**3GPP TSG-RAN WG4 Meeting #94-eR4-2000970**

**E-meeting, 24th Feb, 2020 - 6th Mar, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **37.141** | **CR** | **0922** | **rev** |  | **Current version:** | **16.4.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Introduction of NB-IoT into TS37.141 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NB\_IOTenh3 | | | | |  | ***Date:*** | | | 2020-02-24 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | NB-IoT operation in NR in-band is missing in the existing 37.141 spec, therefore propose to add this feature. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Update the CS 16/18/19/17 to include NB-IoT operation in NR in-band; 2. Update the TC21, NTC21, TC22 to include NB-IoT operation in NR in-band; 3. Update the applicability table in section 5 to include NB-IoT operation in NR in-band; 4. Update the TX and RX requirements; 5. Add the TDD configuration for NB-IoT coexisting with NR in E.0B | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | NB-IoT operation in NR in-band is missing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 4.7,4.8.21,4.8.22,4.8.23,5, 6.1, 6.6.4.5.5, 7.1,7.4,7.5,7.6,7.7,7.8, E.0B | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**<Start of change>**

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**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 the Base 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.

**Carrier aggregation band:** set of one or more operating bands across which multiple NR or E-UTRA 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:** 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: The channel bandwidth is measured in MHz and is used as a reference for transmitter and receiver RF requirements.

NOTE: 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:** The frequency gap between two supported consecutive operating bands.

**Intra-band contiguous carrier aggregation:** contiguousNR orE-UTRAcarriers aggregated in the same operating band.

**Intra-band non-contiguous carrier aggregation:** non-contiguousNR orE-UTRAcarriers 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 RAT output power:** sum of the power of all carriers of the same RAT available at the antenna connector for a specified reference condition.

**Maximum throughput:** maximum achievable throughput for a reference measurement channel.

**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 [9] and mean power for a UTRA carrier is defined in TS 25.141 [10]. 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 GBChannel.

**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:** A 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 an RF bandwidth.

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

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

**Superseding-band:** A 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.

**RAT power:** sum of all carrier powers for all carriers of the same type.

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

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

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

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

NOTE: The RRC filtered mean power of a perfectly modulated UTRA signal is 0.246 dB lower than the mean power of the same signal.

**Throughput:** number of payload bits successfully received per second for a reference measurement channel in a specified reference condition.

**Total output power:** sum of all carrier powers for all carriers transmitted by the BS.

**Total RF Bandwidth**: maximum sum of Base Station RF Bandwidths in all supported operating bands.

**Transmission bandwidth:** bandwidth of an instantaneous NR or E-UTRA transmission from a UE or BS, 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 ON period:** time period during which the base station transmitter is transmitting data and/or reference symbols.

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

**Transmitter transient period:** time period during which the transmitter is changing from the OFF period to the ON period or vice versa.

**Unsynchronized operation:** peration 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

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

 Roll-off factor

 Percentage of the mean transmitted power emitted outside the occupied bandwidth on the assigned channel

BWChannel Channel bandwidth (for E-UTRA and NR)

BWConfig Transmission bandwidth configuration (for E-UTRA), expressed in MHz, where BWConfig = *N*RB x 180 kHz in the uplink and BWConfig = 15 kHz + *N*RB x 180 kHz in the downlink. Transmission bandwidth configuration (for NR), where BWConfig = *N*RB x SCS x 12.

BWRF Base Station RF Bandwidth, where BWRF = FBW RF,high – FBW RF,low

BWRF,max Maximum Base Station RF Bandwidth

DwPTS Downlink part of the special subframe (for E-UTRA TDD operation

f Frequency

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

Δfmax The largest value of Δf used for defining the requirement

ΔfOBUE Maximum offset of the *operating band* unwanted emissions mask from the downlink *operating band* edge

ΔfOOB Maximum offset of the out-of-band boundary from the uplink *operating band* edge

FC Carrier centre frequency

Ffilter Filter centre frequency

f\_offset Separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter

f\_offsetmax The maximum value of f\_offset used for defining the requirement

Fblock,high Upper sub-blockedge, where Fblock,high = FC,block,high + Foffset, RAT

Fblock,low Lower sub-blockedge, where Fblock,low = FC,block,low - Foffset, RAT

FBW RF,high  Upper Base Station RF Bandwidth edge, where FBW RF,high = FC,high + Foffset, RAT

FBW RF,low  Lower Base Station RF Bandwidth edge, where FBW RF,low = FC,low - Foffset, RAT

FC band, high Center frequency of the highest transmitted/received carrier in a band.

