Technical Specifications for New Radio Base Station Radio Frequency Equipment of Mobile Broadband Business

National Communications Commission (NCC)

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Technical Specifications for New Radio Base Station Radio Frequency Equipment of Mobile Broadband Business

1. Legal Basis

The Specifications are established on Paragraph 1, Article 50 of the Telecommunications Act.

2. Scope of Application

The Specifications apply to the type approval of radio frequency equipment for the wide area base stations, medium range base stations and local area base stations in the new radio (NR) frequency bands of mobile broadband services. Depending on terminal duplexing, the frequency division duplex (FDD) and time division duplex (TDD) are available depending on and operate on the following frequency bands:

2.1 Frequency Division Duplex:

FR1 (Frequency Range 1):

700 megahertz (MHz hereafter) band (703 MHz～748 MHz for uplink; 758 MHz～803 MHz for downlink), 900 MHz band (885 MHz～915 MHz for uplink; 930 MHz～960 MHz for downlink), 1800 MHz band (1710 MHz～1785 MHz for uplink;1805 MHz～1880 MHz for downlink), 2100 MHz band (1920 MHz～1980 MHz for uplink; 2110 MHz～2170 MHz for downlink), 2500 MHz and 2600 MHz bands (2500 MHz～2570 MHz for uplink; 2620 MHz～2690MHz for downlink).

2.2 Time Division Duplex:

2.2.1 FR1 (Frequency Range 1):

2500 MHz and 2600 MHz bands (2500 MHz～2570 MHz, 2570 MHz～2620 MHz, 2620MHz～2690 MHz), 3500 MHz band (3300 MHz～3570 MHz).

2.2.2 FR2 (Frequency Range 2):

28000 MHz band (27000 MHz～29500MHz).

2.3 Types of Base Station (BS):

2.3.1 BS Type 1-C:

An NR base station that operates on FR1 and is provided with a separate antenna port. The requirements are applied at the BS antenna connector.

2.3.2 BS Type 1-H:

An NR base station that operates on FR1 with the requirements defined for two points of reference, signified by radiated requirements and conducted requirements. Conducted characteristics are defined at individual or groups of TAB connectors at the transceiver array boundary(TAB), which is the conducted interface between the transceiver unit array and the composite antenna. Radiated characteristics are defined over the air (OTA), where the operating band specific radiated interface is referred to as the Radiated Interface Boundary (RIB). Radiated requirements are also referred to as OTA requirements.

2.3.3 BS Type 1-O:

An NR base station that operates on FR1 and are composed of only the OTA interface that meets the RIB definition.

2.3.4 BS Type 2-O:

An NR base station that operates on FR2 and are composed of only the OTA interface that meets the RIB definition.

2.4 Class of Base Station:

2.4.1 Wide area base station: meets the operating environment of macro cells:

2.4.1.1 BS Type 1-C / BS Type 1-H: the minimum coupling loss from base station to user is 70dB.

2.4.1.2 BS Type 1-O / BS Type 2-O: the shortest distance on the ground from base station

to user is 35m.

2.4.2 Medium range base station: meets the operating environment of micro cells:

2.4.2.1 BS Type 1-C / BS Type 1-H: the minimum coupling loss from base station to user is 53dB.

2.4.2.2 BS Type 1-O / BS Type 2-O: the shortest distance on the ground from base station to user is 5m.

2.4.3 Local area base station: meets the operating environment of pico cells:

2.4.3.1 BS Type 1-C / BS Type 1-H: the minimum coupling loss from base station to user is 45dB.

2.4.3.2 BS Type 1-O / BS Type 2-O: the shortest distance on the ground from base station to user is 2m.

3. Technical Standards

The Specifications are established by referencing the National Standards, including CNS14336-1 and CNS13438, and other applicable international technical standards.

4. Definitions:

Term	Definition
$N_{TXU,countedpercell}$	Number of active transmission units in a single cell
$P_{rated,c,AC}$	Rated carrier output power per antenna connector
$P_{rated,c,TABC}$	Rated carrier output power per TAB connector
$P_{rated,c,cell}$	Rated carrier output power per TAB connector TX min cell group
$P_{rated,c,sys}$	The sum of $P_{rated,c,TABC}$ for all TAB connectors for a single carrier
$P_{max,c,AC}$	Maximum carrier output power measured per antenna connector
$P_{max,c,TABC}$	Maximum carrier output power per TAB connector
$P_{rated,c,TRP}$	Rated carrier TRP declared per RIB, which refers to the total radiated power of carrier at every transceiver radiated interface boundary.
OBUE	Abbreviation for Operating Band Unwanted Emission, which means the unwanted emission in the operating band.

5. Test Conditions

5.1 The applicant for base station radio frequency equipment type approval shall declare the class and type of base station and normal voltage.

5.2 Temperature and relative humidity conditions

The test environment conditions from 6.1 to 6.5 shall meet the table below:

	FR1	FR2
Normal environment	Temperature range: +15℃ to +30℃ Relative humidity range: 20% to 85%	Temperature range: +15℃ to +30℃ Relative humidity range: 20% to 85%

6. Tests to Be Performed and Criteria

6.1 Frequency Error

6.1.1 Conducted test

6.1.1.1 Limits:

6.1.1.1.1 The modulated carrier frequency error of every NR carrier in the base station shall meet Table 1. The observation shall last more than 1 millisecond (ms).

6.1.1.2 Test Method:

6.1.1.2.1 A BS Type 1-C base station shall be tested at the emission end of antenna port according to its operating frequency band. A BS Type 1-H base station shall be tested at the emission end of every TAB antenna port according to its operating frequency band.

6.1.1.2.2 The channel bandwidth and subcarrier spacing shall be defined in normal environment and voltage according to Table 35. The maximum scales of modulation supported shall be used to test the low, medium and high channels of single carrier mode.

6.1.2 Radiated test

6.1.2.1 Limits:

6.1.2.1.1 BS Type 1-O and BS Type 2-O:

The modulated carrier frequency error of every NR carrier in the base station shall meet Table 2. The observation shall last more than 1 ms.

6.1.2.2 Test method:

The low and high channels of single carrier mode shall be tested in normal environment and voltage. For BS Type 1-O, the channel bandwidth and subcarrier spacing shall be defined according to Table 35 and the test is performed with the maximum scales of modulation supported up to 256QAM; for BS Type 2-O, the channel bandwidth and subcarrier spacing shall be defined according to Table 38 and the test is performed with the maximum scales of modulation supported up to 64QAM.

