δf_{max}	10.05 MHz ≤ *f_offset* < f_offset_{max}	–37 dBm (Note 7)	100 kHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –37 dBm/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×Δf_{OBUE} the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-119

LA BS OBUE in BC1 bands ≤ 3 GHz applicable for: BS with standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 6)
0 MHz ≤ Δf < 0.05 MHz (Note 1)	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(-12.5dBm - 60 \cdot \left(\frac{f_{offset}}{MHz} - 0.015 \right) dB + XdB, -33.5dBm)$	30 kHz
0.05 MHz ≤ Δf < 0.16 MHz	0.065 MHz ≤ *f_offset* < 0.175 MHz	$Max(-15.5dBm - 160 \cdot \left(\frac{f_{offset}}{MHz} - 0.065 \right) dB + XdB, -33.5dBm)$	30 kHz

NOTE 1 – The limits in this table only apply for operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 2 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 3 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 4 – In case the carrier adjacent to the Base Station RF Bandwidth edge is a standalone NB-IoT carrier, the value of X = $P_{NB\text{-}IoTcarrier}$ – 24, where $P_{NB\text{-}IoTcarrier}$ is the power level of the standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge. In other cases, X = 0.

The following Notes are common to Tables A1-100 to A1-118.

NOTE 5 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 6 – As a general rule for the requirements in the present subclause, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 7 – The requirement is not applicable when $\Delta f_{max} < \Delta f_{OBUE}$.

3.3.2 Operating band unwanted emissions for band category 2

For a BS operating in band category 2 the requirement applies outside the Base Station RF Bandwidth edges. In addition, for a BS operating in non-contiguous spectrum, it applies inside any sub-block gap.

Outside the Base Station RF Bandwidth edges, emissions shall not exceed the maximum levels specified in Tables A1-121 to A1-132 below, where:

– Δf is the separation between the Base Station RF Bandwidth edge frequency and the nominal –3 dB point of the measuring filter closest to the carrier frequency;

– *f_offset* is the separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter;

– f_offset_{max} is the offset to the frequency Δf_{OBUE} outside the downlink operating band;

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

For a BS operating in multiple bands, inside any Inter RF Bandwidthwith W_{gap} < 2* Δf_{OBUE}, emissions shall not exceed the cumulative sum of the test requirements specified at the Base Station RF

Bandwidth edges on each side of the Inter RF Bandwidth gap. The test requirement for Base Station RF Bandwidth edge is specified in Tables A1-121 to A1-132 below, where in this case:

– Δf is the separation between the Base Station RF Bandwidth edge frequency and the nominal –3 dB point of the measuring filter closest to the carrier frequency.

– *f_offset* is the separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter.

– f_offset_{max} is equal to the Inter RF Bandwidth gap minus half of the bandwidth of the measuring filter.

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

For a BS capable of multi-band operation where multiple bands are mapped on the same antenna connector and where there is no carrier transmitted in an operating band, the operating band unwanted emission limit, as defined in the tables of the present clause for the largest frequency offset (Δf_{max}), of a band where there are no carriers transmitted shall apply from Δf_{OBUE} below the lowest frequency, up to Δf_{OBUE} above the highest frequency of the supported downlink operating band without any carrier transmitted. And no cumulative limits are applied in the inter-band gap between a supported downlink band with carrier(s) transmitted and a supported downlink band without any carrier transmitted.

Inside any sub-block gap for a BS operating in non-contiguous spectrum, emissions shall not exceed the cumulative sum of the test requirement specified for the adjacent sub-blocks on each side of the sub-block gap. The test requirement for each sub-block is specified in Tables A1-121 to A1-132 below, where in this case:

– Δf is the separation between the sub-block edge frequency and the nominal –3 dB point of the measuring filter closest to the sub-block edge;

– *f_offset* is the separation between the sub-block edge frequency and the centre of the measuring filter;

– f_offset_{max} is equal to the sub-block gap bandwidth minus half of the bandwidth of the measuring filter;

– Δf_{max} is equal to f_offset_{max} minus half of the bandwidth of the measuring filter.

Applicability of Wide Area operating band unwanted emission requirements in Tables A1-121, A1-123 and A1-124 is specified in Table A1-120.

NOTE – Option 1 and option 2 correspond to the Category B option 1/2 operating band unwanted emissions defined in the E-UTRA and NR specifications TS 36.104 and TS 38.104. Option 2 also corresponds to the UTRA spectrum emission mask as defined in TS 25.104 with GSM related modifications.

TABLE A1-120

Applicability of operating band unwanted emission requirements for BC2 WA BS

NR band operation	Standalone NB-IoT carrier adjacent to the BS RF bandwidth edge or UTRA supported	Applicable requirement table
None	Y/N	3.3.2-1 (option 2)
In certain regions (Note), Bands 3, 8	N	3.3.2-1 (option 2)
Any	Y	3.3.2-1 (option 2)
Any below 1 GHz except for, in certain regions (Note), Band 8	N	3.3.2-2a (option 1)
Any above 1 GHz except for, in certain regions (Note), Band 3	N	3.3.2-2b (option 1)

NOTE – Applicable only for operation in regions where Category B limits as defined in Recommendation ITU-R SM.329 are used for which category B option 2 operating band unwanted emissions requirements as defined in TS 36.104 and TS 38.104 are applied.

TABLE A1-121

WA BS OBUE in BC2–option 2

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 2, 3)	Measurement bandwidth (Note 9)
0 MHz ≤ Δf < 0.2 MHz (Note 1)	0.015 MHz ≤ *f_offset* < 0.215 MHz	−12.5 dBm	30 kHz
0.2 MHz ≤ Δf < 1 MHz	0.215 MHz ≤ *f_offset* < 1.015 MHz	$-12.5\,\text{dBm} - 15 \cdot \left(\frac{f_offset}{\text{MHz}} - 0.215 \right) \text{dB}$ (Note 4)	30 kHz
(Note 8)	1.015 MHz ≤ *f_offset* < 1.5 MHz	−24.5 dBm (Note 4)	30 kHz
1 MHz ≤ Δf ≤ min(Δf_{max}, 10 MHz)	1.5 MHz ≤ *f_offset* < min(*f_offset*$_{max}$, 10.5 MHz)	−11.5 dBm (Note 4)	1 MHz
10 MHz ≤ Δf ≤ Δf_{max}	10.5 MHz ≤ *f_offset* < *f_offset*$_{max}$	−15 dBm (Note 4, 10)	1 MHz

NOTE 1 – For operation with a GSM/EDGE or standalone NB-IoT or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-122 apply for 0 MHz ≤ Δf < 0.15 MHz.

NOTE 2 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq$ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be −15 dBm/MHz (for MSR BS supporting multi-band operation, either this limit or −16 dBm/100 kHz with correspondingly adjusted *f_offset* shall apply for this frequency offset range for operating bands < 1 GHz).

NOTE 3 – For MSR BS supporting multi-band operation with inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ operation the test requirement within the inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

NOTE 4 – For MSR BS supporting multi-band operation, either this limit or −16 dBm/100 kHz with correspondingly adjusted *f_offset* shall apply for this frequency offset range for operating bands < 1 GHz.

TABLE A1-122

WA BS OBUE in BC2 bands applicable for: BS with GSM/EDGE or standalone NB-IoT or E-UTRA 1.4 or 3 MHz carriers adjacent to the Base Station RF Bandwidth edge

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 5, 6, 7,8)	Measurement bandwidth (Note 9)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(6.5dBm - 60 \cdot \left(\frac{f_{offset}}{MHz} - 0.015 \right) dB + XdB, -12.5dBm)$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$Max(3.5dBm - 160 \cdot \left(\frac{f_{offset}}{MHz} - 0.065 \right) dB + XdB, -12.5dBm)$	30 kHz

NOTE 4 – The limits in this Table only apply for operation with a GSM/EDGE or standalone NB-IoT or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 5 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 6 – For MSR BS supporting multi-band operation with inter RF Bandwidth < $2\times\Delta f_{OBUE}$ the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 7 – In case the carrier adjacent to the Base Station RF Bandwidth edge is a GSM/EDGE carrier, the value of $X = P_{GSMcarrier} - 43$, where $P_{GSMcarrier}$ is the power level of the GSM/EDGE carrier adjacent to the Base Station RF Bandwidth edge. In other cases, $X = 0$.

NOTE 8 – In case the carrier adjacent to the Base Station RF Bandwidth edge is a NB-IoT carrier, the value of $X = P_{NB\text{-}IoTcarrier} - 43$, where $P_{NB\text{-}IoTcarrier}$ is the power level of the NB-IoT carrier adjacent to the Base Station RF Bandwidth edge. In other cases, X = 0.

TABLE A1-123

WA BS OBUE in BC2 bands ≤ 1 GHz – option 1

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 9)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	−5.5 dBm − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−12.5 dBm	100 kHz
10 MHz ≤ $\Delta f \le \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	−16 dBm (Note 10)	100 kHz

Notes to Table A1-123:

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band, the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be −16 dBm/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

NOTE 3 – For operation with an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1.122 apply for 0 MHz ≤ Δf < 0.15 MHz.

TABLE A1-124

WA BS OBUE in BC2 bands > 1 GHz – option 1

Frequency offset of measurement filter −3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 9)**
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	−5.5 dBm − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−12.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	−15 dBm (Note 10)	1 MHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band, the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be −15 dBm/1 MHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

NOTE 3 – For operation with an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-122 apply for 0 MHz ≤ Δf < 0.15 MHz

TABLE A1-125

MR BS OBUE in BC2, bands applicable for: BS with maximum output power $31 < P_{Rated,c} \leq 38$ dBm and not supporting NR; or BS with maximum output power $31 < P_{Rated,c} \leq 38$ dBm and supporting NR with UTRA and/or GSM

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 2, 3)	Measurement bandwidth (Note 9)
0 MHz ≤ Δf < 0.6 MHz (Note 1)	0.015MHz ≤ *f_offset* < 0.615 MHz	$P_{Rated,c}$ − 56.5 dB − 7/5(*f_offset*/MHz-0.015) dB	30 kHz
0.6 MHz ≤ Δf < 1 MHz	0.615MHz ≤ *f_offset* < 1.015 MHz	$P_{Rated,c}$ − 51.5 dB − 15(*f_offset*/MHz-0.215) dB	30 kHz
(Note 8)	1.015MHz ≤ *f_offset* < 1.5 MHz	$P_{Rated,c}$ – 63.5 dB	30 kHz
1 MHz ≤ Δf ≤ 2.8 MHz	1.5 MHz ≤ *f_offset* < 3.3 MHz	$P_{Rated,c}$ – 50.5 dB	1 MHz
2.8 MHz ≤ Δf ≤ 5 MHz	3.3 MHz ≤ *f_offset* < 5.5 MHz	min($P_{Rated,c}$ – 50.5 dB, −13.5 dBm)	1 MHz
5 MHz ≤ Δf ≤ min(Δf_{max}, 10 MHz)	5.5 MHz ≤ *f_offset* < min(*f_offset*$_{max}$,10.5MHz)	$P_{Rated,c}$ – 54.5 dB	1 MHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < *f_offset*$_{max}$	$P_{Rated,c}$ −56 dB (Note 10)	1 MHz

NOTE 1 – For operation with a GSM/EDGE or standalone NB-IoT or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-129 apply for 0 MHz ≤ Δf < 0.15 MHz.

NOTE 2 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be ($P_{Rated,c}$ – 56)dB/MHz.

NOTE 3 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

TABLE A1-126

MR BS OBUE in BC2 bands applicable for: BS with maximum output power $31 < P_{Rated,c} \leq 38$ dBm, supporting NR, not supporting UTRA, and not supporting GSM

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 1, 2)	Measurement bandwidth (Note 9)
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	$P_{Rated,c}$ − 51.5 dB − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	$P_{Rated,c}$−58.5 dB	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	Min($P_{Rated,c}$-60 dB, −25 dBm) (Note 10)	100 kHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq 10$ MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be Min($P_{Rated,c}$-60 dB, −25 dBm)/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block.