FC band, low Center frequency of the lowest transmitted/received carrier in a band.

FC,block, high Centre frequency of the highest transmitted/received carrier in a sub-block.

FC,block, low Centre frequency of the lowest transmitted/received carrier in a sub-block.

FC,high Centre frequency of the highest transmitted/received carrier.

FC,low Centre frequency of the lowest transmitted/received carrier.

Foffset, RAT Frequency offset from the centre frequency of the *highest* transmitted/received carrier to the *upper* Base StationRF 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 StationRF Bandwidth edge, sub-block edge or Inter RF Bandwidth edge for a specific RAT.

FDL\_low The lowest frequency of the downlink operating band

FDL\_high The highest frequency of the downlink operating band

FUL\_low The lowest frequency of the uplink operating band

FUL\_high The highest frequency of the uplink operating band

GBChannel NR minimum guard band defined in subclause 5.3.3 of TS 38.104 [27]

NRB Transmission bandwidth configuration, expressed in units of resource blocks (for E-UTRA)

PEM,B32,B75,B76,ind Declared emission level in Band 32, Band 75 and Band 76, ind=a, b, c

PEM,B32,ind Declared emission level in Band 32, ind= d, e

PEM,B50,B74,B75,ind Declared emission level for Band 50, Band 74 and Band 75, ind=a,b

Pmax Maximum total output power

Pmax,c Maximum carrier output power

Pmax,RAT Maximum RAT output power

PRated,c Rated carrier output power

PREFSENS Reference Sensitivity power level

Wgap Sub-block gap size or Inter RF Bandwidth gap size



Figure 3.2-1: Illustration of Base Station RF Bandwidth related symbols and definitions for Multi-Standard Radio



Figure 3.2-2: Illustration of Base Station RF Bandwidth related symbols and definitions for non-contiguous Multi-Standard Radio



Figure 3.2-3: Illustration of Maximum Radio Bandwidth and Total RF Bandwidth for Multi-band Multi-standard Radio

**<Next of change>**

# 4 General test conditions and declarations

## 4.1 Measurement uncertainties and test requirements

### 4.1.1 General

The requirements of this clause apply to all applicable tests in this specification.

The minimum requirements are given in TS 37.104 [2] and the references therein. Test requirements are given in this specification or are included by reference to TS 25.141 [10], TS 25.142 [12], TS 36.141 [9], TS 38.141-1 [26] or TS 51.021 [11]. Test Tolerances for the test requirements explicitly stated in the present specification are defined in Annex C of this specification. Test Tolerances for test requirements included by reference are defined in the respective referred test specification.

Test Tolerances are individually calculated for each test. The Test Tolerances are used to relax the minimum requirements to create test requirements.

When a test requirement differs from the corresponding minimum requirement, then the Test Tolerance applied for the test is non-zero. The Test Tolerance for the test and the explanation of how the minimum requirement has been relaxed by the Test Tolerance are given in Annex C.

### 4.1.2 Acceptable uncertainty of Test System

The maximum acceptable uncertainty of the Test System is specified below for each test defined explicitly in the present specification, where appropriate. The maximum acceptable uncertainty of the Test System for test requirements included by reference is defined in the respective referred test specification.

The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified tolerance and the equipment under test to be measured with an uncertainty not exceeding the specified values. All tolerances and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95% is the measurement uncertainty tolerance interval for a specific measurement that contains 95% of the performance of a population of test equipment.

For RF tests, it should be noted that the uncertainties in subclause 4.1.2 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

Unless otherwise stated, the uncertainties in subclause 4.1.2 apply to the Test System for testing NR, E-UTRA, UTRA, GSM/EDGE and NB-IoT MSR BS.