6.2 Output Power limits

6.2.1 Conducted test

6.2.1.1 Limits:

6.2.1.1.1 The rated carrier power output of BS Type 1-C base station shall meet Table 3.

6.2.1.1.2 The rated carrier power output of BS Type 1-H base station shall meet Table 4.

6.2.1.1.3 The difference between the maximum carrier power output ($P_{max,c,AC}$ or $P_{max,c,TABC}$) of base station and the rated carrier power output ($P_{rated,c,AC}$, $P_{rated,c,TABC}$ or $P_{rated,c,sys}$) in normal environment and voltage shall meet Table 5.

6.2.1.2 Test method:

6.2.1.2.1 The emission power shall be measured conductively at the emission of antenna port of single frequency band.

6.2.1.2.2 The channel bandwidth and subcarrier spacing shall be defined in normal environment and voltage according to Table 35. QPSK modulation is used to test the low, medium and high channels of single carrier mode.

6.2.2 Radiated test

6.2.2.1 Limits:

6.2.2.1.1 BS Type 1-O and BS Type 2-O:

6.2.2.1.1.1 The limits for total radiated power (TPR) of BS Type 1-O base station shall meet Table 6.

6.2.2.1.1.2 The applicant for BS Type 2-O base station radio frequency equipment type approval shall declare the rated carrier power output ($P_{rated,c,TRP}$) of base station.

6.2.2.1.1.3 The difference between the maximum carrier power output of base station and the rated carrier power output ($P_{rated,c,TRP}$) in normal environment and voltage shall be smaller than 3.4dB for BS Type 1-O ($f \leq 3GHz$) or 3.5dB for BS Type 1-O ($3GHz < f \leq 4.2GHz$), where the limits may be relaxed according to Table 42; or smaller than 5.1dB for BS Type 2-O, where the limits may be relaxed according to Table 43.

6.2.2.2 Test method:

The test shall be performed on the low, medium and high channels of single carrier

mode in normal environment and voltage using the QPSK modulation. The channel bandwidth and subcarrier spacing of BS Type 1-O and BS Type 2-O shall be defined according to Table 35 and Table 38, respectively.

6.3 Adjacent channel leakage power ratio (ACLR)

6.3.1 Conducted test

6.3.1.1 Limits:

6.3.1.1.1 For BS Type1-C base station, the ACLR of every antenna port shall meet Table 7 or

Table 8, whichever is more relaxed.

6.3.1.1.2 For BS Type1-H base station, the ACLR of every TAB antenna port shall meet the limit in

Table 8 + X, where X = $10\log_{10}(N_{TXU,countedpercell})$ or the limit in Table 7, whichever is more relaxed.

6.3.1.2 Test method:

The channel bandwidth and subcarrier spacing shall be defined in normal environment and voltage according to Table 35. The QPSK modulation is used to test the low, medium and high channel of single carrier mode.

6.3.2 Radiated test

6.3.2.1 Limits:

6.3.2.1.1 For BS Type 1-O base station, the OTA ACLR shall meet the limit for OTA ACLR in Table 9 or the absolute limit for OTA ACLR in Table 10, whichever is more relaxed.

6.3.2.1.2 For BS Type 2-O base station, the OTA ACLR shall meet the limit for OTA ACLR in Table 11 or the absolute limit for OTA ACLR in Table 12, whichever is more relaxed.

6.3.2.2 Test method:

The channel bandwidth and subcarrier spacing shall be defined in normal environment and voltage according to Table 38. The QPSK modulation is used to test the low and high channels of single carrier mode.

6.4 Operating band unwanted emissions

6.4.1 Conducted test

6.4.1.1 Limits:

6.4.1.1.1 BS Type 1-C and BS Type 1-H

6.4.1.1.1.1 Wide area base station:

6.4.1.1.1.1.1 Table 13 shall be met for operating frequency band lower than 1 GHz.

6.4.1.1.1.1.2 Table 14 shall be met for operating frequency band between 1 GHz and 3GHz.

6.4.1.1.1.1.3 Table 15 shall be met for operating frequency band between 3 GHz and 4.2 GHz.

6.4.1.1.1.2 Medium range base station (31 dBm < $P_{rated,x} \leq$ 38 dBm):

6.4.1.1.1.2.1 Table 16 shall be met for operating frequency band lower than 3 GHz.

6.4.1.1.1.2.2 Table 17 shall be met for operating frequency band between 3 GHz and 4.2 GHz.

6.4.1.1.1.3 Medium range base station ($P_{rated,x} \leq$ 31 dBm):

6.4.1.1.1.3.1 Table 18 shall be met for operating frequency band lower than 3 GHz.

6.4.1.1.1.3.2 Table 19 shall be met for operating frequency band between 3 GHz and 4.2 GHz.

6.4.1.1.1.4 Local area base station:

6.4.1.1.1.4.1 Table 20 shall be met for operating frequency band lower than 3 GHz.

6.4.1.1.1.4.2 Table 21 shall be met for operating frequency band between 3 GHz and 4.2 GHz.

6.4.1.2 Test method:

6.4.1.2.1 The highest channel bandwidth and highest subcarrier spacing shall be defined in normal environment and voltage. The QPSK modulation is used to test the low, medium and high channels of single carrier mode.

6.4.1.2.2 Test frequency range: (lowest operating band - Δf_{OBUE}) to (highest operating band + Δf_{OBUE}); Δf_{OBUE} is defined in Table 22.

6.4.1.2.3 BS Type 1-C:

6.4.1.2.3.1 All physical antenna ports shall be tested.

6.4.1.2.3.2 $P_{rated,x} = P_{rated,c,AC}$

6.4.1.2.4 BS Type 1-H:

6.4.1.2.4.1 All TAB ports shall be tested.

6.4.1.2.4.2 All unused TAB ports shall be connected to dummy load during the test.

6.4.1.2.4.3 $P_{rated,x} = P_{rated,c,cell} - 10 \times \log_{10}(N_{TXU,countedpercell})$

6.4.2 Radiated test

6.4.2.1 BS Type 1-O:

The unwanted emission of operating frequency band shall be tested based on the type and class of base station and meet Table 23 through Table 31.

6.4.2.2 Test method:

6.4.2.2.1 The highest channel bandwidth and highest subcarrier spacing shall be defined in normal environment and voltage. The QPSK modulation is used to test the low, medium and high channels of single carrier mode.