NOTE 3 – For operation with a standalone NB-IoT or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-129 apply for 0 MHz ≤ Δf < 0.15 MHz.

TABLE A1-127

MR BS OBUE in BC2 bands applicable for: BS with maximum output power $P_{Rated,c} \leq 31$ dBm and not supporting NR; or BS with maximum output power $P_{Rated,c} \leq 31$ dBm and supporting NR with UTRA and/or GSM

Frequency offset of measurement filter –3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 2, 3)	Measurement bandwidth (Note 9)
0 MHz ≤ Δf < 0.6 MHz (Note 1)	0.015 MHz ≤ *f_offset* < 0.615 MHz	$-25.5\text{dBm} - \frac{7}{5}\left(\frac{f_offset}{\text{MHz}} - 0.015\right)\text{dB}$	30 kHz
0.6 MHz ≤ Δf < 1 MHz	0.615 MHz ≤ *f_offset* < 1.015 MHz	$-20.5\text{dBm} - 15\cdot\left(\frac{f_offset}{\text{MHz}} - 0.215\right)\text{dB}$	30 kHz
(Note 8)	1.015 MHz ≤ *f_offset* < 1.5 MHz	−32.5 dBm	30 kHz
1 MHz ≤ Δf ≤ 5 MHz	1.5 MHz ≤ *f_offset* < 5.5 MHz	−19.5 dBm	1 MHz
5 MHz ≤ Δf ≤ min(Δf_{max},10MHz)	5.5 MHz ≤ *f_offset* < min(f_offset_{max},10.5 MHz)	−23.5 dBm	1 MHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.5 MHz ≤ *f_offset* < f_offset_{max}	−25 dBm (Note 10)	1 MHz

Notes to Table A1-127:

NOTE 1 – For operation with a GSM/EDGE or standalone NB-IoT or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-130 apply for 0 MHz ≤ Δf < 0.15 MHz.

NOTE 2 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq$ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –25 dBm/MHz.

NOTE 3 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < the test requirement within the Inter RF Bandwidthgaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block or Base Station RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or Base Station RF Bandwidth.

TABLE A1-128

MR BS OBUE in BC2 bands applicable for: BS with maximum output power $P_{Rated,c} \leq$ 31 dBm BS, supporting NR, not supporting UTRA, and not supporting GSM

Frequency offset of measurement filter –3 dB point, Δf	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 1, 2)**	**Measurement bandwidth (Note 9)**
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ *f_offset* < 5.05 MHz	−20.5 dBm − 7/5(*f_offset*/MHz-0.05) dB	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ *f_offset* < min(10.05 MHz, f_offset_{max})	−27.5 dBm	100 kHz
10 MHz ≤ $\Delta f \leq \Delta f_{max}$	10.05 MHz ≤ *f_offset* < f_offset_{max}	−29 dBm (Note 10)	100 kHz

NOTE 1 – For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is $\Delta f \geq$ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be −29 dBm/100 kHz.

NOTE 2 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2\times\Delta f_{OBUE}$ the minimum requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block.

NOTE 3 – For operation with a standalone NB-IoT or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-130 apply for 0 MHz ≤ Δf < 0.15 MHz.

TABLE A1-129

MR BS OBUE in BC2 bands applicable for: BS with maximum output power $31 < P_{Rated,c} \leq 38$ dBm and with GSM/EDGE or E-UTRA 1.4 or 3 MHz carriers or standalone NB-IoT adjacent to the Base Station RF Bandwidth edge

Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 5, 6)	Measurement bandwidth (Note 9)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$P_{Rated,c}$ − 36.5dB − 60(f_offset/MHz-0.015) dB $P - 36.5\text{dB} - 60 \cdot \left(\frac{f_{offset}}{\text{MHz}} - 0.015 \right) \text{dB}$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$P_{Rated,c}$ − 39.5 dB − 160(*f_offset*/MHz-0.065) dB	30 kHz

NOTE 4 – The limits in this Table only apply for operation with a GSM/EDGE or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 5 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 6 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2 \times \Delta f_{OBUE}$ the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

TABLE A1-130

MR BS OBUE in BC2 bands applicable for: BS with maximum output power $P_{Rated,c} \leq 31$ dBm and with GSM/EDGE or E-UTRA 1.4 or 3 MHz carriers or standalone NB-IoT adjacent to the Base Station RF Bandwidth

Frequency offset of measurement filter −3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Test requirement (Notes 5, 6, 7)	Measurement bandwidth (Note 9)
0 MHz ≤ Δf < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(-5.5\text{dBm} - 60 \cdot \left(\frac{f_{offset}}{\text{MHz}} - 0.015 \right) \text{dB} + X\text{dB}, -25.5\text{dBm})$	30 kHz
0.05 MHz ≤ Δf < 0.15 MHz	0.065 MHz ≤ *f_offset* < 0.165 MHz	$Max(-8.5\text{dBm} - 160 \cdot \left(\frac{f_{offset}}{\text{MHz}} - 0.065 \right) \text{dB} + X\text{dB}, -25.5\text{dBm})$	30 kHz

NOTE 4 – The limits in this Table only apply for operation with a GSM/EDGE or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 5 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 6 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < $2 \times \Delta f_{OBUE}$ the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth.

NOTE 7 – In case the carrier adjacent to the Base Station RF Bandwidth edge is a GSM/EDGE carrier, the value of $X = P_{GSMcarrier} - 31$, where $P_{GSMcarrier}$ is the power level of the GSM/EDGE carrier adjacent to the Base Station RF Bandwidth edge. In other cases, $X = 0$.

NOTE 8 – In case the carrier adjacent to the Base Station RF Bandwidth edge is a NB-IoT carrier, the value of $X = P_{NB\text{-}IoTcarrier} - 31$, where $P_{NB\text{-}IoTcarrier}$ is the power level of the NB-IoT carrier adjacent to the Base Station RF Bandwidth edge. In other cases, X = 0

TABLE A1-131

LA BS OBUE in BC2 bands

Frequency offset of measurement filter –3 dB point, Δ*f*	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 2, 3)**	**Measurement bandwidth (Note 9)**
0 MHz ≤ Δ*f* < 5 MHz (Note 1)	0.05 MHz ≤ *f_offset* < 5.05 MHz	$-28.5\text{dBm}-\frac{7}{5}\left(\frac{f_offset}{\text{MHz}}-0.05\right)\text{dB}$	100 kHz
5 MHz ≤ Δ*f* < min(10 MHz, $\Delta f_{\max}$)	5.05 MHz ≤ *f_offset* < min(10.05 MHz, $f_offset_{\max}$)	–35.5 dBm	100 kHz
10 MHz ≤ Δ*f* ≤ $\Delta f_{\max}$	10.05 MHz ≤ *f_offset* < $f_offset_{\max}$	–37 dBm (Note 7)	100 kHz

NOTE 1 – For operation with a GSM/EDGE or standalone NB-IoT or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table A1-132 apply for 0 MHz ≤ Δ*f* < 0.16 MHz.

NOTE 2 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum contributions from adjacent sub-blocks on each side of the sub-block gap. Exception is Δ*f* ≥ 10 MHz from both adjacent sub-blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be –37 dBm/100 kHz.

NOTE 3 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×Δf_{OBUE} the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the Inter RF Bandwidthgap.

TABLE A1-132

LA BS OBUE in BC2 bands applicable for: BS with GSM/EDGE or E-UTRA 1.4 or 3 MHz carriers or standalone NB-IoT adjacent to the Base Station RF Bandwidth edge

Frequency offset of measurement filter –3 dB point, Δ*f*	**Frequency offset of measurement filter centre frequency, *f_offset***	**Test requirement (Notes 5, 6, 7)**	**Measurement bandwidth (Note 9)**
0 MHz ≤ Δ*f* < 0.05 MHz	0.015 MHz ≤ *f_offset* < 0.065 MHz	$Max(-12.5dBm-60\cdot\left(\frac{f_{offset}}{MHz}-0.015\right)dB+ XdB,-33.5dBm)$	30 kHz
0.05 MHz ≤ Δ*f* < 0.16 MHz	0.065 MHz ≤ *f_offset* < 0.175 MHz	$Max(-15.5dBm-160\cdot\left(\frac{f_{offset}}{MHz}-0.065\right)dB+ XdB,-33.5dBm)$	30 kHz

NOTE 4 – The limits in this Table only apply for operation with a GSM/EDGE or an E-UTRA 1.4 or 3 MHz carrier adjacent to the Base Station RF Bandwidth edge.

NOTE 5 – For MSR BS supporting non-contiguous spectrum operation within any operating band the test requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap.

NOTE 6 – For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×Δf_{OBUE} the test requirement within the Inter RF Bandwidth gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks or Base Station RF Bandwidth on each side of the Inter RF Bandwidth gap.

NOTE 7 – In case the carrier adjacent to the Base Station RF Bandwidth edge is a GSM/EDGE carrier, the value of $X = P_{GSMcarrier} - 24$, where $P_{GSMcarrier}$ is the power level of the GSM/EDGE carrier adjacent to the Base Station RF Bandwidth edge. In other cases, $X = 0$.

The following Notes are common to Tables A1-121 to A1-132.

NOTE 8 – This frequency range ensures that the range of values of *f_offset* is continuous.

NOTE 9 – As a general rule for the requirements in the present subclause, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity and efficiency, the resolution bandwidth may be smaller than the measurement bandwidth. When the resolution bandwidth is smaller than the measurement bandwidth, the result should be integrated over the measurement bandwidth in order to obtain the equivalent noise bandwidth of the measurement bandwidth.

NOTE 10 – The requirement is not applicable when $\Delta f_{max} < \Delta f_{OBUE}$.

3.3.3 Additional requirements

3.3.3.1 Limits in FCC Title 47

In addition to the requirements in §§ 3.3.1 and 3.3.2, the BS may have to comply with the applicable emission limits established by FCC Title 47, when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer.

3.3.3.2 Unsynchronized operation for BC3

In certain regions, the following requirements may apply to a TDD BS operating in BC3 in the same geographic area and in the same operating band as another TDD system without synchronisation. For this case the emissions shall not exceed –52 dBm/MHz in the downlink operating band except in:

– The frequency range from 10 MHz below the Lower Base Station RF Bandwidth edge to the frequency 10 MHz above the Upper Base Station RF Bandwidth edge.

NOTE 1 – Local or regional regulations may specify another excluded frequency range, which may include frequencies where synchronised TDD systems operate.

NOTE 2 – TDD base stations that are synchronized and operating in BC3 can transmit without these additional co-existence requirements.

NOTE 3 – Unsynchronized operation for BC3 BS with any NR configuration is FFS.

3.3.3.3 Protection of DTT

In certain regions the following requirement may apply for protection of DTT. For a BS operating in Band 20, the level of emissions in the band 470-790 MHz, measured in an 8 MHz filter bandwidth on centre frequencies F_{filter} according to Table A1-133, shall not exceed the maximum emission level $P_{EM,N}$ declared by the manufacturer. This requirement applies in the frequency range 470-790 MHz even though part of the range falls in the spurious domain.

TABLE A1-133

Declared emissions levels for protection of DTT

Filter centre frequency, F_{filter}	Measurement bandwidth	Declared emission level (dBm)
$F_{filter} = 8*N + 306$ (MHz); $21 \leq N \leq 60$	8 MHz	$P_{EM,N}$

NOTE – The regional requirement is defined in terms of e.i.r.p. which is dependent on both the BS emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The requirement defined above provides the characteristics of the base station needed to verify compliance with the regional requirement.

3.3.3.4 Additional band 32, 50, 51, 74, 75 and 76 unwanted emissions

In certain regions, the following requirements may apply to BS operating in Band 32 within 1 452-1 492 MHz, in Band 75 within 1 432-1 517 MHz and in Band 76 within 1 427-1 432 MHz. The level of operating band unwanted emissions, measured on centre frequencies *f_offset* with filter bandwidth, according to Table A1-134, shall neither exceed the maximum emission level $P_{EM,B32,B75,B76,a}$, $P_{EM,B32,B75,B76,b}$ nor $P_{EM,B32,B75,B76,c}$ declared by the manufacturer.