#### 4.1.2.1 Measurement of transmitter

Table 4.1.2-1: Maximum Test System uncertainty for transmitter tests

|  |  |  |
| --- | --- | --- |
| Subclause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| 6.2.1 Base Station maximum output power | ±0.7 dB for UTRA, E-UTRA and NR, f ≤ 3.0 GHz  ±1.0 dB, 3.0 GHz < f ≤ 4.2 GHz for UTRA, E-UTRA and NR  ±1.0 dB for GSM/EDGE or standalone NB-IoT |  |
| 6.4 Transmit ON/OFF power | ±2.0 dB, f ≤ 3.0 GHz  ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz |  |
| 6.6.1.5.1 Transmitter spurious emissions, Mandatory Requirements | 9 kHz < f ≤ 4 GHz: ±2.0 dB  4 GHz < f ≤ 19 GHz: ±4.0 dB |  |
| 6.6.1.5.2 Transmitter spurious emissions, Mandatory Requirements | 9 kHz < f ≤ 4 GHz: ±2.0 dB  4 GHz < f ≤ 19 GHz: ±4.0 dB |  |
| 6.6.1.5.3 Transmitter spurious emissions, Additional BC2 Requirement | 9 kHz < f ≤ 4 GHz: ±2.0 dB  4 GHz < f ≤ 12.75 GHz: ±4.0 dB |  |
| 6.6.1.5.4 Transmitter spurious emissions, Protection of BS receiver | ±3.0 dB |  |
| 6.6.1.5.5 Transmitter spurious emissions, Additional spurious emission requirements | ±2.0 dB for > -60dBm, f ≤ 3.0 GHz  ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz  ±3.0 dB for ≤ -60dBm, f ≤ 3.0 GHz  ±3.5 dB, 3.0 GHz < f ≤ 4.2 GHz |  |
| 6.6.1.5.6 Transmitter spurious emissions,  Co-location | ±3.0 dB |  |
| 6.6.2 Operating band unwanted emissions | ±1.5 dB, f ≤ 3.0 GHz  ±1.8 dB, 3.0 GHz < f ≤ 4.2 GHz |  |
| 6.6.3 Occupied bandwidth | For NR: 5 MHz, 10 MHz BS Channel BW: ±100 kHz  15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz, 50 MHz BS Channel BW: ±300 kHz  60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz BS Channel BW: ±600 kHz  For E-UTRA: 1.4MHz, 3MHz Channel BW: ±30kHz  5MHz, 10MHz Channel BW: ±100kHz  15MHz, 20MHz: Channel BW: ±300kHz  For UTRA: ±100kHz |  |
| 6.6.4 Adjacent Channel Leakage Power Ratio (ACLR) | ACLR  BW ≤ 20MHz: ±0.8 dB  BW > 20MHz: ±1.2 dB  Absolute power ±2.0 dB, f ≤ 3.0GHz  Absolute power ±2.5 dB, 3.0GHz < f ≤ 4.2GHz  CACLR  BW ≤ 20MHz: ±0.8 dB  BW > 20MHz: ±1.2 dB  CACLR absolute power ±2.0 dB, f ≤ 3.0 GHz  CACLR absolute power ±2.5 dB, 3.0 GHz < f ≤ 4.2 GHz |  |
| 6.7 Transmitter intermodulation  (interferer requirements)  This tolerance applies to the stimulus and not the measurements defined in 6.6.1, 6.6.2 and 6.6.4 | The value below applies only to the interfering signal and is unrelated to the measurement uncertainty of the tests (6.6.1, 6.6.2 and 6.6.4) which have to be carried out in the presence of the interferer.    ±1.0 dB | The uncertainty of interferer has double the effect on the result due to the frequency offset |

## 4.6 Manufacturer's declarations of regional and optional requirements

### 4.6.1 Operating band and frequency range

The manufacturer shall declare which operating band(s) specified in clause 4.4 that is supported by the BS under test and if applicable, which frequency ranges within the operating band(s) that the Base Station can operate in. Requirements for other operating bands and frequency ranges need not be tested.

The manufacturer shall declare which operating band(s) specified in clause 4.4 are supported by the BS under test for carrier aggregation.