6.4.2.2.2 The test shall be performed based on the class and type of base station:

6.4.2.2.2.1 Wide area base station:

6.4.2.2.2.1.1 Table 23 shall be met for operating frequency band lower than 1 GHz.

6.4.2.2.2.1.2 Table 24 shall be met for operating frequency band between 1 GHz and 3 GHz.

6.4.2.2.2.1.3 Table 25 shall be met for operating frequency band between 3 GHz and 4.2 GHz.

6.4.2.2.2.2 Medium range base station (40 dBm < $P_{rated,c,TRP} \leq$ 47 dBm):

6.4.2.2.2.2.1 Table 26 shall be met for operating frequency band lower than 3 GHz.

6.4.2.2.2.2.2 Table 27 shall be met for operating frequency band between 3 GHz and 4.2 GHz.

6.4.2.2.2.3 Medium range base station ($P_{rated,c,TRP} \leq$ 40 dBm):

6.4.2.2.2.3.1 Table 28 shall be met for operating frequency band lower than 3 GHz.

6.4.2.2.2.3.2 Table 29 shall be met for operating frequency band between 3 GHz and 4.2 GHz.

6.4.2.2.2.4 Local area base station:

6.4.2.2.2.4.1 Table 30 shall be met for operating frequency band lower than 3 GHz.

6.4.2.2.2.4.2 Table 31 shall be met for operating frequency band between 3 GHz and 4.2 GHz.

6.4.2.3 BS Type 2-O:

6.4.2.3.1 Table 32 shall be met for the unwanted emission of operating frequency band.

6.4.2.3.2 Test method:

The highest channel bandwidth and highest subcarrier spacing shall be defined in normal environment and voltage. The QPSK modulation is used to test the low, medium and high channels of single carrier mode.

6.5 Transmitter spurious emissions

6.5.1 Conducted test

6.5.1.1 Limits:

6.5.1.1.1 BS Type 1-C and BS Type 1-H

6.5.1.1.1.1 The general limits shall meet Table 33.

6.5.1.1.1.2 The additional limits shall meet Table 34.

6.5.1.2 Test method:

6.5.1.2.1 The channel bandwidth and subcarrier spacing shall be defined in normal environment and voltage according to Table 35. The QPSK modulation is used to test the low and high channels of single carrier mode.

6.5.1.2.2 The test is performed on the lowest channel when the frequency of spurious emission zone to be tested is lower than $F_{DL\_low} - \Delta f_{OBUE}$; and on the highest channel when the frequency of spurious emission zone to be tested is higher than $F_{DL\_high} + \Delta f_{OBUE}$. See Table 22 for the definition of Δf_{OBUE}.

6.5.1.2.3 BS Type 1-C:

All physical antenna ports shall be tested.

6.5.1.2.4 BS Type 1-H:

6.5.1.2.4.1 All TAB ports shall be tested.

6.5.1.2.4.2 All unused TAB ports shall be connected to dummy load during the test.

6.5.2 Radiated test

6.5.2.1 BS Type 1-O:

6.5.2.1.1 The unwanted emission limits shall meet Table 36. The measurement frequency band does not include the maximum offset frequency Δf_{OBUE} beyond the downlink operating frequency band in Table 40.

6.5.2.1.2 Test method:

6.5.2.1.2.1 The channel bandwidth and subcarrier spacing shall be defined in normal environment and voltage according to Table 35. The QPSK modulation is used to test the low and high channels of single carrier mode.

6.5.2.1.2.2 The additional limits shall meet Table 37.

6.5.2.2 BS Type 2-O:

6.5.2.2.1 The unwanted emission limits shall meet Table 39. The measurement frequency band does not include the maximum offset frequency Δf_{OBUE} beyond the downlink operating frequency band in Table 40.

6.5.2.2.2 Test method:

The channel bandwidth and subcarrier spacing shall be defined in normal environment and voltage according to Table 38. The QPSK modulation is used to test the low and high channels of single carrier mode.

6.6 Electrical safety:

CNS14336-1 shall be met.

6.7 Electromagnetic compatibility(EMC):

CNS13438 shall be met.

7. Test requirements

Unless otherwise specified in the Specifications, the latest version of 3GPP TS 38.104, 3GPP TS 38.141-1 and 3GPP TS 38.141-2 shall apply to the test procedures.

Table 1 Frequency error test requirement for BS Type 1-C and BS Type 1-H (see 3GPP 38.141-1 Table 6.5.2.5-1)

Base station class	Frequency stability
Wide area base station	±(f × 0.05 ppm + 12 Hz)
Medium range base station	±(f × 0.1 ppm + 12 Hz)
Local area base station	±(f × 0.1 ppm + 12 Hz)
Note: f is the central frequency of channel.	

Table 2 OTA frequency error test requirement for BS Type 1-O and BS Type 2-O (see 3GPP TS 38.141-2 Table 6.6.2.5-1)

Base station class	Frequency stability limit
Wide area base station	±(f × 0.05 ppm + 12 Hz)
Medium range base station	±(f × 0.1 ppm + 12 Hz)
Local area base station	±(f × 0.1 ppm + 12 Hz)
Note: f is the central frequency of channel.	

Table 3 Rated carrier output power limits for BS Type 1-C (see 3GPP TS 38.141-1 Table 6.2.1-1 and Table C.1-1)

Base station class	$P_{rated,c,AC}$
Wide area base station	(note 1)
Medium range base station	≤ 38 dBm (note 2)
Local area base station	≤ 24 dBm (note 2)
Note 1: no upper limit for the rated power output, $P_{rated,c,AC}$, for wide area base station. Note 2: the limits may be relaxed according to Table 41.	

Table 4 Rated power output limits for BS Type 1-H (see 3GPP TS 38.141-1 Table 6.2.1-2 and Table C.1-1)

Base station class	$P_{rated,c,sys}$ (note 2)	$P_{rated,c,TABC}$ (note 2)
Wide area base station	(note 1)	(note 1)
Medium range base station	≤ 38 dBm +10log($N_{TXU,counted}$)	≤ 38 dBm
Local area base station	≤ 24 dBm +10log($N_{TXU,counted}$)	≤ 24 dBm
Note 1: no upper limit for $P_{rated,c,sys}$ or $P_{rated,c,TABC}$ for Wide area base station. Note 2: the limits may be relaxed according to Table 41.		

Table 5 Difference between maximum carrier power output of base station and rated carrier power output (see 3GPP TS 38.141-1 Table 6.2.5-1 and Table C.1-1)

Base station type	Normal environment + normal voltage
BS Type 1-C BS Type 1-H	f ≤ 3 GHz: ±2.7 dB (note)
	3GHz < f ≤ 6 GHz: ±3.0dB (note)
Note: the limits may be relaxed according to Table 41.	