For Band 32, this requirement applies in the frequency range 1 452-1 492 MHz when non-Mobile/Fixed Communications Network (MFCN) services are deployed in adjacent frequency ranges, while it applies also within 1 427-1 452 MHz and/or 1 492-1 517 MHz when MFCN services are deployed in such frequency ranges, even though part of the ranges falls in the spurious domain. For Band 75, this requirement applies in the frequency range 1 427-1 517 MHz. For Band 76, this requirement applies in the frequency range 1 432-1 517 MHz even though part of the range falls in the spurious domain.

TABLE A1-134

Declared operating band 32, 75 a,d 76 unwanted emission within 1 427-1 517 MHz

Frequency offset of measurement filter centre frequency, *f_offset*	Declared emission level (dBm)	Measurement bandwidth
2.5 MHz	$P_{EM,B32,B75,B76,a}$	5 MHz
7.5 MHz	$P_{EM,B32,B75,B76,b}$	5 MHz
12.5 MHz $\leq f_offset \leq f_offset_{max}$	$P_{EM,B32,B75,B76,c}$	5 MHz

NOTE – The regional requirement is defined in terms of EIRP per antenna, which is dependent on both the BS emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The requirement defined above provides the characteristics of the base station needed to verify compliance with the regional requirement. The assessment of the EIRP level is described in Annex H of TS 36.104.

In certain regions, the following requirement may apply to BS operating in Band 32 within 1 452-1 492 MHz for the protection of non-MFCN services in spectrum adjacent to the frequency range 1 452-1 492 MHz. The level of emissions, measured on centre frequencies F_{filter} with filter bandwidth according to Table A1-135, shall neither exceed the maximum emission level $P_{EM,B32,d}$ nor $P_{EM,B32,e}$ declared by the manufacturer. This requirement applies in the frequency range 1 429-1 518 MHz even though part of the range falls in the spurious domain.

TABLE A1-135

Operating band 32 declared emission outside 1 452-1 492 MHz

Filter centre frequency, F_{filter}	Declared emission level (dBm)	Measurement bandwidth
1 429.5 MHz $\leq F_{filter} \leq$ 1 448.5 MHz	$P_{EM,B32,d}$	1 MHz
F_{filter} = 1 450.5 MHz	$P_{EM,B32,e}$	3 MHz
F_{filter} = 1 493.5 MHz	$P_{EM,B32,e}$	3 MHz
1 495.5 MHz $\leq F_{filter} \leq$ 1 517.5 MHz	$P_{EM,B32,d}$	1 MHz

NOTE – The regional requirement is defined in terms of EIRP per antenna, which is dependent on both the BS emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The

requirement defined above provides the characteristics of the base station needed to verify compliance with the regional requirement. The assessment of the EIRP level is described in Annex H of TS 36.104.

In certain regions, the following requirement may apply to BS operating in Band 50 and Band 75 within 1 492-1 517 MHz and in Band 74 within 1 492-1 518 MHz. The level of emissions, measured on centre frequencies F_{filter} with filter bandwidth according to Table A1-136, shall neither exceed the maximum emission level $P_{EM,B50,B74,B75,a}$ nor $P_{EM,B50,B74,B75,b}$ declared by the manufacturer.

TABLE A1-136

Operating Bands 50, 74 and 75 declared emission above 1 518 MHz

Filter centre frequency, F_{filter}	Declared emission level (dBm)	Measurement bandwidth
1 518.5 MHz ≤ F_{filter} ≤ 1 519.5 MHz	$P_{EM,B50,B74,B75,a}$	1 MHz
1 520.5 MHz ≤ F_{filter} ≤ 1 558.5 MHz	$P_{EM,B50,B74,B75,b}$	1 MHz

NOTE – The regional requirement is defined in terms of EIRP per antenna, which is dependent on both the BS emissions at the antenna connector and the deployment (including antenna gain and feeder loss). The requirement defined above provides the characteristics of the base station needed to verify compliance with the regional requirement. The assessment of the EIRP level is described in Annex H of TS 36.104.

In certain regions, the following requirement may apply to E-UTRA or NR BS operating in Band 50 and Band 75 within 1 432-1 452 MHz, and in Band 51 and Band 76. Emissions shall not exceed the maximum levels specified in Table A1-137.

TABLE A1-137

Additional operating band unwanted emission limits for BS operating in Bands 50 and 75 within 1 432-1 452 MHz, and in Bands 51 and 76

Filter centre frequency, F_{filter}	Declared emission level (dBm)	Measurement bandwidth
F_{filter} = 1 413.5 MHz	−42	27 MHz

3.3.3.5 Additional requirements for band 48

The following requirement may apply to BS operating in Band 48 in certain regions. Emissions shall not exceed the maximum levels specified in Table A1-138.

TABLE A1-138

Additional operating band unwanted emission limits for Band 48

Channel bandwidth	Frequency offset of measurement filter −3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Minimum requirement	Measurement bandwidth
All	0 MHz ≤ Δf < 10 MHz	0.5 MHz ≤ *f_offset* < 9.5 MHz	−13 dBm	1 MHz

3.3.3.6 Additional requirements for band 53

The following requirement may apply to BS operating in Band 53 in certain regions. Emissions shall not exceed the maximum levels specified in Table A1-139.

TABLE A1-139

Additional operating band unwanted emission limits for Band 53

Channel band-width (MHz)	Frequency range (MHz)	Frequency offset of measurement filter −3 dB point, Δf	Frequency offset of measurement filter centre frequency, *f_offset*	Minimum require-ment	Measure-ment bandwidth
1.4, 3, 5	2 400-2 477.5	6 MHz ≤ Δf < 83.5MHz	6.5 MHz ≤ *f_offset* < 83 MHz	−25 dBm	1 MHz
10	2 400-2 473.5	10 MHz ≤ Δf < 83.5 MHz	10.5 MHz ≤ *f_offset* < 83 MHz	−25 dBm	1 MHz
1.4, 3, 5	2 477.5-2 478.5	5 MHz ≤ Δf < 6 MHz	5.5 MHz	−13 dBm	1 MHz
10	2 473.5-2 478.5	5 MHz ≤ Δf < 10 MHz	5.5 MHz ≤ *f_offset* < 9.5 MHz	−13 dBm	1 MHz
All	2 478.5-2 483.5	0 MHz ≤ Δf < 5 MHz	0.5 MHz ≤ *f_offset* < 4.5 MHz	−10 dBm	1 MHz
1.4, 3, 5	2 495-2 501	0 MHz ≤ Δf < 6 MHz	0.5 MHz ≤ *f_offset* < 5.5 MHz	−13 dBm	1 MHz
10	2 495-2 505	0 MHz ≤ Δf < 10 MHz	0.5 MHz ≤ *f_offset* < 9.5 MHz	−13 dBm	1 MHz
1.4, 3, 5	2 501-2 690	6 MHz ≤ Δf < 195 MHz	6.5 MHz ≤ *f_offset* < 194.5 MHz	−25 dBm	1 MHz
10	2 505-2 690	10 MHz ≤ Δf < 195 MHz	10.5 MHz ≤ *f_offset* < 194.5 MHz	−25 dBm	1 MHz

3.4 Adjacent channel leakage ratio (ACLR)

Refer to § 2.4.

3.5 Cumulative adjacent channel leakage ratio (CACLR)

The following test requirement applies for sub-block or Inter RF Bandwidth gap sizes listed in Table A1-140:

– Inside a sub-block gap within an operating band for a BS operating in non-contiguous spectrum.

– Inside an Inter RF Bandwidth gap for a BS operating in multiple bands, where multiple bands are mapped on the same antenna connector.

The cumulative adjacent channel leakage power ratio (CACLR) in a sub-block gap or the Inter RF Bandwidth gap is the ratio of

a) the sum of the filtered mean power centred on the assigned channel frequencies for the two carriers adjacent to each side of the sub-block gap or the Inter RF Bandwidth gap, and

b) the filtered mean power centred on a frequency channel adjacent to one of the respective sub-block edges or RF bandwidth edges.

The requirement applies to adjacent channels of E-UTRA or UTRA carriers allocated adjacent to each side of the sub-block gap or the Inter RF Bandwidth gap. The assumed filter for the adjacent channel frequency is defined in Table A1-140 and the filters on the assigned channels are defined in Table A1-141.

NOTE – If the RAT on the assigned channel frequencies are different, the filters used are also different.

For wide area category A BS, either the CACLR limits in Table A1-140 or the absolute limit of −13 dBm/MHz shall apply, whichever is less stringent.

For Wide Area Category B BS, either the CACLR limits in Table A1-140 or the absolute limit of −15 dBm/MHz shall apply, whichever is less stringent.

For Medium Range BS, either the CACLR limits in Table A1-140 or the absolute limit of −25 dBm/MHz shall apply, whichever is less stringent.

For local area BS, either the CACLR limits in Table A1-140 or the absolute limit of −32 dBm/MHz shall apply, whichever is less stringent.

The CACLR for E-UTRA and UTRA carriers located on either side of the sub-block gap or the Inter RF Bandwidth gap shall be higher than the value specified in Table A1-140.

TABLE A1-140

Base station CACLR in non-contiguous spectrum or multiple bands

Band category	**Sub-block or Inter RF Bandwidth gap size (W_{gap}) where the limit applies**	**BS adjacent channel centre frequency offset below or above the sub-block edge or the Baase station RF bandwidth edge (inside the gap)**	**Assumed adjacent channel carrier (informative)**	**Filter on the adjacent channel frequency and corresponding filter bandwidth**	**CACLR limit (dB)**
BC1, BC2	5 MHz ≤ W_{gap} < 15 MHz (2)	2.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2
BC1, BC2	10 MHz ≤ W_{gap} < 20 MHz (2)	7.5 MHz	3.84 Mcps UTRA	RRC (3.84 Mcps)	44.2
BC3	5 ≤ W_{gap} < 15 MHz (2)	2.5 MHz	5 MHz E-UTRA	Square (BW_{Config})	44.2
BC3	10 < W_{gap} < 20 MHz (2)	7.5 MHz	5 MHz E-UTRA	Square (BW_{Config})	44.2
BC1, BC2, BC3	5 MHz ≤ W_{gap} < 45 MHz (3)	2.5 MHz	5 MHz NR (1)	Square (BW_{Config})	44.2
BC1, BC2, BC3	10 ≤ W_{gap} < 50 MHz (3)	7.5 MHz	5 MHz NR (1)	Square (BW_{Config})	44.2

TABLE A1-140 (*end*)

Band category	Sub-block or Inter RF Bandwidth gap size (W_{gap}) where the limit applies	BS adjacent channel centre frequency offset below or above the sub-block edge or the Baase station RF bandwidth edge (inside the gap)	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	CACLR limit (dB)
BC1, BC2, BC3	20 MHz < W_{gap} < 30 MHz (2), (4)	10 MHz	20 MHz NR (1)	Square (BW_{Config})	44.2
BC1, BC2, BC3	20 ≤ W_{gap} < 60 MHz (3)	10 MHz	20 MHz NR (1)	Square (BW_{Config})	44.2
BC1, BC2, BC3	40 ≤ W_{gap} < 50 MHz (2), (4)	30 MHz	20 MHz NR (1)	Square (BW_{Config})	44.2
BC1, BC2, BC3	40 ≤ W_{gap} < 80 MHz (3)	30 MHz	20 MHz NR (1)	Square (BW_{Config})	44.2

(1) With SCS that provides largest transmission bandwidth configuration (BW_{Config}).

(2) Applicable in case the channel bandwidth of the carrier transmitted at the other edge of the gap is 5, 10, 15, 20 MHz.

(3) Applicable in case the channel bandwidth of the NR carrier transmitted at the other edge of the gap is 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz.

(4) Applicable in case the *channel bandwidth* of the lowest/highest NR carrier transmitted is 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz.