The manufacturer shall declare which NB-IoT operating mode (standalone, NB-IoT operation in E-UTRA in-band and/or guard band, NB-IoT operation in NR in-band) the BS supports for the declared supported band.

For each supported E-UTRA channel bandwidth, manufacturer shall declare if BS supports NB-IoT in-band and/or guard band operation and the number of supported NB-IoT PRBs.

For each supported NR channel bandwidth, manufacturer shall declare if BS supports NB-IoT operation in NR in-band and the number of supported NB-IoT PRBs.

### 4.6.2 Spurious emissions category

The manufacturer shall declare one of the following:

a) The BS is tested against Category A limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [13]. In this case

- conformance with the spurious emissions requirements in clause 6.6.1.5.1 is mandatory, and the requirements specified in clause 6.6.1.5.2 and 6.6.1.5.3 need not be demonstrated.

b) The BS is tested against Category B limits for spurious emissions, as defined in ITU-R Recommendation SM.329 [13]. In this case,

- conformance with the spurious emissions requirements in clause 6.6.1.5.2 and 6.6.1.5.3 (for BC2) are mandatory, and the requirements specified in clause 6.6.1.5.1 need not be demonstrated.

### 4.6.3 Additional operating band unwanted emissions

The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where the additional operating band unwanted emission limits defined in clause 6.6.2.4 of TS 37.104 [2] apply. If this is the case, conformance with the applicable emission limits shall be demonstrated.

NOTE: For the emission limits established by FCC Title 47 [8], there is no test method or requirement defined in the present specification.

For a BS declared to support Band 20 and to operate in geographic areas within the CEPT in which frequencies are allocated to broadcasting (DTT) service, the manufacturer shall additionally declare the following quantities associated with the applicable test conditions of Table 6.6.2.5.4.4-1 and information in annex G of TS 36.104 [5] :

PEM,N Declared emission level for channel N

P10MHz Maximum output Power in 10 MHz

Conformance with the declared emission level PEM,N shall be demonstrated.

For a BS declared to support Band 32, 75 or 76 and to operate in geographic areas within the CEPT, the manufacturer shall additionally declare the following quantities associated with the applicable test conditions of Table 6.6.2.5.4.6-1 and Table 6.6.2.5.4.6-2:

PEM,B32,B75,B76,ind Declared emission level in Band 32, Band 75 and Band 76, ind=a, b, c

PEM,B32,ind Declared emission level in Band 32, ind= d, e

Conformance with the declared emission level PEM,B32,B75,B76,ind and PEM,B32,ind shall be demonstrated.

For a BS declared to support Band 50, 74 or 75 and to operate in geographic areas where the additional unwanted emission limit defined in Table 6.6.2.5.4.6-3 applies, the manufacturer shall additionally declare the following quantity associated with the applicable test conditions of Table 6.6.2.5.4.6-3:

PEM,B50,B74,B75,ind Declared emission level for Band 50, Band 74 and Band 75, ind=a,b

Conformance with the declared emission level PEM,B50,B74,B75,ind shall be demonstrated.

### 4.6.4 Co-existence with other systems

The manufacturer shall declare whether the BS under test is intended to operate in geographic areas where one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA, NR and/or PHS operating in another band are deployed. If this is the case, conformance with the applicable test requirement for spurious emissions specified in clause 6.6.1.5.5 shall be demonstrated.

### 4.6.5 Co-location with other Base Stations

The manufacturer shall declare whether the BS under test is intended to operate co-located with Base Stations of one or more of the systems GSM850, GSM900, DCS1800, PCS1900, UTRA FDD, UTRA TDD, E-UTRA and/or NR operating in another band. If this is the case,

- Conformance with the applicable test requirement for spurious emissions specified in clause 6.6.1.5.6 shall be demonstrated.

- Conformance with the applicable test requirement for receiver blocking specified in clause 7.5.5.2 shall be demonstrated.

### 4.6.6 NB-IoT sub-carrier spacing

If the BS supports NB-IoT, manufacturer shall declare if it supports 15 kHz sub-carrier spacing, 3.75 kHz sub-carrier spacing, or both for NPUSCH.