Table 6 Rated carrier TRP output power limits for BS Type 1-O (see 3GPP TS 38.104 Table 9.3.1-1 and TS 38.141-2 Table C.1-1)

Base station class	$P_{rated,c,TRP}$
Wide area base station	(note 1)

Medium range base station	≤ + 47 dBm (note 2)
Local area base station	≤ + 33 dBm (note 2)
Note 1: no upper limit for $P_{rated,c,TRP}$ for wide area base station. Note 2: the limits may be relaxed according to Table 42.	

Table 7 Adjacent channel leakage ratio (ACLR) limits for BS Type 1-C and BS Type 1-H base stations (see 3GPP TS 38.141-1 Table 6.6.3.5.2-1 and Table C.1-1)

BS channel bandwidth of lowest/highest NR carrier transmitted $BW_{Channel}$ (MHz)	BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted (MHz)	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	ACLR limit (note 4)
5, 10, 15, 20	$BW_{Channel}$	NR of same BW (note 2)	Square (BW_{Config})	44.2 dB
	$2 \times BW_{Channel}$	NR of same BW (note 2)	Square (BW_{Config})	44.2 dB
	$BW_{Channel}$ /2 + 2.5 MHz	5 MHz E-UTRA	Square (4.5 MHz)	44.2 dB (note 3)
	$BW_{Channel}$ /2 + 7.5 MHz	5 MHz E-UTRA	Square (4.5 MHz)	44.2 dB (note 3)
25, 30, 40, 50, 60, 70, 80, 90, 100	$BW_{Channel}$	NR of same BW (note 2)	Square (BW_{Config})	43.8 dB
	$2 \times BW_{Channel}$	NR of same BW (note 2)	Square (BW_{Config})	43.8 dB
	$BW_{Channel}$ /2 + 2.5 MHz	5 MHz E-UTRA	Square (4.5 MHz)	43.8 dB (note 3)
	$BW_{Channel}$ /2 + 7.5 MHz	5 MHz E-UTRA	Square (4.5 MHz)	43.8 dB (note 3)

Note 1: $BW_{Channel}$ and BW_{Config} are the lowest/highest channel bandwidth and emission bandwidth configuration, respectively, when a base station is emitting NR carrier on the specified channel.
Note 2: the subcarrier spacing (SCS) provides the maximum emission bandwidth configuration (BW_{Config}).
Note 3: this limit applies to E-UTRA or UTRA on this frequency band.
Note 4: the limits may be relaxed according to Table 41.

Table 8 Base station ACLR absolute basic limit for BS Type 1-C and BS Type 1-H (see 3GPP TS 38.141-1 Table 6.6.3.5.2-2 and Table C.1-1)

Base station class	ACLR absolute basic limit
Wide area base station	-13 dBm/MHz
Medium range base station	-25 dBm/MHz
Local area base station	-32 dBm/MHz
Note: the limits may be relaxed according to Table 41.	

Table 9 Adjacent channel leakage ratio (ALCR) limits for BS Type 1-O (see 3GPP TS 38.141-2 Table 6.7.3.5.1-1 and Table C.1-1)

BS channel bandwidth of lowest/highest NR carrier transmitted $BW_{Channel}$(MHz)	BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted (MHz)	Assumed adjacent channel carrier (informative)	Filter on the adjacent channel frequency and corresponding filter bandwidth	OTA ACLR limit (0 – 3 GHz) (note 4)	OTA ACLR limit (3 – 6 GHz) (note 4)
5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90,100	$BW_{Channel}$	NR of same BW (note 2)	Square (BW_{Config})	44dB	43.8dB
	$2 \times BW_{Channel}$	NR of same BW (note 2)	Square (BW_{Config})	44dB	43.8dB
	$BW_{Channel}/2 + 2.5$ MHz	5 MHz E-UTRA	Square (4.5 MHz)	44dB (note 3)	43.8dB (note 3)
	$BW_{Channel}/2 + 7.5$ MHz	5 MHz E-UTRA	Square (4.5 MHz)	44dB (note 3)	43.8dB (note 3)
Note 1: $BW_{Channel}$ and BW_{Config} are the BS channel bandwidth and transmission bandwidth configuration of the lowest/highest NR carrier transmitted on the assigned channel frequency. Note 2: With subcarrier spacing (SCS) that provides largest transmission bandwidth configuration (BW_{Config}). Note 3: The requirements are applicable when the band is also defined for E-UTRA or UTRA. Note 4: the limits may be relaxed according to Table 42.					

Table 10 Absolute adjacent channel leakage ratio (ALCR) limits for BS Type 1-O (see 3GPP TS 38.141-2 Table 6.7.3.5.1-2 and Table C.1-1)

Base station class	Absolute ACLR limit (Note 1, 2)
Wide area base station	-4dBm/MHz
Medium range base station	-16dBm/MHz

Local area base station	-23dBm/MHz
Note 1: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance. Note 2: the limits may be relaxed according to Table 42.	

Table 11 Adjacent channel leakage ratio (ALCR) limits for BS Type 2-O (see 3GPP TS 38.141-2 Table 6.7.3.5.2-1 and Table C.1-2)

BS channel bandwidth of lowest/highest NR 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	OTA ACLR limit (dB)
50, 100, 200, 400	$BW_{Channel}$	NR of same BW (note 2)	Square (BW_{Config})	25.7 (note 3)
Note 1: $BW_{Channel}$ and BW_{Config} are the BS channel bandwidth and transmission bandwidth configuration of the lowest/highest NR carrier transmitted on the assigned channel frequency Note 2: With subcarrier spacing (SCS) that provides largest transmission bandwidth configuration (BWConfig). Note 3: the limits may be relaxed according to Table 43.				

Table 12 Adjacent channel leakage ratio (ALCR) absolute limit for BS Type 2-O (see 3GPP TS 38.141-2 Table 6.7.3.5.2-2 and Table C.1-2)

Base station class	Absolute ACLR limit
Wide area base station	-10.3dBm/MHz
Medium range base station	-17.3 dBm/MHz
Local area base station	-17.3 dBm/MHz
Note 1: the limits may be relaxed according to Table 43.	