NOTE – For BC1 and BC2 the RRC filter shall be equivalent to the transmit pulse shape filter defined in 3GPP TS 25.104, with a chip rate as defined in this Table.

TABLE A1-141

Filter parameters for the assigned channel

RAT of the carrier adjacent to the sub-block or Inter RF Bandwidthgap	Filter on the assigned channel frequency and corresponding filter bandwidth
E-UTRA	E-UTRA of same BW
UTRA FDD	RRC (3.84 Mcps)
NR	NR of same BW with SCS that provides largest transmission bandwidth configuration

NOTE 1 – The RRC filter shall be equivalent to the transmit pulse shape filter defined in 3GPP TS 25.104, with a chip rate as defined in this Table.

3.6 Transmitter spurious emissions

The test requirements of either § 3.6.1 (category A limits) or § 3.6.2 (category B limits) shall apply. In addition for a BS operating in band category 2, the test requirements of § 3.6.1.3 shall apply in case of category B limits.

3.6.1 Spurious emissions (category A)

The power of any spurious emission shall not exceed the limits in Table A1-142.

TABLE A1-142

BS spurious emission limits, Category A

Frequency range	Maximum level	Measurement bandwidth	Note
9 kHz – 150 kHz	–13 dBm	1 kHz	Note 1
150 kHz – 30 MHz		10 kHz	Note 1
30 MHz – 1 GHz		100 kHz	Note 1
1 GHz – 12.75 GHz	–13 dBm	1 MHz	Note 2
12.75 GHz – 5th harmonic of the upper frequency edge of the DL operating band in GHz		1 MHz	Notes 2, 3

NOTE 1 – Bandwidth as in Recommendation ITU-R SM.329, § 4.1.

NOTE 2 – Bandwidth as in Recommendation ITU-R SM.329, § 4.1. Upper frequency as in Recommendation ITU-R SM.329, § 2.5, Table 1.

NOTE 3 – This spurious frequency range applies only for *operating bands* for which the 5th harmonic of the upper frequency edge of the DL *operating band* is reaching beyond 12.75 GHz.

3.6.2 Spurious emissions (category B)

The power of any spurious emission shall not exceed the limits in Table A1-143.

TABLE A1-143

BS Spurious emissions limits, Category B

Frequency range	Maximum level	Measurement bandwidth	Note
9 kHz ↔ 150 kHz	–36 dBm	1 kHz	Note 1
150 kHz ↔ 30 MHz	–36 dBm	10 kHz	Note 1
30 MHz ↔ 1 GHz	–36 dBm	100 kHz	Note 1
1 GHz ↔ 12.75 GHz	–30 dBm	1 MHz	Note 2
12.75 GHz ↔ 5th harmonic of the upper frequency edge of the DL operating band in GHz	–30 dBm	1 MHz	Notes 2, 3

NOTE 1 – Bandwidth as in Recommendation ITU-R SM.329, § 4.1.

NOTE 2 – Bandwidth as in Recommendation ITU-R SM.329, § 4.1. Upper frequency as in Recommendation ITU-R SM.329, § 2.5 Table 1.

NOTE 3 – This spurious frequency range applies only for *operating bands* for which the 5th harmonic of the upper frequency edge of the DL *operating band* is reaching beyond 12.75 GHz.

3.6.3 Protection of the BS receiver of own or different BS

This requirement shall be applied for FDD operation in order to prevent the receivers of base stations being desensitised by emissions from the BS transmitter. It is measured at the transmit antenna port for any type of BS which has common or separate Tx/Rx antenna ports.

The power of any spurious emission shall not exceed the limits in Table A1-144, depending on the declared base station class and band category.

TABLE A1-144

BS Spurious emissions limits for protection of the BS receiver

BS Class	Band category	Frequency range	Maximum level	Measurement bandwidth	Note
Wide area BS	BC1	$F_{UL_low} - F_{UL_high}$	–96 dBm	100 kHz	–
Wide area BS	BC2	$F_{UL_low} - F_{UL_high}$	–98 dBm	100 kHz	–
Medium range BS	BC1,BC2	$F_{UL_low} - F_{UL_high}$	–91 dBm	100 kHz	–
Local area BS	BC1,BC2	$F_{UL_low} - F_{UL_high}$	–88 dBm	100 kHz	–

NOTE 1 – For E-UTRA Band 28 BS operating in regions where Band 28 is only partially allocated for E-UTRA operations, this requirement only applies in the UL frequency range of the partial allocation.

3.6.4 Additional spurious emission requirements

These requirements may be applied for the protection of system operating in frequency ranges other than the BS downlink operating band. The limits may apply as an optional protection of such systems that are deployed in the same geographical area as the BS, or they may be set by local or regional regulation as a mandatory requirement for an operating band. It is in some cases not stated in the present document whether a requirement is mandatory or under what exact circumstances that a limit applies, since this is set by local or regional regulation.

Some requirements may apply for the protection of specific equipment (UE, MS and/or BS) or equipment operating in specific systems (GSM/EDGE, CDMA, UTRA, E-UTRA, NR, etc.) as listed below. The power of any spurious emission shall not exceed the limits of Table A1-145 for a BS where requirements for co-existence with the system listed in the first column apply.

For BS capable of multi-band operation, the exclusions and conditions in the Note column of Table A1-145 apply for each supported operating band. For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the exclusions and conditions in the Note column of Table A1-145 apply for the operating band supported at that antenna connector.

TABLE A1-145

BS spurious emissions limits for co-existence with systems operating in other frequency bands

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
GSM900	921-960 MHz	–57 dBm	100 kHz	This requirement does not apply to BS operating in Band 8.
	876-915 MHz	–61 dBm	100 kHz	For the frequency range 880-915 MHz, this requirement does not apply to BS operating in Band 8.
DCS1800 (Note 3)	1 805-1 880 MHz	–47 dBm	100 kHz	This requirement does not apply to BS operating in Band 3.
	1 710-1 785 MHz	–61 dBm	100 kHz	This requirement does not apply to BS operating in Band 3.
PCS1900	1 930-1 990 MHz	–47 dBm	100 kHz	This requirement does not apply to BS operating in Band 2, 25, 36 or Band 70.
	1 850-1 910 MHz	–61 dBm	100 kHz	This requirement does not apply to BS operating in Band 2 or 25. This requirement does not apply to BS operating in Band 35.

TABLE A1-145 (*continued*)

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
GSM850 or CDMA850	869-894 MHz	–57 dBm	100 kHz	This requirement does not apply to BS operating in Band 5 or 26. This requirement applies to E-UTRA BS operating in Band 27 for the frequency range 879-894 MHz.
	824-849 MHz	–61 dBm	100 kHz	This requirement does not apply to BS operating in Band 5 or 26. For BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band.
UTRA FDD Band I or E-UTRA Band 1 or NR Band n1	2 110-2 170 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 1 or 65.
	1 920-1 980 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 1 or 65.
UTRA FDD Band II or E-UTRA Band 2 or NR Band n2	1 930-1 990 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 2, 25 or 70.
	1 850-1 910 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 2 or 25.
UTRA FDD Band III or E-UTRA Band 3 or NR Band n3 (Note 3)	1 805-1 880 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 3 or 9.
	1 710-1 785 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 3. For BS operating in band 9, it applies for 1 710 MHz to 1 749.9 MHz and 1 784.9 MHz to 1785 MHz.
UTRA FDD Band IV or E-UTRA Band 4	2 110-2 155 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 4, 10 or 66.
	1 710-1 755 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 4, 10 or 66.
UTRA FDD Band V or E-UTRA Band 5 or NR Band n5	869-894 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 5 or 26. This requirement applies to E-UTRA BS operating in Band 27 for the frequency range 879-894 MHz.
	824-849 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 5 or 26. For BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band.

TABLE A1-145 (*continued*)

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
UTRA FDD Band VI, XIX or E-UTRA Bands 6, 18, 19 or NR Band n18	860-890 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Bands 6, 18, 19.
	815-830 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 18.
	830-845 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Bands 6, 19.
UTRA FDD Band VII or E-UTRA Band 7 or NR Band n7	2 620-2 690 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 7.
	2 500-2 570 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 7.
UTRA FDD Band VIII or E-UTRA Band 8 or NR Band n8	925-960 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 8.
	880-915 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 8.
UTRA FDD Band IX or E-UTRA Band 9	1 844.9-1 879.9 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 3 or 9.
	1 749.9-1 784.9 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 3 or 9.
UTRA FDD Band X or E-UTRA Band 10	2 110-2 170 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 4, 10 or 66.
	1 710-1 770 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Bands 10, 66. For BS operating in Band 4, it applies for 1 755 MHz to 1 770 MHz.
UTRA FDD Band XI or XXI or E-UTRA Band 11 or 21	1 475.9-1 510.9 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 11, 21, 32, 50, 74 or 75.
	1 427.9-1 447.9 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 11 or 74. This requirement does not apply to BS operating in Band 32, 50, 51, 75 or 76.
	1 447.9-1 462.9 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 21, 74. This requirement does not apply to BS operating in Band 32, 50 or 75.
UTRA FDD Band XII or E-UTRA Band 12 or NR Band n12	729-746 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 12 or 85.
	699-716 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 12 or 85. For BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 7).
UTRA FDD Band XIII or E-UTRA Band 13	746-756 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 13.
	777-787 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 13.

TABLE A1-145 (*continued*)

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
UTRA FDD Band XIV or E-UTRA Band 14 or NR Band n14	758-768 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 14.
	788-798 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 14.
E-UTRA Band 17	734-746 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 17.
	704-716 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 17. For BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 7).
UTRA FDD Band XX or E-UTRA Band 20 or NR Band n20	791-821 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 20 or 28.
	832-862 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 20.
UTRA FDD Band XXII or E-UTRA Band 22	3 510–3 590 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 22, 42, 48, 49, 77 or 78.
	3 410-3 490 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 22. This requirement does not apply to Band 42, 77 or 78.
E-UTRA Band 24	1 525-1 559 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 24.
	1626.5-1 660.5 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 24.
UTRA FDD Band XXV or E-UTRA Band 25 or NR Band n25	1 930-1 995 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 2, 25 or 70
	1 850-1 915 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 25. For BS operating in Band 2, it applies for 1 910 MHz to 1 915 MHz.

TABLE A1-145 (*continued*)

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
UTRA FDD Band XXVI or E-UTRA Band 26 or NR Band n26	859-894 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 5 or 26. This requirement applies to E-UTRA BS operating in Band 27 for the frequency range 879-894 MHz.
	814-849 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 26. For BS operating in Band 5, it applies for 814 MHz to 824 MHz. For BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band.
E-UTRA Band 27	852-869 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 5, 26 or 27.
	807-824 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 27. For BS operating in Band 26, it applies for 807 MHz to 814 MHz. This requirement also applies to BS operating in Band 28, starting 4 MHz above the Band 28 downlink operating band (Note 6).
E-UTRA Band 28 or NR Band n28	758-803 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 20, 28, 44 or 67.
	703-748 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 28. This requirement does not apply to BS operating in Band 44. For BS operating in Band 67, it applies for 703-736 MHz. For E-UTRA BS operating in Band 68, it applies for 728 MHz to 733 MHz.
E-UTRA Band 29 or NR Band n29	717-728 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 29 or 85.
E-UTRA Band 30 or NR Band n30	2 350-2 360 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 30 or 40.
	2 305-2 315 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 30. This requirement does not apply to BS operating in Band 40.
E-UTRA Band 31	462.5-467.5 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 31, 72 or 73.
	452.5-457.5 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 31. This requirement does not apply to BS operating in Band 72 or 73.
UTRA FDD Band XXXII or E-UTRA Band 32	1 452-1 496 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 11, 21, 32, 50, 74 or 75.
UTRA TDD Band a) or E-UTRA Band 33	1 900-1 920 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 33.
UTRA TDD Band a) or E-UTRA Band 34 or NR Band n34	2 010-2 025 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 34.
UTRA TDD Band b) or E-UTRA Band 35	1 850-1 910 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 35.