### 4.6.7 NB-IoT power dynamic range

If the BS supports E-UTRA with NB-IoT operating in-band and/or in guard band, manufacturer shall declare the maximum power dynamic range it could support with a minimum of +6dB as mentioned in TS 36.104 [5] clause 6.3.3.

If the BS supports 5 MHZ E-UTRA with NB-IoT operating in guard band, manufacturer shall also declare the maximum power that could be allocated to this NB-IoT PRB.

If the BS supports NB-IoT operation in NR in-band, manufacturer shall declare the maximum power dynamic range it could support with a minimum requirement as defined in TS 38.104 [29] clause 6.3.4.

## 4.7 Capability set definition and manufacturer's declarations of supported RF configurations

### 4.7.1 Definition of Capability Sets (CS)

Capability set is defined as the BS capability to support certain RAT combinations in an operating band.

The manufacturer shall declare the supported capability set(s) according to Table 4.7.1-1 and Table 4.7.1.-2 for each supported operating band.

Table 4.7.1-1: Capability sets

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Capability Set supported by the BS | CS1 | CS2 | CS3 | CS4 | CS5 | CS6 | CS7 |
| Supported RATs | UTRA  (MC) | E-UTRA  (MC)3 | UTRA,  E-UTRA3 | GSM, UTRA | GSM, E-UTRA3 | GSM, UTRA, E-UTRA | GSM, UTRA, E-UTRA3 |
| Supported configurations | SR UTRA (SC, MC) | SR  E-UTRA3 (SC, MC, CA) | MR UTRA + E-UTRA3  SR UTRA (SC, MC)  SR E-UTRA3 (SC, MC, CA) | MR GSM + UTRA  SR GSM (MCBTS)  SR UTRA (SC, MC) | MR GSM + E-UTRA3  SR GSM (MCBTS)  SR E-UTRA3 (SC, MC, CA) | MR GSM + UTRA +  E-UTRA  MR GSM + UTRA  MR GSM + E-UTRA  MR UTRA + E-UTRA  SR GSM (MCBTS)  SR UTRA (SC, MC)  SR E-UTRA (SC, MC, CA) | MR GSM + UTRA2  MR GSM +  E-UTRA3  MR E-UTRA3 + UTRA2  SR UTRA (SC, MC)2  SR E-UTRA3 (SC, MC) |
| Applicable BC | BC1, BC2 or BC3 | BC1, BC2 or BC3 | BC1, BC2 or BC3 | BC2 | BC2 | BC2 | BC2 |
| NOTE 1: MC denotes multi-carrier in single RAT; SC denotes single carrier; MR denotes multi-RAT; SR denotes single-RAT.  NOTE 2: For this configuration related to BC2 bands, the support of UTRA in band 3 is declared by the manufacturer.  NOTE 3: Includes optional (declared by the manufacturer) support of NB-IoT in-band and/or NB-IoT guard band operation within E-UTRA carrier(s)  NOTE 4: Void  NOTE 5: Void | | | | | | | |

Table 4.7.1-1A: Capability sets

|  |  |  |  |
| --- | --- | --- | --- |
| Capability Set supported by the BS | CS16 | CS18 | CS19 |
| Supported RATs | NR4, E-UTRA3 | GSM, E-UTRA3, NR4 | UTRA, E-UTRA3, NR4 |
| Supported configurations | MR E-UTRA3 + NR4  SR NR4  (SC, MC, CA)  SR E-UTRA3 (SC, MC, CA) | SR E-UTRA3 (SC, MC, CA)  SR NR4 (SC, MC, CA)  MR GSM + E-UTRA3  MR GSM + NR4  MR E-UTRA3 + NR4  MR GSM+ E-UTRA3 + NR4 | SR UTRA (SC, MC)  SR E-UTRA3 (SC, MC, CA)  SR NR4 (SC, MC, CA)  MR UTRA + E-UTRA3  MR UTRA + NR4  MR E-UTRA3 + NR4  MR UTRA + E-UTRA3 + NR4 |
| Applicable BC | BC1, BC2 or BC3 | BC2 | BC1, BC2 |
| NOTE 1: MC denotes multi-carrier in single RAT; SC denotes single carrier; MR denotes multi-RAT; SR denotes single-RAT.  NOTE 2: For this configuration related to BC2 bands, the support of UTRA in band 3 is declared by the manufacturer.  NOTE 3: Includes optional (declared by the manufacturer) support of NB-IoT in-band and/or NB-IoT guard band operation within E-UTRA carrier(s)  NOTE 4: Includes optional (declared by the manufacturer) support of NB-IoT operation in NR in-band within NR carrier(s). | | | |