Table 13 Limits for unwanted emission of operating frequency band for wide area base station (NR bands ≤ 1GHz, BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.4.5.2-1 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Basic limit (note 2)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-5.5dBm-\frac{7}{5}\cdot\left(\frac{f\_offset}{MHz}-0.05\right)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	-12.5 dBm	100 kHz

10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	-13 dBm (note 1)	100 kHz
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 14 Limits for unwanted emission of operating frequency band for wide area base station (1GHz < NR bands ≤ 3GHz, BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.4.5.2-2 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Basic limit (note 2)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-5.5dBm-\frac{7}{5}\cdot\left(\frac{f\_offset}{MHz}-0.05\right)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	-12.5 dBm	100 kHz
10 MHz ≤ Δf ≤ Δf_{max}	10.5 MHz ≤ f_offset < f_offset_{max}	-13 dBm (note 1)	1MHz
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 15 Limits for unwanted emission of operating frequency band for wide area base station (NR bands >3GHz, BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.4.5.2-3 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Basic limit (note 2)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-5.2dBm-\frac{7}{5}\cdot\left(\frac{f\_offset}{MHz}-0.05\right)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	-12.2 dBm	100 kHz
10 MHz ≤ Δf ≤ Δf_{max}	10.5 MHz ≤ f_offset < f_offset_{max}	-13 dBm (note 1)	1MHz
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 16 Limits for unwanted emission of operating frequency band for medium range base station (NR bands ≤ 3GHz, Type 1-C, BS Type 1-H) (31 dBm < $P_{rated,x}$ ≤ 38 dBm) (see 3GPP TS 38.141-1 Table 6.6.4.5.4-1 and Table C.1-1)

Offset frequency at -3dB frequency point of measurement filter, Δf	Frequency offset of measurement filter centre frequency, f_offset	Basic limit (note 2)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$P_{rated,x} - 51.5dB - \frac{7}{5}\left(\frac{f\_offset}{MHz} - 0.05\right) dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	$P_{rated,x}$ - 58.5dB	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	Min($P_{rated,x}$ - 60dB, -25dBm) (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 17 Limits for unwanted emission of operating frequency band for medium range base station (NR bands >3GHz, Type 1-C, BS Type 1-H) (31 dBm < $P_{rated,x}$ ≤ 38 dBm) (see 3GPP TS 38.141-1 Table 6.6.4.5.4-3 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Basic limit (note 2)	Measurement band width
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$P_{rated,x} - 51.2dB - \frac{7}{5}\left(\frac{f\_offset}{MHz} - 0.05\right) dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	$P_{rated,x}$ - 58.2dB	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	Min($P_{rated,x}$ - 60dB, -25dBm) (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 18 Limits for unwanted emission of operating frequency band for medium range base station (NR bands ≤ 3GHz, BS Type 1-C, BS Type 1-H) ($P_{rated,x}$ ≤ 31 dBm) (see 3GPP TS 38.141-1 Table 6.6.4.5.4-2 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Basic limit (note 2)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-20.5\ \text{dBm} - \frac{7}{5}\left(\frac{f\_offset}{MHz} - 0.05\right) dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	-27.5 dBm	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	-29 dBm (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 19 Limits for unwanted emission of operating frequency band for medium range base station (NR bands >3GHz, BS Type 1-C, BS Type 1-H) ($P_{rated,x}$ ≤31 dBm) (see 3GPP TS 38.141-1 Table 6.6.4.5.4-4 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Basic limit (note 2)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-20.2\ \text{dBm} - \frac{7}{5}\left(\frac{f\_offset}{MHz} - 0.05\right) dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	-27.2 dBm	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	-29 dBm (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 20 Limits for unwanted emission of operating frequency band for local area base station (NR bands ≤ 3GHz, BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.4.5.5-1 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Basic limit (note 2)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 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	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	-37 dBm (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 21 Limits for unwanted emission of operating frequency band for local area base station (NR bands >3GHz,BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.4.5.5-2 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Limit (note 2)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-28.2dBm-\frac{7}{5}\cdot\left(\frac{f\_offset}{MHz}-0.05\right)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤f_offset < min(10.05 MHz, f_offset_{max})	-35.2 dBm	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤f_offset < f_offset_{max}	-37 dBm (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: the limits may be relaxed according to Table 41.			

Table 22 Maximum offset of OBUE outside the downlink operating band (see 3GPP TS 38.141-1 Table 6.6.1-1)

Base station type	Operating band characteristics	Δf_{OBUE} (MHz)
BS Type 1-C	$F_{DL\_high} - F_{DL\_low}$ ≤ 200 MHz	10
	200 MHz < $F_{DL\_high} - F_{DL\_low}$ ≤ 900 MHz	40
BS Type 1-H	$F_{DL\_high} - F_{DL\_low}$ < 100 MHz	10
	100 MHz ≤ $F_{DL\_high} - F_{DL\_low}$ ≤ 900 MHz	40

Table 23 Limits for unwanted emission of operating frequency band for wide area base station (NR bands ≤ 1GHz, BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.1-1 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (note 2, 3)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	3.8 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})	-3.2 dBm	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	-4 dBm (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10 MHz. Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance. Note 3: the limits may be relaxed according to Table 42.			

Table 24 Operating band unwanted emission limits for wide area base station (1GHz < NR bands ≤ 3GHz, BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.1-2 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Emission limit (note 2, 3)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	3.8 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})	-3.2 dBm	
10 MHz ≤ Δf ≤ Δf_{max}	10.5 MHz ≤ f_offset < f_offset_{max}	-4 dBm (note 1)	1MHz
Note 1: The requirement is not applicable when Δf_{max} < 10MHz. Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance. Note 3: the limits may be relaxed according to Table 42.			

Table 25 Operating band unwanted emission limits for wide area base station (3 GHz < NR bands ≤ 4.2 GHz, BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.1-3 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Emission limit (note 2, 3)	Resolution bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	4 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})	-3 dBm	

10 MHz ≤ Δf ≤ Δf_{max}	10.5 MHz ≤ f_offset < f_offset_{max}	-4 dBm (note 1)	1MHz
Note 1: The requirement is not applicable when Δf_{max} < 10MHz. Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance. Note 3: the limits may be relaxed according to Table 42.			

Table 26 Operating band unwanted emission limits for medium range base station (NR bands ≤ 3GHz, BS Type 1-O) (40 dBm < $P_{rated,c,TRP}$ ≤ 47 dBm) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.4-1 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (note 2, 3)	Measurement band width
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$P_{rated,c,TRP} - 51.2dB - \frac{7}{5}(\frac{f\_offset}{MHz} - 0.05)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	$P_{rated,c,TRP}$ − 58.2 dB	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	Min($P_{rated,c,TRP}$ - 60 dB, -16 dBm) (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10MHz. Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance. Note 3: the limits may be relaxed according to Table 42.			