TABLE A1-145 (*continued*)

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
UTRA TDD Band b) or E-UTRA Band 36	1 930-1 990 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 2, 25 or 36.
UTRA TDD in Band c) or E-UTRA Band 37	1 910-1 930 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 37. This unpaired band is defined in ITU-R M.1036, pending any future deployment.
UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38	2 570-2 620 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 38 or 69.
UTRA TDD Band f) or E-UTRA Band 39 or NR Band n39	1 880-1 920 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 39.
UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40	2 300-2 400 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 30 or 40.
E-UTRA Band 41 or NR Band n41	2 496-2 690 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 41 or 53.
E-UTRA Band 42	3 400-3 600 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 22, 42, 43, 48, 49, 52, 77 or 78.
E-UTRA Band 43	3 600-3 800 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 42, 43, 48, 49, 77 or 78.
E-UTRA Band 44	703-803 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 28 or 44.
E-UTRA Band 45	1 447-1 467 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 45.
E-UTRA Band 46 or NR Band n46	5 150-5 925 MHz	–52 dBm	1 MHz	
E-UTRA Band 47	5 855-5 925 MHz	–52 dBm	1 MHz	
E-UTRA Band 48 or NR Band n48	3 550-3 700 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 22, 42, 43, 48, 49, 77 or 78.
E-UTRA Band 49	3 550-3 700 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 22, 42, 43, 48, 49, 77 or 78.
E-UTRA Band 50 or NR Band n50	1 432-1 517 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 45, 50, 51, 74, 75 or 76.
E-UTRA Band 51 or NR Band n51	1 427-1 432 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 50, 51, 75 or 76.
E-UTRA Band 52	3 300-3 400 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 42 or 52.
E-UTRA Band 53 or NR Band n53	2 483.5-2 495 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 41 or 53.
E-UTRA Band 65 or NR Band n65	2 110-2 200 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 1 or 65.

TABLE A1-145 (*continued*)

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
	1 920-2 010 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 65. For BS operating in Band 1, it applies for 1 980 MHz to 2 010 MHz.
E-UTRA Band 66 or NR Band n66	2 110-2 200 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 4, 10, 23 or 66.
	1 710-1 780 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 66. For BS operating in Band 4, it applies for 1 755 MHz to 1 780 MHz. For BS operating in Band 10, it applies for 1 770 MHz to 1 780 MHz
E-UTRA Band 67	738-758 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 28 or 67.
E-UTRA Band 68	753-783 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 28 or 68.
	698-728 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 68. For BS operating in Band 28, it applies between 698 MHz and 703 MHz.
E-UTRA Band 69	2 570-2 620 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 38 or 69.
E-UTRA Band 70 or NR Band n70	1 995-2 020 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 2, 25 or 70.
	1 695-1 710 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 70.
E-UTRA Band 71 or NR Band n71	617-652 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 71.
	663-698 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 71.
E-UTRA Band 72	461-466 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 31, 72 or 73.
	451-456 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 72. This requirement does not apply to BS operating in band 73.
E-UTRA Band 73	460-465 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 31, 72 or 73.
	450-455 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 73.
E-UTRA Band 74 or NR Band n74	1 475-1 518 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 11, 21, 32, 50, 74 or 75.
	1 427-1 470 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 74. This requirement does not apply to BS operating in Band 32, 45, 50, 51, 75 or 76.
E-UTRA Band 75 or NR Band n75	1 432-1 517 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 11, 21, 32, 45, 50, 51, 74, 75 or 76.
E-UTRA Band 76 or NR Band n76	1 427-1 432 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 50, 51, 75 or 76.

TABLE A1-145 (*continued*)

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
NR Band n77	3 300-4 200 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 22, 42, 43, 48, 49, 52, 77 or 78.
NR Band n78	3 300-3 800 MHz	–52 dBm	1 MHz	This is not applicable to BS operating in Band 22, 42, 43, 48, 49, 52, 77 or 78.
NR Band n79	4 400-5 000 MHz	–52 dBm	1 MHz	
NR Band n80	1 710-1 785 MHz	–-49 dBm	1 MHz	This requirement does not apply to BS operating in Band 3. For BS operating in Band 9, it applies for 1 710 MHz to 1 749.9 MHz and 1 784.9 MHz to 1 785 MHz.
NR Band n81	880-915 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 8.
NR Band n82	832-862 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 20.
NR Band n83	703-748 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 28. This requirement does not apply to BS operating in Band 44. For BS operating in Band 67, it applies for 703-736 MHz. For BS operating in Band 68, it applies for 728 MHz to 733 MHz.
NR Band n84	1 920-1 980 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 1 or 65.
E-UTRA Band 85	728-746 MHz	–52 dBm	1 MHz	This requirement does not apply to BS operating in Band 12, 29 or 85.
	698-716 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 85. For BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 7).
NR Band n86	1 710-1 780 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 66. For BS operating in Band 4, it applies for 1 755 MHz to 1 780 MHz. For BS operating in Band 10, it applies for 1 770 MHz to 1 780 MHz.
E-UTRA Band 87	420-425 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 87 or 88.
	410-415 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 87.
E-UTRA Band 88	422-427 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 87 or 88.
	412-417 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 88. This requirement does not apply to E-UTRA BS operating in Band 87.
NR Band n89	824-849 MHz	–49 dBm	1 MHz	This requirement does not apply to BS operating in Band 5 or 26. For BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band.

TABLE A1-145 (*end*)

System type to co-exist with	Frequency range for co-existence requirement	Maximum level	Measurement bandwidth	Note
NR Band n91	1 427-1 432 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 50, 51, 75 or 76.
	832-862 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 20.
NR Band n92	1 432-1 517 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 45, 50, 51, 74, 75 or 76.
	832-862 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 20.
NR Band n93	1 427-1 432 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 50, 51, 75 or 76.
	880-915 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 8.
NR Band n94	1 432-1 517 MHz	–52 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 11, 21, 32, 45, 50, 51, 74, 75 or 76.
	880-915 MHz	–49 dBm	1 MHz	This requirement does not apply to E-UTRA BS operating in Band 8.
NR Band n95	2 010-2 025 MHz	–52 dBm	1 MHz	
NR Band n96	5 925-7 125 MHz	–52 dBm	1 MHz	

NOTE 1 – As defined in the scope for spurious emissions in this subclause, except for the cases where the noted requirements apply to a BS operating in Band 25, Band 27, Band 28 or Band 29, the co-existence requirements in Table A1-145 do not apply for the 10 MHz frequency range immediately outside the downlink operating band. Emission limits for this excluded frequency range may be covered by local or regional requirements.

NOTE 2 – Table A1-145 assumes that two operating bands, where the frequency ranges would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-existence requirements may apply that are not covered by these specifications.

NOTE 3 – For the protection of DCS1800, UTRA Band III or E-UTRA Band 3 or NR Band n3 in China, the frequency ranges of the downlink and uplink protection requirements are 1 805-1 850 MHz and 1 710-1 755 MHz respectively.

NOTE 4 – TDD base stations deployed in the same geographical area, that are synchronized and use the same or adjacent operating bands can transmit without additional co-existence requirements. For unsynchronized (except in Band 46), base stations, special co-existence requirements may apply that are not covered by these specifications.

NOTE 5 – Void

NOTE 6 – For Band 28 BS, specific solutions may be required to fulfil the spurious emissions limits for BS for co-existence with Band 27 UL operating band.

NOTE 7 – For Band 29 BS, specific solutions may be required to fulfil the spurious emissions limits for BS for co-existence with UTRA Band XII or E-UTRA Band 12 or NR Band n12 UL operating band or E-UTRA Band 17 UL operating band or E-UTRA Band 85 UL operating band.

The following requirement may be applied for the protection of PHS. This requirement is also applicable at specified frequencies falling between Δf_{OBUE} below the lowest BS transmitter frequency of the downlink operating band and Δf_{OBUE} above the highest BS transmitter frequency of the downlink operating band.

The power of any spurious emission shall not exceed:

TABLE A1-146

BS spurious emissions limits for BS for co-existence with PHS

Frequency range	Maximum level	Measurement bandwidth	Note
1 884.5-1 915.7 MHz	–41 dBm	300 kHz	Applicable for co-existence with PHS system operating in 1 884.5-1 915.7 MHz

NOTE – The requirement is not applicable in China.

The following requirement may apply to E-UTRA BS operating in Band 41 in certain regions. This requirement is also applicable at the frequency range from Δf_{OBUE} below the lowest frequency of the BS downlink operating band up to Δf_{OBUE} above the highest frequency of the BS downlink operating band.

For Band 41 NR operation, the additional BS spurious emissions limits shall be applied to the sum of the emission power over all *antenna connectors.*

The power of any spurious emission shall not exceed:

TABLE A1-147

Additional BS spurious emissions limits for BS operating in Band 41

Frequency range	Maximum level	Measurement bandwidth	Note
2 505 MHz-2 535 MHz	–42 dBm	1 MHz	–

NOTE – This requirement applies for 10 or 20 MHz E-UTRA carriers allocated within 2 545-2 645 MHz

In addition to the requirements in §§ 3.6.1 to 3.6.4 and above in the present subclause, the BS may have to comply with the applicable emission limits established by FCC Title 47, when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer.

The following requirement may apply to BS operating in Band 30 in certain regions. This requirement is also applicable at the frequency range from 10 MHz below the lowest frequency of the BS downlink operating band up to 10 MHz above the highest frequency of the BS downlink operating band.

The power of any spurious emission shall not exceed:

TABLE A1-148

Additional BS spurious emissions limits for Band 30

Frequency range	Maximum level	Measurement bandwidth	Note
2 200 MHz-2 345 MHz	–45 dBm	1 MHz	
2 362.5 MHz-2 365 MHz	–25 dBm	1 MHz	
2 365 MHz-2 367.5 MHz	–40 dBm	1 MHz	
2 367.5 MHz-2 370 MHz	–42 dBm	1 MHz	
2 370 MHz-2 395 MHz	–45 dBm	1 MHz	

In certain regions the following requirement may apply to E-UTRA BS operating in Band 45. Emissions shall not exceed the maximum levels specified in Table A1-149.

TABLE A1-149

Emissions limits for protection of adjacent band services

Operating Band	Filter centre frequency, F_{filter}	Maximum level (dBm)	Measurement bandwidth
45	F_{filter} = 1 467.5	–20	1 MHz
	F_{filter} = 1 468.5	–23	1 MHz
	F_{filter} = 1 469.5	–26	1 MHz
	F_{filter} = 1 470.5	–33	1 MHz
	F_{filter} = 1 471.5	–40	1 MHz
	1 472.5 MHz ≤ F_{filter} ≤ 1 491.5 MHz	–47	1 MHz

The following requirement may apply to E-UTRA BS operating in Band 48 in certain regions. The power of any spurious emission shall not exceed:

TABLE A1-150

Additional BS Spurious emissions limits for Band 48

Frequency range	Maximum Level	Measurement Bandwidth	Note
3 530 MHz – 3 720 MHz	–25 dBm	1 MHz	Applicable 10 MHz from the assigned channel edge
3 100 MHz – 3 530 MHz 3 720 MHz – 4 200 MHz	–40 dBm	1 MHz	

3.6.5 Co-location with other base stations

These requirements may be applied for the protection of other BS receivers when GSM900, DCS1800, PCS1900, GSM850, CDMA850, UTRA FDD, UTRA TDD, E-UTRA and/or NR BS are co-located with a BS.

The requirements assume a 30 dB coupling loss between transmitter and receiver and are based on co-location with base stations of the same class.

The power of any spurious emission shall not exceed the limits of Table A1-151 for a BS where requirements for co-location with a BS type listed in the first column apply, depending on the declared BS class.

BS capable of multi-band operation, the exclusions and conditions in the Note column of Table A1-151 apply for each supported operating band. For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the exclusions and conditions in the Note column of Table A1-151 apply for the operating band supported at that antenna connector.