Table 4.7.1-:2 Capability sets with NB-IoT standalone operation

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Capability Set supported by the BS | CS8 | CS9 | CS10 | CS11 | CS12 | CS13 | CS14 | CS15 | CS17 |
| Supported RATs | NB-IoT standalone | GSM,  NB-IoT standalone | UTRA,  NB-IoT standalone | E-UTRA,  NB-IoT standalone | GSM, UTRA,  NB-IoT standalone | GSM, E‑UTRA,  NB-IoT standalone | UTRA, E‑UTRA,  NB-IoT standalone | GSM, UTRA, E-UTRA,  NB-IoT standalone | NR6, E-UTRA, NB-IoT standalone |
| Supported configurations | SR NB-IoT standalone (SC, MC) | MR GSM + NB-IoT standalone  SR GSM (MCBTS)  SR NB-IoT standalone (SC, MC) | MR UTRA +  NB-IoT standalone  SR UTRA (SC, MC)  SR NB-IoT standalone (SC, MC) | MR E-UTRA + NB-IoT standalone  SR E-UTRA (SC, MC, CA)  SR NB-IoT standalone (SC, MC) | MR GSM + UTRA + NB‑IoT standalone  SR GSM (MCBTS)  SR UTRA (SC, MC)  SR NB-IoT standalone (SC, MC)  MR GSM +  NB-IoT standalone  MR UTRA +  NB-IoT standalone  MR GSM +  UTRA | MR GSM + E‑UTRA + NB-IoT standalone  SR GSM (MCBTS)  SR E-UTRA (SC, MC, CA)  SR NB-IoT standalone (SC, MC)  MR GSM +  NB-IoT standalone  MR E-UTRA + NB-IoT standalone  MR GSM +  E-UTRA | MR UTRA + E-UTRA + NB-IoT standalone  SR UTRA (SC, MC)  SR E-UTRA (SC, MC, CA)  SR NB-IoT standalone (SC, MC)  MR UTRA +  NB-IoT standalone  MR E-UTRA + NB-IoT standalone  MR UTRA +  E-UTRA | MR GSM + UTRA2 + NB‑IoT standalone  MR GSM + E‑UTRA + NB-IoT standalone  MR UTRA2 + E-UTRA + NB-IoT standalone  MR GSM +  NB-IoT standalone  MR UTRA2 +  NB-IoT standalone  MR E-UTRA + NB-IoT standalone  MR GSM + UTRA2  MR GSM +  E-UTRA  MR E-UTRA + UTRA2  SR UTRA (SC, MC)2  SR E-UTRA (SC, MC)  SR NB-IoT standalone (SC, MC) | MR E-UTRA + NR  SR NR  (SC, MC, CA)  SR E-UTRA3 (SC, MC, CA)  SR NB-IoT standalone  (SC, MC)  MR E-UTRA + NB-IoT standalone  MR NR + NB‑IoT standalone  MR NR + E‑UTRA + NB‑IoT standalone |
| Applicable BC | BC1, BC2 or BC3 | BC2 | BC1, BC2 or BC3 | BC1, BC2 or BC3 | BC2 | BC2 | BC1, BC2 or BC3 | BC2 | BC1, BC2 or BC3 |
| NOTE 1: MC denotes multi-carrier in single RAT; SC denotes single carrier; MR denotes multi-RAT; SR denotes single-RAT.  NOTE 2: For this configuration related to BC2 bands, the support of UTRA in band 3 is declared by the manufacturer.  NOTE 3: Includes optional (declared by the manufacturer) support of NB-IoT in-band and/or NB-IoT guard band operation within E-UTRA carrier(s).  NOTE 4: Void  NOTE 5: Void  NOTE 6: Includes optional (declared by the manufacturer) support of NB-IoT operation in NR in-band within NR carrier(s) | | | | | | | | | |

The applicable test configurations for each RF requirement are defined in sub-clause 5.1 and 5.2 for the declared capability set(s). For a BS declared to be capable of multi-band operation, the applicable test configurations for each RF requirement are defined in sub-clause 5.3 for the declared capability set(s).