Table 27 Operating band unwanted emission limits for medium range base station (3 GHz < NR bands ≤ 4.2 GHz, BS Type 1-O) (40 dBm < $P_{rated,c,TRP}$ ≤ 47 dBm) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.4-2 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (note 2, 3)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$P_{rated,c,TRP} - 51\,dB - \frac{7}{5}(\frac{f\_offset}{MHz} - 0.05)\,dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	$P_{rated,c,TRP}$ - 58 dB	

10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	Min($P_{rated,c,TRP}$ – 60 dB, -16 dBm) (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10MHz. Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance. Note 3: the limits may be relaxed according to Table 42.			

Table 28 Operating band unwanted emission limits for medium range base station (NR bands ≤ 3GHz, BS Type 1-O) ($P_{rated,c,TRP}$ ≤ 40 dBm) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.4-4 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (note 2, 3)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-11.2dB-\frac{7}{5}(\frac{f\_offset}{MHz}-0.05)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	-18.2 dBm	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	-20 dBm (note 1)	
Note 1: The requirement is not applicable when Δf_{max} < 10MHz. Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance. Note 3: the limits may be relaxed according to Table 42.			

Table 29 Operating band unwanted emission limits for medium range base station (3GHz < NR bands ≤ 4.2GHz, BS Type 1-O) ($P_{rated,c,TRP}$ ≤ 40 dBm) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.4-5 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (note 2, 3)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-11dB-\frac{7}{5}(\frac{f\_offset}{MHz}-0.05)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset_{max})	-18 dBm	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset_{max}	-20 dBm (note 1)	

Note 1: The requirement is not applicable when Δf_{max} < 10MHz.
Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance.
Note 3: the limits may be relaxed according to Table 42.

Table 30 Operating band unwanted emission limits for local area base station (NR bands ≤ 3GHz, BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.5-1 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (note 2, 3)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤f_offset < 5.05 MHz	$-19.2dB-\frac{7}{5}(\frac{f\_offset}{MHz}-0.05)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset$_{max}$)	-26.2 dBm	100 kHz
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset$_{max}$	-28 dBm (note 1)	100 kHz

Note 1: The requirement is not applicable when Δfmax < 10MHz.
Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance.
Note 3: the limits may be relaxed according to Table 42.

Table 31 Operating band unwanted emission limits for local area base station (3GHz < NR bands ≤ 4.2GHz, BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.4.5.1.5-2 and Table C.1-1)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Test requirement (note 2, 3)	Measurement bandwidth
0 MHz ≤ Δf < 5 MHz	0.05 MHz ≤ f_offset < 5.05 MHz	$-19dB-\frac{7}{5}(\frac{f\_offset}{MHz}-0.05)dB$	100 kHz
5 MHz ≤ Δf < min(10 MHz, Δf_{max})	5.05 MHz ≤ f_offset < min(10.05 MHz, f_offset$_{max}$)	-26 dBm	
10 MHz ≤ Δf ≤ Δf_{max}	10.05 MHz ≤ f_offset < f_offset$_{max}$	-28 dBm (note 1)	

Note 1: The requirement is not applicable when Δf_{max} < 10MHz.
Note 2: The test requirements are originated from the basic limits. The proportional factor (difference between conducted & radiation), which is 9 dB, has be incorporated and applies to any test tolerance.
Note 3: the limits may be relaxed according to Table 42.

Table 32 Operating band unwanted emission limits (BS Type 2-O) (see 3GPP TS 38.141-2 Table 6.7.4.5.2.2-1 and Table C.1-2)

Frequency offset of measurement filter 3dB point, Δf	Frequency offset of measurement filter centre frequency, f_offset	Limit (dBm) (note)	Resolution bandwidth

0 MHz ≤ Δf < 0.1× $BW_{contiguous}$	0.5 MHz ≤ f_offset < 0.1 × $BW_{contiguous}$ +0.5 MHz	Min(-2.3, Max($P_{rated,t,TRP}$ - 32.3, -9.3))	1MHz
0.1 × $BW_{contiguous}$ ≤ Δf < Δf_{max}	0.1× $BW_{contiguous}$ +0.5 MHz ≤ f_offset < f_ $offset_{max}$	Min(-13, Max($P_{rated,t,TRP}$ – 43, -20))	1MHz
Note: the limits may be relaxed according to Table 43.			

Table 33 General BS transmitter spurious emission limits in the conducted test (BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.5.5.1.1-1 and Table C.1-1)

Spurious emission frequency range	Basic limit	Measurement bandwidth	Notes
9 kHz – 150 kHz	-13 dBm	1 kHz	Note 1, Note 4
150 kHz – 30 MHz		10 kHz	Note 1, Note 4
30 MHz – 1 GHz		100 kHz	Note 1
1 GHz – 12.75 GHz		1 MHz	Note 1, Note 2
12.75 GHz – 5 x highest harmonics of the maximum DL operating frequency, in GHz		1 MHz	Note 1, Note 2, Note 3
Note 1: Measurement bandwidths as in ITU-R SM.329 , s4.1. Note 2: Upper frequency as in ITU-R SM.329 , s2.5 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. Note 4: This spurious frequency range applies only to BS type 1-C and BS type 1-H. Note 5: the limits may be relaxed according to Table 41.			

Table 34 BS spurious emissions limits for BS for co-existence with systems operating in other frequency bands in the conducted test (BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.5.5.1.3-1 and Table C.1-1)

Co-existing system	Frequency range needed for co-existence	Limit	Resolution bandwidth	Note
GSM900	921 – 960 MHz	-57 dBm	100 kHz	Not applicable to n8 base station
	876 – 915 MHz	-61 dBm	100 kHz	Not applicable to n8 base station
DCS1800	1805 – 1880 MHz	-47 dBm	100 kHz	Not applicable to n3 base station
	1710 – 1785 MHz	-61 dBm	100 kHz	Not applicable to n3 base station
UTRA FDD Band I or E-UTRA Band 1 or NR Band n1	2110 – 2170 MHz	-52 dBm	1 MHz	Not applicable to n1 base station
	1920 – 1980 MHz	-49 dBm	1 MHz	Not applicable to n1 base station
UTRA FDD Band VII or E-UTRA Band 7 or NR Band n7	2620 – 2690 MHz	-52 dBm	1 MHz	Not applicable to n7 base station
	2500 – 2570 MHz	-49 dBm	1 MHz	Not applicable to n7 base station
E-UTRA Band 28 or NR Band n28	758 – 803 MHz	-52 dBm	1 MHz	Not applicable to n20 or n28 base station
	703 – 748 MHz	-49 dBm	1 MHz	Not applicable to

				n28 base station
UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38	2570 – 2620 MHz	-52 dBm	1 MHz	Not applicable to n38 base station
E-UTRA Band 41 or NR Band n41	2496 – 2690 MHz	-52 dBm	1 MHz	Not applicable to n41 base station
NR Band n77	3.3 – 4.2 GHz	-52 dBm	1 MHz	Not applicable to n48, n77 or n78 base station
Note: the limits may be relaxed according to Table 41.				