TABLE A1-151

BS spurious emissions limits for BS co-located with another BS

Type of co-located BS	Frequency range for co-location requirement	Maximum level (WA BS)	Maximum level (MR BS)	Maximum level (LA BS)	Measurement bandwidth	Note
GSM900	876-915 MHz	–98 dBm	–91 dBm	–88 dBm	100 kHz	–
DCS1800	1 710-1 785 MHz	–98 dBm	–91 dBm	–88 dBm	100 kHz	–
PCS1900	1 850-1 910 MHz	–98 dBm	–91 dBm	–88 dBm	100 kHz	–
GSM850 or CDMA850	824-849 MHz	–98 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band I or E-UTRA Band 1 or NR Band n1	1 920-1 980 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band II or E-UTRA Band 2 or NR Band n2	1 850-1 910 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band III or E-UTRA Band 3 or NR Band n3	1 710-1 785 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band IV or E-UTRA Band 4	1 710-1 755 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band V or E-UTRA Band 5 or NR Band n5	824-849 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band VI, XIX or E-UTRA Band 6, 19	830-845 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band VII or E-UTRA Band 7 or NR Band n7	2 500-2 570 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–

TABLE A1-151 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level (WA BS)	Maximum level (MR BS)	Maximum level (LA BS)	Measurement bandwidth	Note
UTRA FDD Band VIII or E-UTRA Band 8 or NR Band n8	880-915 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band IX or E-UTRA Band 9	1 749.9-1 784.9 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band X or E-UTRA Band 10	1 710-1 770 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band XI or E-UTRA Band 11	1 427.9-1 447.9 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 50, 51, 75 or 76
UTRA FDD Band XII or E-UTRA Band 12 or NR Band n12	699-716 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band XIII or E-UTRA Band 13	777-787 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band XIV or E-UTRA Band 14 or NR Band n14	788-798 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
E-UTRA Band 17	704-716 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
E-UTRA Band 18 or NR Band n18	815-830 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band XX or E-UTRA Band 20 or NR Band n20	832-862 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band XXI or E-UTRA Band 21	1 447.9-1 462.9 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 32, 50 or 75
UTRA FDD Band XXII or E-UTRA Band 22	3 410-3 490 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 42, 77 or 78
E-UTRA Band 23	2 000-2 020 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
E-UTRA Band 24	1 626.5-1 660.5 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–

TABLE A1-151 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level (WA BS)	Maximum level (MR BS)	Maximum level (LA BS)	Measurement bandwidth	Note
UTRA FDD Band XXV or E-UTRA Band 25 or NR Band n25	1 850-1 915 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
UTRA FDD Band XXVI or E-UTRA Band 26 or NR Band n26	814-849 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
E-UTRA Band 27	807-824 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	–
E-UTRA Band 28 or NR Band n28	703-748 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 44
E-UTRA Band 30 or NR Band n30	2 305-2 315 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 40
E-UTRA Band 31	452.5-457.5 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
UTRA TDD Band a) or E-UTRA Band 33	1 900-1 920 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 33
UTRA TDD Band a) or E-UTRA Band 34 or NR Band n34	2 010-2 025 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 34
UTRA TDD Band b) or E-UTRA Band 35	1 850-1 910 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 35
UTRA TDD Band b) or E-UTRA Band 36	1 930-1 990 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Bands 2 and 36
UTRA TDD Band c) or E-UTRA Band 37	1 910-1 930 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 37. This unpaired band is defined in Rec. ITU-R M.1036, pending any future deployment
UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38	2 570-2 620 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 38

TABLE A1-151 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level (WA BS)	Maximum level (MR BS)	Maximum level (LA BS)	Measurement bandwidth	Note
UTRA TDD Band f) or E-UTRA Band 39 or NR Band n38	1 880-1 920 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Bands 33 and 39
UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40	2 300-2 400 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 40
E-UTRA Band 41 or NR Band n41	2 496-2 690 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 41 or 53
E-UTRA Band 42	3 400-3 600 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 22, 42, 43, 48, 49, 52 77 or 78.
E-UTRA Band 43	3 600-3 800 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 42, 43, 48, 49, 77 or 78
E-UTRA Band 44	703-803 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 28 or 44
E-UTRA Band 45	1 447-1 467 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 45
E-UTRA Band 46 or NR Band n46	5 150-5925 MHz	N/A	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 48 or NR Band n48	3 550-3700 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 42, 43, 48, 49, 77 or 78.
E-UTRA Band 49	3 550-3 700 MHz	N/A	N/A	–88 dBm	100 kHz	This is not applicable to BS operating in Band 42, 43, 48, 49, 77 or 78.
E-UTRA Band 50 or NR Band n50	1 432-1 517 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 11, 21, 32, 51, 74, 75 or 76

TABLE A1-151 (*continued*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level (WA BS)	Maximum level (MR BS)	Maximum level (LA BS)	Measurement bandwidth	Note
E-UTRA Band 51 or NR Band n51	1 427-1 432 MHz	N/A	N/A	–88 dBm	100 kHz	This is not applicable to E-UTRA BS operating in Band 50, 75 or 76
E-UTRA Band 52	3 300-3 400 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 42 or 52.
E-UTRA Band 53 or NR Band n53	2 483.5-2 495 MHz	N/A	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 41 or 53
E-UTRA Band 65 or NR Band n65	1 920-2 010 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 66 or NR Band n66	1 710-1 780 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 68	698-728 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 70 or NR Band n70	1 695-1 710 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 71 or NR Band 71	663-698 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 72	451-456 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 73	450-455 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 74 or NR Band n74	1 427-1470 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 50 or 51.
NR Band n77	3 300-4 200 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 22, 42, 43, 48, 49, 52, 77 or 78.
NR Band n78	3 300-3 800 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 22, 42, 43, 48, 49, 52, 77 or 78.

TABLE A1-151 (*end*)

Type of co-located BS	Frequency range for co-location requirement	Maximum level (WA BS)	Maximum level (MR BS)	Maximum level (LA BS)	Measurement bandwidth	Note
NR Band n79	4.4-5.0 GHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n80	1 710-1 785 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n81	880-915 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n82	832-862 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n83	703- 748 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	This is not applicable to BS operating in Band 44
NR Band n84	1 920-1 980 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 85	698-716 MHz	–96 dBm	–91 dBm	–91 dBm	100 kHz	
NR Band n86	1 710-1 780 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 87	410-415 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
E-UTRA Band 88	412-417 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n89	824-849 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n91	832-862 MHz	N/A	N/A	–88 dBm	100 kHz	
NR Band n92	832-862 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n93	880-915 MHz	N/A	N/A	–88 dBm	100 kHz	
NR Band n94	880-915 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n95	2 010-2 025 MHz	–96 dBm	–91 dBm	–88 dBm	100 kHz	
NR Band n96	5 925-7 125 MHz	N/A	−90dBm	–87 dBm	100 kHz	

NOTE 1 – As defined in the scope for spurious emissions in this subclause, the co-location requirements in Table A1-151 do not apply for the Δf_{OBUE} frequency range immediately outside the BS transmit frequency range of a downlink operating band. The current state-of-the-art technology does not allow a single generic solution for co-location with other system on adjacent frequencies for 30 dB BS-BS minimum coupling loss. However, there are certain site-engineering solutions that can be used. These techniques are addressed in 3GPP TR 25.942.

NOTE 2 – Table A1-151 assumes that two operating bands, where the corresponding BS transmit and receive frequency ranges would be overlapping, are not deployed in the same geographical area. For such a case of operation with overlapping frequency arrangements in the same geographical area, special co-location requirements may apply that are not covered by these specifications.

NOTE 3 – Co-located TDD Base Stations that are synchronized and using the same or adjacent operating band can transmit without special co-locations requirements. For unsynchronized base stations, special co-location requirements may apply that are not covered by these specifications.

3.7 Receiver spurious emissions

For TDD BS with common RX and TX antenna port the requirement applies during the Transmitter OFF period. For FDD BS with common RX and TX antenna port the transmitter spurious emission limits as specified in § 3.6.1 are valid.

Unless otherwise stated, a BS declared to be capable of E-UTRA with NB-IoT in-band and guard band operations (or any combination with GSM and/or UTRA) is only required to pass the receiver spurious emissions tests for E-UTRA with guard band operation (or any combination with GSM

and/or UTRA). It is not required to perform the receiver spurious emissions tests again for E-UTRA with in-band operation (or any combination with GSM and/or UTRA).

The power of any spurious emission shall not exceed the levels in Table A1-152.

TABLE A1-152

General spurious emission test requirement

Frequency range	Maximum level	Measurement Bandwidth	Note
30 MHz – 1 GHz	–57 dBm	100 kHz	
1 GHz – 12.75 GHz	–47 dBm	1 MHz	
12.75 GHz – 5th harmonic of the upper frequency edge of the UL operating band in GHz	–47 dBm	1 MHz	This spurious frequency range applies only for *operating bands* for which the 5th harmonic of the upper frequency edge of the UL *operating band* is reaching beyond 12.75 GHz.

NOTE – The frequency range from $F_{BW\,RF,DL,low} - \Delta f_{OBUE}$ to $F_{BW\,RF,DL,high} + \Delta f_{OBUE}$ may be excluded from the requirement. For BS capable of multi-band operation, the exclusion applies for all supported operating bands. For BS capable of multi-band operation where multiple bands are mapped on separate antenna connectors, the single-band requirements apply and the excluded frequency range is only applicable for the operating band supported on each antenna connector.

In addition to the requirements in Table A1-152, the power of any spurious emission shall not exceed the additional spurious emissions requirements in §§ 3.6.1 to 3.6.4. In addition, the requirements for co-location with other base stations specified in § 3.6.5 may also be applied.

Attachment 1 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 of Recommendation ITU-R M.1545. In case the core specification value is equal to the test limit (Fig. 3 of Annex 1 of Recommendation ITU-R M.1545) the “test tolerances” are equal to 0.

Annex 2

WirelessMAN-Advanced

Out-of-band and spurious emission regions

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

1 Default specifications

1.1 Default channel spectral mask

The spectrum masks of Tables A2-1 and A2-2 are applicable to all bands and all regions unless specific mask for a band or a region is specified in other relevant sub-section of § 1.1.

TABLE A2-1

Channel mask for 5 MHz bandwidth

No	Offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/Integration bandwidth) as measured at the antenna port
1	$2.5 \le \Delta f < 7.5$	100	$-7-7(\Delta f - 5.05)/5$
2	$7.5 \le \Delta f < 12.5$	100	–14

NOTE 1 – Δf is the absolute value of separation in MHz between the carrier frequency and the centre of the measuring filter.

NOTE 2 – The first measurement position with a 100 kHz filter is at Δf equals to 2.550 MHz; the last is at Δf equals to 12.450 MHz.

NOTE 3 – Integration Bandwidth refers to the frequency range over which the emission power is integrated.

TABLE A2-2

Channel mask for 10 MHz bandwidth

No	Offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/Integration bandwidth) as measured at the antenna port
1	$5 \le \Delta f < 10$	100	$-7-7(\Delta f - 5.05)/5$
2	$10 \le \Delta f < 15$	100	–14
3	$15 \le \Delta f \le 25$	1 000	–13

NOTE 1 – Δf is the absolute value of separation in MHz between the carrier frequency and the centre of the measuring filter.

NOTE 2 – The first measurement position with a 100 kHz filter is at Δf equals to 5.05 MHz; the last is at Δf equals to 14.95 MHz. The first measurement position with a 1 MHz filter is at Δf equals to 15.5 MHz; the last is at Δf equals to 24.5 MHz.

NOTE 3 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

TABLE A2-3

Channel mask for 20 MHz bandwidth

No	Offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/Integration bandwidth) as measured at the antenna port
1	$5 \le \Delta f < 10$	100	$-7-7(\Delta f - 5.05)/5$
2	$10 \le \Delta f < 15$	100	–14
3	$15 \le \Delta f \le 35$	1000	–13

NOTE 1 – Δf is the absolute value of separation in MHz between the carrier frequency and the centre of the measuring filter.