NOTE: Not every supported configuration within a CS is tested, but the tables in sub-clause 5.1, 5.2 and 5.3 provide a judicious choice among the supported configurations and test configurations to ensure proper test coverage.

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### 4.8.21 TC21: Contiguous operation in CS16, 18, 19

#### 4.8.21.0 General

The purpose of TC21, TC21a and TC21 bis to test multi-RAT operations with NR.

Unless otherwise stated, for all test configurations in this section, the narrowest supported NR channel bandwidth and lowest SCS for that bandwidth for the operating band shall be used in the test configuration.

Unless otherwise stated, the E-UTRA bandwidth shall be 5 MHz unless the BS does not support 5 MHz E-UTRA, in which case the E-UTRA bandwidth shall be the lowest supported bandwidth for the operating band.

#### 4.8.21.1 TC21 generation

TC21 is only applicable for a BS that supports E-UTRA and NR. TC21 is constructed using the following method:

- The Base Station RF Bandwidth shall be the declared maximum Base Station RF Bandwidth.

- If NB-IoT operation in NR in-band is supported, place a NR carrier with NB-IoT operation in NR in-band adjacent to the lower Base Station RF Bandwidth edge. Place the power boosted NB-IoT RB at the lower outermost RB eligible for NB-IoT operation in NR in-band at the lower Base Station RF Bandwidth edge. The specified FOffset, RAT shall apply.

- If NB-IoT operation in NR in-band is not supported, place an NR carrier adjacent to the lower Base Station RF Bandwidth edge. The specified FOffset, RAT shall apply.

- If NB-IoT guard band operation is supported, place a 10 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost guard-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge and adjacent to the E-UTRA PRB edge as close as possible (i.e., away from the upper Base Station RF Bandwidth edge). The specified FOffset-RAT shall apply.

- If NB-IoT guard-band operation is not supported and NB-IoT in-band operation is supported, place a 5 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost in-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- If neither NB-IoT guard-band nor NB-IoT in-band operation is supported, place an E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- For transmitter tests, alternately add NR carriers at the low end and E-UTRA carriers at the high end adjacent to the already placed carriers until the Base Station RF Bandwidth is filled or the total number of supported carriers is reached. The nominal carrier spacing defined in subclause 4.5.1 shall apply.

#### 4.8.21.1A TC21a generation

TC21a is only applicable for a BS that supports GSM, E-UTRA and NR. TC21a is constructed using the following method:

For transmitter tests, if the rated total output power and total number of supported carriers are not simultaneously supported in Multi-RAT operations, two instances of TC21a shall be generated using the following values for rated total output power and the total number of supported carriers:

1) The rated total output power and the reduced number of supported carriers at the rated total output power in Multi-RAT operations

2) The reduced rated total output power at the total number of supported carriers in Multi-RAT operations and the total number of supported carriers.

If the rated total output power and total number of supported carriers are not simultaneously supported in Multi-RAT operations, tests that use TC21a shall be performed using both instances 1) and 2) of TC21a except tests for modulation accuracy in which only TC21a according to 2) shall be used.

- The Base Station RF Bandwidth shall be the declared maximum Base Station RF Bandwidth.

- Place a GSM carrier at the lower Base Station RF Bandwidth edge and:

- If NB-IoT operation in NR in-band is supported, place a NR carrier with NB-IoT operation in NR in-band adjacent to the lower Base Station RF Bandwidth edge. Place the power boosted NB-IoT RB at the upper outermost RB eligible for NB-IoT operation in NR in-band at the upper Base Station RF Bandwidth edge. The specified FOffset, RAT shall apply.