Table 35 Test signal parameters for unwanted emission of spurious emission zone for FR1 (see 3GPP TS 38.141-1 Table 4.7.2-1)

Operating frequency band parameters		$F_{DL\_high} - F_{DL\_low} < 100$ MHz	$F_{DL\_high} - F_{DL\_low} \geq 100$ MHz
Test signal parameters	Frequency bandwidth	5 MHz (note)	20 MHz (note)
	Subcarrier spacing	Smallest subcarrier spacing supported	
Note: If this channel bandwidth is not supported, the narrowest supported channel bandwidth shall be used.			

Table 36 General OTA BS transmitter spurious emission limits (BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.5.2.5.1-1 and Table C.1-1)

Spurious emission frequency zone	Limit (note 5)	Resolution bandwidth	Note
30MHz – 1GHz	-13 + X dBm	100kHz	Note 1, Note 4
1GHz – 12.75GHz	-13 + X dBm	1MHz	Note 1, Note 2, Note 4
12.75GHz –5 x highest harmonics of the maximum DL operating frequency, in GHz	-13 + X dBm	1MHz	Note 1, Note 2, Note 3, Note 4
Note 1: see ITU-R SM.329, s4.1 for resolution bandwidth Note 2: see ITU-R SM.329, s2.5 table 1 for upper limit frequency. Note 3: applicable only for 5 x highest harmonics of the maximum DL operating frequency > 12.75GHz. Note 4: X = 9 dB except for different requirements in different areas. Note 5: the limits may be relaxed according to Table 42.			

Table 37 BS spurious emissions test limits for BS for co-existence with systems operating in other frequency bands (BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.5.4.5-1 and Table C.1-1)

Co-existing system	Frequency range needed for co-existence	Limit	Resolution bandwidth	Note
GSM900	921 – 960 MHz	-45.4 dBm	100 kHz	Not applicable to n8 base station
	876 – 915 MHz	-49.4 dBm	100 kHz	Not applicable to n8 base station
DCS1800	1805 – 1880 MHz	-35.4 dBm	100 kHz	Not applicable to n3 base station
	1710 – 1785 MHz	-49.4 dBm	100 kHz	Not applicable to n3 base station

UTRA FDD Band I or E-UTRA Band 1 or NR Band n1	2110 – 2170 MHz	-40.4 dBm	1 MHz	Not applicable to n1 base station
	1920 – 1980 MHz	-37.4 dBm	1 MHz	Not applicable to n1 base station
UTRA FDD Band VII or E-UTRA Band 7 or NR Band n7	2620 – 2690 MHz	-40.4 dBm	1 MHz	Not applicable to n7 base station
	2500 – 2570 MHz	-37.4 dBm	1 MHz	Not applicable to n7 base station
E-UTRA Band 28 or NR Band n28	758 – 803 MHz	-40.4 dBm	1 MHz	Not applicable to n20 or n28 base station
	703 – 748 MHz	-37.4 dBm	1 MHz	Not applicable to n28 base station
UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38	2570 – 2620 MHz	-40.4 dBm	1 MHz	Not applicable to n38 base station
E-UTRA Band 41 or NR Band n41	2496 – 2690 MHz	-40.4 dBm	1 MHz	Not applicable to n41 base station
NR Band n77	3.3– 4.2 GHz	-40 dBm	1 MHz	Not applicable to n77 or n 78 base station
Note: the limits may be relaxed according to Table 42.				

Table 38 Radiation test signal parameters for unwanted emission of spurious emission zone for FR2 (see 3GPP TS 38.141-2 Table 4.7.2.1-2)

Operating frequency band parameters		$F_{DL\_high} - F_{DL\_low} \leq 3250$ MHz
Test signal parameters	Frequency bandwidth	100 MHz (Note 1, Note 2)
	Subcarrier spacing	Smallest carrier spacing that is supported and declared for every operating frequency band
Note 1: the applicant for base station radio frequency equipment type approval may decide to test with 50MHz of base station channel bandwidth and the smallest carrier spacing that is supported and declared for every operating frequency band instead of the 100 MHz of base station channel bandwidth. Note 2: the smallest base station channel bandwidth that is supported and declared for every operating frequency band is used if the base station channel bandwidth is not supported.		

Table 39 BS radiated Tx spurious emission limits (BS Type 2-O) (see 3GPP TS 38.104 Table 9.7.5.3.2.2-1 and TS 38.141-2 Table C.1-2)

Spurious emission frequency zone	Limit (note 3)	Measurement Bandwidth	Note
30MHz – 1GHz	-13dBm	100kHz	Note 1
1 GHz – 2nd harmonic of the upper frequency edge of the DL operating band		1MHz	Note 1, Note 2

Note 1: Bandwidth as in ITU-R SM.329 , s4.1 Note 2: Upper frequency as in ITU-R SM.329 , s2.5 table 1 Note 3: the limits may be relaxed according to Table 43.

Table 40 Maximum offset Δf_{OBUE} outside the downlink operating band (see 3GPP TS 38.141-2 Table 6.7.1-1)

Base station type	Operating frequency band characteristics	Δf_{OBUE} (MHz)
BS Type 1-O	$F_{DL\_high} - F_{DL\_low} < 100$ MHz	10
	$100 \text{ MHz} \leq F_{DL\_high} - F_{DL\_low} \leq 900$ MHz	40
BS Type 2-O	$F_{DL\_high} - F_{DL\_low} \leq 3250$ MHz	1500

Table 41 Test tolerance for conducted tests to be performed (see 3GPP TS 38.141-1 Table C.1-1)

Tests to be performed	Minimum test requirements in TS 38.104	Test tolerance (TT)	Test requirements
Table 3 Rated carrier output power limits for BS Type 1-C (see 3GPP TS 38.141-1 Table 6.2.1-1 and Table C.1-1) or Table 4 Rated power output limits for BS Type 1-H (see 3GPP TS 38.141-1 Table 6.2.1-2 and Table C.1-1) or Table 5 Difference between maximum carrier power output of base station and rated carrier power output (see 3GPP TS 38.141-1 Table 6.2.5-1 and Table C.1-1)	Per 6.2, TS 38.104	Normal environment (f is the operating frequency): 0.7 dB, $f \leq 3.0$ GHz 1.0 dB, 3.0 GHz $< f \leq$ 6GHz	Formula: Upper limit +TT, Lower limit -TT
Table 7 Adjacent channel leakage ratio (ACLR) limits for BS Type 1-C and BS Type 1-H base stations (see 3GPP TS 38.141-1 Table 6.6.3.5.2-1 and Table C.1-1) or Table 8 Base station ACLR absolute basic limit for BS Type 1-C and BS	Per 6.6.3, TS 38.104	ACLR: BW $\leq$ 20MHz: 0.8dB BW > 20MHz: 1.2 dB Absolute basic ACLR: 0 dB	Formula: (1) ACLR limit - TT (2) Absolute basic ACLR limit +TT