NOTE 2 – The first measurement position with a 100 kHz filter is at Δf equals to 10.05 MHz; the last is at Δf equals to 14.95 MHz. The first measurement position with a 1 MHz filter is at Δf equals to 15.5 MHz; the last is at Δf equals to 34.5 MHz.

NOTE 3 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

1.2 Default Spurious Emission

Unless otherwise specified in other sub sections of § 1.2 for specific bands, the default spurious emission specifications of Table 4 are applicable.

TABLE A2-4

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

No	Spurious frequency (f) range	Measurement bandwidth	Maximum emission level (dBm)
1	9 kHz ≤ f < 150 kHz	1 kHz	–36
2	150 kHz ≤ f < 30 MHz	10 kHz	–36
3	30 MHz ≤ f < 1 000 MHz	100 kHz	–36
4	1 GHz ≤ f < 5 x F_{ue}	30 kHz If 2.5 × ChBW ≤ Δf < 10 × ChBW 300 kHz If 10 × ChBW ≤ Δf < 12 × ChBW 1 MHz If 12 × ChBW ≤ Δf	–30

2 Band Class 1

2.1 Band class group 1.C

2.1.1 Channel spectral mask

The spectrum emission mask for 5 and 10 MHz bandwidth are specified in Tables A2-5 and A2-6.

TABLE A2-5

Channel mask for 5 MHz (BCG 1.C)

No	Frequency offset from centre (MHz)	Allowed emission level (dBM)	Measurement bandwidth
1	2.5 ≤ Δf < 3.5	–13	50 kHz
2	3.5 ≤ Δf < 12.5	–13	1 MHz

TABLE A2-6

Channel Mask for 10 MHz (BCG 1.C)

No	Frequency offset from centre (MHz)	Allowed emission level (dBM)	Measurement bandwidth
1	5 ≤ Δf < 6	–13	100 kHz
2	6 ≤ Δf < 25	–13	1 MHz

2.1.2 Transmitter spurious emission specification

TABLE A2-7

Base station spurious emission limit, category A (BCG 1.C)

No	Band	Allowed emission level	Measurement bandwidth	Note
1	30 MHz-1 GHz	−13 dBm	100 kHz	Bandwidth as in Recommendation ITU-R SM.329-10, § 4.1
2	1 GHz-13.45 GHz		1 MHz	Upper frequency as in Recommendation ITU-R SM.329-10, § 2.5, Table 1

TABLE A2-8

Base station spurious emissions limit, category B (BCG 1.C)

No	Band	Measurement bandwidth	Allowed emission level (dBM)
1	9 kHz ≤ f < 150 kHz	1 kHz	−36
2	150 kHz ≤ f < 30 MHz	10 kHz	−36
3	30 MHz ≤ f < 1 000 MHz	100 kHz	−36
4	1 GHz ≤ f < 13.45 GHz	30 kHz If 2.5 × BW <= | $f_c - f$ | < 10 × BW 300 kHz If 10 × BW <= | $f_c - f$ | < 12 × BW 1 MHz If 12 × BW <= | $f_c - f$ |	−30

TABLE A2-9

Additional spurious emissions (BCG 1.C)

No	Spurious frequency (f) range (MHz)	Measurement bandwidth (MHz)	Maximum emission level (dBM)
1	791 ≤ f < 821	1	−52
2	831 ≤ f < 862	1	−49
3	876 ≤ f < 915	1	−51
4	921 ≤ f < 925	1	−47
5	925 ≤ f < 960	1	−52
6	1 710 ≤ f < 1 785	1	−51
7	1 805 ≤ f < 1 880	1	−52
8	1 920 ≤ f < 1 980	1	−49
9	2 110 ≤ f < 2 170	1	−52
10	1 900 ≤ f < 1 920	1	−52

TABLE A2-9 (*end*)

No	Spurious frequency (*f*) range (MHz)	Measurement bandwidth (MHz)	Maximum emission level (dBM)
11	$2\,010 \le f < 2\,025$	1	–52
12	$2\,500 \le f < 2\,570$	1	–49
13	$2\,570 \le f < 2\,620$	1	–52
14	$2\,620 \le f < 2\,690$	1	–52

3 Band class 3

3.1 Band class group 3.C

3.1.1 Channel spectral mask

The spectrum emission mask for 5 MHz bandwidth is specified in Tables A2-10 and A2-11.

In this section, the unwanted emission requirements for Japan 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 A2-10

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

No	Frequency offset from centre (MHz)	Allowed emission level (dBm)	Measurement bandwidth
1	$2.5 \le \Delta f < 3.5$	–13	50 kHz
2	$3.5 \le \Delta f < 12.5$	–13	1 MHz

TABLE A2-11

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

No	Frequency offset from centre	Allowed emission level (dBm)	Measurement bandwidth (MHz)
1	$\Delta f = 5$	7	4.8
2	7.5 MHz $\le \Delta f < 12.25$	$-15-1.4 \times (\Delta f - 7.5)$	1
3	$12.25 \le \Delta f < 22.5$ MHz	–22	1

The spectrum emission mask for 10 MHz bandwidth is specified in Tables A2-12 and A2-13.

TABLE A2-12

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

No	Frequency offset from centre (MHz)	Allowed emission level (dBm)	Measurement bandwidth (MHz)
1	$5 \le \Delta f < 6$ MHz	–13 dBm	100 kHz
2	$6 \le \Delta f < 25$ MHz	–13 dBm	1 MHz

TABLE A2-13

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

No	Frequency offset from centre (MHz)	Allowed emission level (dBm)	Measurement bandwidth (MHz)
1	$\Delta f = 10$	3	9.5
2	$15 \le \Delta f < 25$	–22	1

The spectrum emission mask for 20 MHz bandwidth is specified in Table A2-14.

TABLE A2-14

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

No	Frequency offset from centre (MHz)	Allowed emission level (dBm)	Measurement bandwidth (MHz)
1	$\Delta f = 20$	6	19.5
2	$30 \le \Delta f < 50$	–22	1

3.1.2 Transmitter spurious emission specification

TABLE A2-15

Base station spurious emission limit, category A (BCG 3.C)

No	Band	Allowed emission level	Measurement bandwidth	Note
1	30 MHz-1 GHz	–13 dBm	100 kHz	Bandwidth as in Recommendation ITU-R SM.329-10, § 4.1
2	1 GHz-13.45 GHz		1 MHz	Upper frequency as in Recommendation ITU-R SM.329-10, § 2.5, Table 1

TABLE A2-16

Base station spurious emissions limit, category B (BCG 3.C)

No	Band	Measurement bandwidth	Allowed emission level (dBM)
1	30 MHz ≤ f < 1 000 MHz	100 kHz	–36
2	1 GHz ≤ f < 13.45 GHz	30 kHz If 2.5 × BW <= | f_c − f | < 10 × BW 300 kHz If 10 × BW <= | f_c − f | < 12 × BW 1 MHz If 12 × BW <= | f_c − f |	–30

NOTE – In Table A2-16, BW is the signal channel bandwidth of 5 or 10 MHz.

TABLE A2-17

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

No	Frequency bandwidth	Measurement bandwidth	Allowed emission level
1	9 kHz ≤ f < 150 kHz	1 kHz	−13
2	150 kHz ≤ f < 30 MHz	10 kHz	−13
3	30 MHz ≤ f < 1 000 MHz	100 kHz	−13
4	1 000 MHz ≤ f < 2 505 MHz	1 MHz	−13
5	2 505 MHz ≤ f < 2 535 MHz	1 MHz	−42
6	2 535 MHz ≤ f	1 MHz	−13

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 from the centre frequency.

3.2 Band class group 3.D

3.2.1 Channel spectral mask

The spectrum emission mask of Tables A2-18 and A2-19 apply to US region.

TABLE A2-18

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

No	Offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBM/Integration bandwidth) as measured at the antenna port
1	2.5 ≤ Δf < 3.5	50	–13
2	3.5 ≤ Δf ≤ 12.5	1 000	–13

NOTE 1 – 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.

NOTE 2 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

TABLE A2-19

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

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

NOTE 1 – 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.

NOTE 2 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

The spectrum emission mask of Table A2-20 and Table A2-21 apply to Europe region.

TABLE A2-20

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

No	Offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/Integration bandwidth) as measured at the antenna port
1	$2.5 \le \Delta f < 7.5$	100	$-7-7(\Delta f - 2.55)/5$
2	$7.5 \le \Delta f \le 12.5$	100	–14

NOTE 1 – The first measurement position with a 100 kHz filter is at Δf equals to 2.550 MHz; the last is at Δf equals to 12.450 MHz.

NOTE 2 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

TABLE A2-21

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

No	Offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/Integration bandwidth) as measured at the antenna port
1	$5 \le \Delta f < 10$	100	$-7-7(\Delta f - 5.05)/5$
2	$10 \le \Delta f < 15$	100	–14
3	$15 \le \Delta f \le 25$	1 000	–13

NOTE 1 – The first measurement position with a 100 kHz filter is at Δf equals to 5.05 MHz; the last is at Δf equals to 14.95 MHz. The first measurement position with a 1 MHz filter is at Δf equals to 15.5 MHz; the last is at Δf equals to 24.5 MHz.

NOTE 2 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

3.2.2 Transmitter spurious emission specification

TABLE A2-22

Spurious emissions – US (BCG 3.D)

No	Measurement frequency range	Measurement bandwidth (MHz)	Maximum emission level (dBm)
1	30 MHz < f < 13.450 GHz	1	–13

TABLE A2-23

Spurious emissions for 5 MHz bandwidth – Europe (BCG 3.D)

No	Measurement frequency (f) range	Measurement bandwidth (MHz)	Maximum emission level (dBm)
1	9 kHz ≤ f < 150 kHz	1 kHz	–36
2	150 kHz ≤ f < 30 MHz	10 kHz	–36
3	30 MHz ≤ f < 1 000 MHz	100 kHz	–36
4	1 GHz ≤ f < 13 450 MHz	30 kHz If 12.5 MHz ≤ Δf < 50 MHz 300 kHz If 50 MHz ≤ Δf < 60 MHz 1 MHz If 60 MHz ≤ Δf	–30

TABLE A2-24

Spurious emissions for 10 MHz bandwidth – Europe (BCG 3.D)

No	Spurious frequency (f) range	Measurement bandwidth	Maximum emission level (dBm)
1	9 kHz ≤ f < 150 kHz	1 kHz	–36
2	150 kHz ≤ f < 30 MHz	10 kHz	–36
3	30 MHz ≤ f < 1 000 MHz	100 kHz	–36
4	1 GHz ≤ f < 13 450 MHz	30 kHz If 25 MHz ≤ Δf < 100 MHz 300 kHz If 100 MHz ≤ Δf < 120 MHz 1 MHz If 120 MHz ≤ Δf	–30

Table A2-25 specifies limits to protect BS receivers against its intra-system BS transmit emissions.

TABLE A2-25

BS Spurious Emissions Limits for protection of the BS receiver (BCG 3.D)

No	Spurious frequency (*f*) range (MHz)	Measurement bandwidth	Maximum level
1	2 496-2 572	100 kHz	–96 dBm

4 Band class 5

4.1 Channel spectral mask: BCG 5L.E

The spectrum emission mask for 5 and 10 MHz bandwidth sizes are specified in Table A2-26 and Table A2-27. Table A2-26 specifies breakpoints of the underlying piecewise linear power spectral density mask. This mask is a relative mask and conditionally applicable depending on the base station *Pnom* power level.

TABLE A2-26

Relative transmit spectral power density channel mask (BCG 5L.E)

No	Power	Frequency offset				
		0.5*BW	**0.71*BW**	**1.06*BW**	**2.0*BW**	**2.5*BW**
1	39 dBm < P_{nom}	–20 dB	–27 dB	–32 dB	–50 dB	–50 dB
2	33 dBm < P_{nom} ≤ 39 dBm	–20 dB	–27 dB	–32 dB	–50 dB + (39 dBm – P_{nom})	Refer to Table 27

Table A2-27 specifies the emission levels of an underlying piecewise step function applicable conditionally only to some of P_{nom} power levels.