Type 1-H (see 3GPP TS 38.141-1 Table 6.6.3.5.2-2 and Table C.1-1)			
Unwanted emission of operating frequency band (Conducted test) Table 13, Table 14, Table 15, Table 16, Table 17, Table 18, Table 19, Table 20, Table 21	Per 6.6.4, TS 38.104	Offset frequency Δf < 10MHz 1.5 dB, f ≤ 3.0GHz 1.8 dB, 3.0GHz < f ≤ 6GHz (note) Offset frequency Δf ≥ 10MHz 0dB	Formula: Limit + TT
Table 33 General BS transmitter spurious emission limits in the conducted test (BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.5.5.1.1-1 and Table C.1-1)	Per 6.6.5.1, TS 38.104	0 dB	Formula: Limit + TT
Table 34 BS spurious emissions limits for BS for co-existence with systems operating in other frequency bands in the conducted test (BS Type 1-C, BS Type 1-H) (see 3GPP TS 38.141-1 Table 6.6.5.5.1.3-1 and Table C.1-1)	Per 6.6.5.2.3, TS 38.104	0 dB	Formula: Limit + TT
Note: TT is applicable only for base station operating frequency, f, within 4.2 GHz < f ≤ 6.0 GHz.			

Table 42 FR1 radiation test tolerance (see 3GPP TS 38.141-2 Table C.1-1)

Tests to be performed	Minimum test requirements in TS 38.104	Test tolerance (TT_{OTA})	Test requirements
Table 6 Rated carrier TRP output power limits for BS Type 1-O (see 3GPP TS 38.104 Table 9.3.1-1 and TS 38.141-2 Table C.1-1) or 6.2.2.1.1.3 (TRP test for Type 1-O base	Per 9.3m TS 38.104	1.4 dB, f ≤ 3.0 GHz 1.5 dB, 3.0 GHz < f ≤ 4.2 GHz 1.5 dB, 4.2 GHz < f ≤ 6.0 GHz	Formula: Upper limit + TT, Lower limit – TT

station)			
Table 9 Adjacent channel leakage ratio (ALCR) limits for BS Type 1-O (see 3GPP TS 38.141-2 Table 6.7.3.5.1-1 and Table C.1-1) or Table 10 Absolute adjacent channel leakage ratio (ALCR) limits for BS Type 1-O (see 3GPP TS 38.141-2 Table 6.7.3.5.1-2 and Table C.1-1)	Per 9.7.3, TS 38.104	ACLR: 1.0 dB, f ≤ 3.0GHz 1.2 dB, 3.0GHz < f ≤ 4.2GHz 1.2 dB, 4.2GHz < f ≤ 6.0GHz Absolute ACLR: 0 dB	Formula: (1) ACLR limit - TT (2) Absolute ACLR limit +TT
Unwanted emission of operating frequency band (radiation test) Table 23, Table 24, Table 25, Table 26, Table 27, Table 28, Table 29Table 30, Table 31	Per 9.7.4, TS 38.104	Offset frequency Δf < 10MHz 1.8 dB, f ≤ 3.0GHz 2 dB, 3.0GHz < f ≤ 4.2GHz 2 dB, 4.2GHz < f ≤ 6.0GHz Offset frequency Δf ≥ 10MHz 0 dB	Formula: Limit + TT
Table 36 General OTA BS transmitter spurious emission limits (BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.5.2.5.1-1 and Table C.1-1)	Per 9.7.5.2.2, TS 38.104	0 dB	Formula: Limit + TT
Table 37 BS spurious emissions test limits for BS for co-existence with systems operating in other frequency bands (BS Type 1-O) (see 3GPP TS 38.141-2 Table 6.7.5.4.5-1 and Table C.1-1)	Per 9.7.5.2.4, TS 38.104	2.6 dB, f ≤ 3 GHz 3.0 dB, 3 GHz < f ≤ 4.2 GHz 3.5 dB, 4.2 GHz < f ≤ 6 GHz	Formula: Limit + TT

Table 43 FR2 radiation test tolerance (see 3GPP TS 38.141-2 Table C.1-2)

Tests to be performed	Minimum test requirements in TS 38.104	Test tolerance (TT_{OTA})	Test requirements
6.2.2.1.1.3 (TRP test for Type 2-O base station)	Per 9.3, TS 38.104	2.1 dB, 24.25GHz < f ≤ 29.5GHz	Formula: Upper limit + TT, Lower limit – TT

Table 11 Adjacent channel leakage ratio (ALCR) limits for BS Type 2-O (see 3GPP TS 38.141-2 Table 6.7.3.5.2-1 and Table C.1-2) or Table 12 Adjacent channel leakage ratio (ALCR) absolute limit for BS Type 2-O (see 3GPP TS 38.141-2 Table 6.7.3.5.2-2 and Table C.1-2)	Per 9.7.3, TS 38.104	ACLR: 2.3 dB, 24.25GHz < f ≤ 29.5GHz Absolute ACLR: 2.7 dB, 24.25GHz < f ≤ 29.5GHz	Formula: (1) ACLR limit - TT (2) Absolute ACLR limit +TT
Table 32 Operating band unwanted emission limits (BS Type 2-O) (see 3GPP TS 38.141-2 Table 6.7.4.5.2.2-1 and Table C.1-2)	Per 9.7.4, TS 38.104	0 MHz $\leqq \Delta f < 0.1 \times BW_{contiguous}$ 2.7 dB, 24.25GHz < f $\leqq$ 29.5GHz 2.7 dB, 37GHz < f $\leqq$ 40GHz $0.1 \times BW_{contiguous} \leqq \Delta f < \Delta f_{max}$ 0 dB	Formula: Limit + TT
Table 39 BS radiated Tx spurious emission limits (BS Type 2-O) (see 3GPP TS 38.104 Table 9.7.5.3.2.2-1 and TS 38.141-2 Table C.1-2)	Per 9.7.5.3.2, TS 38.104	0 dB	Formula: Limit + TT