TABLE A2-27

Absolute spectral emission channel mask (BCG 5L.E)

No	Power	Frequency offset			
		0.50 BW ≤ Δ*f* < 0.71 BW	**0.71 BW ≤ Δ*f* < 1.06 BW**	**1.06 BW ≤ Δ*f* <2.00 BW**	**2.00 BW ≤ Δ*f* ≤ 2.50 BW**
1	33 dBm < P_{nom} ≤ 39 dBm	Refer to Table 26	Refer to Table 26	Refer to Table 26	−21 + x dBm/MHz
2	P_{nom} ≤ 33 dBm	–5.5 dBm/MHz	–5.5 dBm/MHz	–23.5 dBm/MHz	−23.5 dBm/MHz

NOTE – In Table A2-27, x = −10 log(BW/10)

5 Band class 6

5.1 Band class group 6.D

5.1.1 Channel spectral mask

Table A2-28 and Table A2-29 specify the spectrum emission for FDD base stations with 5 and 10 MHz channel bandwidths.

TABLE A2-28

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

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

TABLE A2-29

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

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

5.1.2 Transmitter spurious emission specification

TABLE A2-30

Spurious emissions (BCG 6.D)

No	Measurement frequency range	Measurement bandwidth (MHz)	Maximum emission level (dBm)
1	30 MHz < f < 10.775 GHz	1	–13

5.2 Band class group 6.E

5.2.1 Channel spectral mask

Table A2-31 and Table A2-32 specify the spectrum emission for FDD base stations with 5 and 10 MHz channel bandwidths.

TABLE A2-31

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

No	Frequency offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$2.5 \le \Delta f < 7.5$	100	$-7.0 - 7(\Delta f - 2.55)/5$
2	$7.5 \le \Delta f \le 12.5$	100	–14

NOTE 1 – The first measurement position with a 100 kHz filter is at Δf equals to 2.550 MHz; the last is at Δf equals to 12.450 MHz.

NOTE 2 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

TABLE A2-32

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

No	Frequency offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \le \Delta f < 10$	100	$-7.0-7(\Delta f - 5.05)/5$
2	$10 \le \Delta f < 15$	100	–14
3	$15 \le \Delta f \le 25$	1 000	–13

NOTE 1 – The first measurement position with a 100 kHz filter is at Δf equals to 5.05 MHz; the last is at Δf equals to 14.95 MHz. The first measurement position with a 1 MHz filter is at Δf equals to 15.5 MHz; the last is at Δf equals to 24.5 MHz.

NOTE 2 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

Table A2-33 specifies the spectrum emission mask for FDD base stations with 20 MHz channel bandwidth.

TABLE A2-33

Channel mask for 20 MHz bandwidth (BCG 6.E)

No	Frequency offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$10 \le \Delta f < 15$	100	$-7-7(\Delta f - 10.05)/5$
2	$15 \le \Delta f < 20$	100	–14
3	$20 \le \Delta f \le 50$	1 000	–13

NOTE 1 – The first measurement position with a 100 kHz filter is at Δf equals to 10.05 MHz; the last is at Δf equals to 19.95 MHz. The first measurement position with a 1 MHz filter is at Δf equals to 20.5 MHz; the last is at Δf equals to 49.5 MHz.

NOTE 2 – Integration bandwidth refers to the frequency range over which the emission power is integrated.

5.2.2 Transmitter spurious emission specification

Table A2-34 specifies the spurious emission limits while Table A2-35 specify the additional spurious emission limits.

TABLE A2-34

Spurious emissions (BCG 6.E)

No	Measurement frequency range	Measurement bandwidth	Maximum emission level (dBm)
1	9 kHz ≤ f < 150 kHz	1 kHz	–36
2	150 kHz ≤ f < 30 MHz	10 kHz	–36
3	30 MHz ≤ f < 1 000 MHz	100 kHz	–36
4	1 GHz ≤ f < 10.775 GHz	1 MHz	–30

TABLE A2-35

Additional spurious emissions (BCG 6.E)

No	Measurement frequency range (MHz)	Measurement bandwidth	Maximum emission level (dBm)
1	921-960	100 kHz	–57
2	876-915	100 kHz	–61
3	1 805-1 880	100 kHz	–47
4	1 710-1 785	100 kHz	–61
5	1 930-1 990	100 kHz	–47
6	1 850-1 910	100 kHz	–61
7	869-894	100 kHz	–57
8	824-849	100 kHz	–61
9	1 930-1 990	1 MHz	–52

TABLE A2-35 (*end*)

No	Measurement frequency range (MHz)	Measurement bandwidth (MHz)	Maximum emission level (dBm)
10	1 850-1 910	1 MHz	–49
11	1 805-1 880	1 MHz	–52
12	1 710-1 785	1 MHz	–49
13	2 110-2 155	1 MHz	–52
14	1 710-1 755	1 MHz	–49
15	869-894	1 MHz	–52
16	824-849	1 MHz	–49
17	860-895	1 MHz	–52
18	815-850	1 MHz	–49
19	2 620-2 690	1 MHz	–52
20	2 500-2 570	1 MHz	–49
21	925-960	1 MHz	–52
22	880-915	1 MHz	–49
23	1 844.9-1 879.9	1 MHz	–52
24	1 749.9-1 784.9	1 MHz	–49
25	2 110-2 170	1 MHz	–52
26	1 710-1 770	1 MHz	–49
27	1 475.9-1 500.9	1 MHz	–52
28	1 427.9-1 452.9	1 MHz	–49
29	728-746	1 MHz	–52
30	698-716	1 MHz	–49
31	746-756	1 MHz	–52
32	777-787	1 MHz	–49
33	758-768	1 MHz	–52
34	788-798	1 MHz	–49
35	1 900-1 920	1 MHz	–52
36	2 010-2 025	1 MHz	–52
37	1 850-1 910	1 MHz	–52
38	1 930-1 990	1 MHz	–52
39	1 910-1 930	1 MHz	–52
40	2 570-2 620	1 MHz	–52
41	1 880-1 920	1 MHz	–52
42	2 300-2 400	1 MHz	–52

5.3 Band class group 6.F

5.3.1 Channel spectral mask

Table A2-36 specifies BS spectrum emission mask for 5 MHz channel bandwidth while Table A2-37 specifies BS spectrum emission mask for 10 MHz channel bandwidth.

TABLE A2-36

Channel mask – Europe: 5 MHz (BCG 6.F)

No	Frequency offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$2.515 \le \Delta f < 2.715$	30	–14
2	$2.715 \le \Delta f < 3.515$	30	$-14-15(\Delta f - 2.715)$
3	$3.515 \le \Delta f < 4.0$	30	–26
4	$4.0 \le \Delta f$ 12.5	1 000	–13

TABLE A2-37

Channel mask – Europe: 10 MHz (BCG 6.F)

No	Frequency offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5.015 \le \Delta f < 5.215$	30	–14
2	$5.215 \le \Delta f < 6.015$	30	$-14-15(\Delta f - 2.715)$
3	$6.015 \le \Delta f < 6.5$	30	–26
4	$6.5 \le \Delta f < 15.50$	1 000	–13
5	$15.50 \le \Delta f \le 25.0$	1 000	–15

5.3.2 Transmitter spurious emission specification

TABLE A2-38

Spurious emission for 5 MHz channel bandwidth size (BCG 6.F)

No	Transmitter centre frequency (f_c) MHz)	Spurious frequency (f) range	Integration bandwidth	Maximum emission level (dBm)
1	1 805-1 880	9 kHz $\le f <$ 150 kHz	1 kHz	–36
2	1 805-1 880	150 kHz $\le f <$ 30 MHz	10 kHz	–36
3	1 805-1 880	30 MHz $\le f <$ 1 000 MHz	100 kHz	–36
4	1 805-1 880	1 GHz $\le f <$ 12.75 GHz	30 kHz, If 12.5 MHz $\le \Delta f <$ 50 MHz 300 kHz, If 50 MHz $\le \Delta f <$ 60 MHz 1 MHz, If 60 MHz $\le \Delta f$	–30

TABLE A2-39

Spurious emission for 10 MHz channel bandwidth size (BCG 6.F)

No	Spurious frequency (f) range	Measurement bandwidth	Maximum emission level (dBm)
1	9 kHz ≤ f < 150 kHz	1 kHz	–36
2	150 kHz ≤ f < 30 MHz	10 kHz	–36
3	30 MHz ≤ f < 1 000 MHz	100 kHz	–36
4	1 GHz ≤ f < 13 450 MHz	30 kHz If 25 MHz ≤ Δf < 100 MHz 300 kHz If 100 MHz ≤ Δf < 120 MHz 1 MHz If 120 MHz ≤ Δf	–30

Table A2-40 specifies limits to protect BS receivers against its intra-system BS transmit emissions.

TABLE A2-40

Spurious emissions limits for protection of the BS receiver (BCG 6.F)

No	Transmitter centre frequency (f_c) MHz	Spurious frequency (f) range (MHz)	Measurement bandwidth	Maximum level
1	1 805-1 880	1 710-1 785	100 kHz	–96 dBm

The spurious emission limits specified in Table A2-41 may be required by local or regional regulations.

TABLE A2-41

Additional spurious emission (BCG 6.F)

No	Transmitter centre frequency (f_c) (MHz)	Spurious frequency (f) range (MHz)	Measurement bandwidth	Maximum emission level (dBm)
1	1 805-1 880	791-821	1 MHz	–52
2		831-862	1 MHz	–49
3		1 805-1 880	100 kHz	–47
4		1 710-1 785	100 kHz	–61
5		1 805-1 880	1 MHz	–52
6		1 710-1 785	1 MHz	–49

6 Band class 7

6.1 Band class group 7.A to 7.E

6.1.1 Channel spectral mask

The spectrum emission mask of Table A2-42 and Table A2-43 apply to US region.

TABLE A2-42

Channel mask for 5 MHz bandwidth – US (BCG 7.A-7.E)

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

NOTE 1 – Δf is the separation between the carrier frequency and the centre of the measuring filter.

NOTE 2 – 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 A2-43

Channel mask for 10 MHz bandwidth – US (BCG 7.A-7.E)

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

NOTE 1 – Δf is the separation between the carrier frequency and the centre of the measuring filter.

NOTE 2 – 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.

The Spectrum Emission Mask of Table A2-44 and Table A2-45 apply to Europe region.

TABLE A2-44

Channel Mask for 5 MHz Bandwidth – Europe (BCG 7.A-7.E)

No	Frequency offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$2.5 \le \Delta f < 7.5$	100	$-7-7(\Delta f - 2.55)/5$
2	$7.5 \le \Delta f \le 12.5$	100	–14

NOTE 1 – Δf is the absolute value of separation in MHz between the carrier frequency and the centre of the measuring filter.

NOTE 2 – The first measurement position with a 100 kHz filter is at Δf equals to 2.550 MHz; the last is at Δf equals to 12.450 MHz.

NOTE 3 – Integration Bandwidth refers to the frequency range over which the emission power is integrated.

TABLE A2-45

Channel Mask for 10 MHz Bandwidth – Europe (BCG 7.A-7.E)

No	Frequency offset Δf from channel centre (MHz)	Integration bandwidth (kHz)	Maximum allowed emission level (dBm/integration bandwidth) as measured at the antenna port
1	$5 \le \Delta f < 10$	100	$-7-7(\Delta f - 5.05)/5$
2	$10 \le \Delta f < 15$	100	–14
3	$15 \le \Delta f \le 25$	1 000	–13

NOTE 1 – Δf is the absolute value of separation in MHz between the carrier frequency and the centre of the measuring filter.

NOTE 2 – The first measurement position with a 100 kHz filter is at Δf equals to 5.05 MHz; the last is at Δf equals to 24.95 MHz.

NOTE 3 – Integration bandwidth refers to the frequency range over which the emission power is integrated.