- If NB-IoT operation in NR in-band is not supported:

* If NB-IoT guard band operation is supported, place a 10 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost guard-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge and adjacent to the E-UTRA PRB edge as close as possible (i.e., away from the upper Base Station RF Bandwidth edge). The specified FOffset-RAT shall apply.
* If NB-IoT guard-band operation is not supported and NB-IoT in-band operation is supported, place a 5 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost in-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.
* If neither NB-IoT guard-band nor NB-IoT in-band operation is supported, place a GSM carrier adjacent to the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply. Place one E-UTRA carrier adjacent to the already placed GSM carrier. The specified FOffset-RAT shall apply.

- Place one NR carrier adjacent to the already placed E-UTRA carrier.

- For transmitter tests, add GSM carriers at the lower edge using 600 kHz spacing until no more GSM carriers are supported or no more GSM carriers fit. Add alternately NR carriers and E-UTRA carriers at the high end adjacent to the already placed carriers until the Base Station RF Bandwidth is filled or the total number of supported carriers is reached. The nominal carrier spacing defined in subclause 4.5.1 shall apply.

#### 4.8.21.1B TC21b generation

TC21b is only applicable for a BS that supports UTRA, E-UTRA and NR. TC21b is constructed using the following method:

For transmitter tests, if the rated total output power and total number of supported carriers are not simultaneously supported in Multi-RAT operations, two instances of TC21b shall be generated using the following values for rated total output power and the total number of supported carriers:

1) The rated total output power and the reduced number of supported carriers at the rated total output power in Multi-RAT operations

2) The reduced rated total output power at the total number of supported carriers in Multi-RAT operations and the total number of supported carriers.

If the rated total output power and total number of supported carriers are not simultaneously supported in Multi-RAT operations, tests that use TC21b shall be performed using both instances 1) and 2) of TC21b.

- The Base Station RF Bandwidth shall be the declared maximum Base Station RF Bandwidth.

- If NB-IoT operation in NR in-band is supported, place an NR carrier with NB-IoT operation in NR in-band adjacent to the lower Base Station RF Bandwidth edge. Place the power boosted NB-IoT RB at the lower outermost RB eligible for NB-IoT operation in NR in-band at the lower Base Station RF Bandwidth edge. The specified FOffset, RAT shall apply.

- If NB-IoT operation in NR in-band is not supported, place an NR carrier adjacent to the lower Base Station RF Bandwidth edge. The specified FOffset, RAT shall apply.- If NB-IoT guard band operation is supported, place a 10 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost guard-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge and adjacent to the E-UTRA PRB edge as close as possible (i.e., away from the upper Base Station RF Bandwidth edge). The specified FOffset-RAT shall apply.

- If NB-IoT guard-band operation is not supported and NB-IoT in-band operation is supported, place a 5 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost in-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- If neither NB-IoT guard-band nor NB-IoT in-band operation is supported, place a E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- Place UTRA carrier adjacent to the already placed E-UTRA carrier. The UTRA FDD may be shifted maximum 100 kHz towards lower frequencies to align with the channel raster.

- For transmitter tests, alternately add NR carriers at the low end and E-UTRA carriers at the high end adjacent to the already placed carriers until the Base Station RF Bandwidth is filled or the total number of supported carriers is reached. The nominal carrier spacing defined in subclause 4.5.1 shall apply.

#### 4.8.21.2 TC21 power allocation

a) Unless otherwise stated, set each carrier to the same power so that the sum of the carrier powers equals the rated total output power as appropriate for the test configuration according to manufacturer’s declarations in subclause 4.7.2

b) In case that TC21 is configured for testing modulation quality, the power allocated per carrier for the RAT on which modulation quality is measured shall be the highest possible for the given modulation configuration according to the manufacturer’s declarations in subclause 4.7.2, unless that power is higher than the level defined by case a). The power of the remaining carriers from other RAT(s) shall be set to the same level as in case a).

If in the case of b) the power of one RAT needs to be reduced in order to meet the manufacture’s declaration the power in the other RAT(s) does not need to be increased.

### 4.8.22 NTC21: Non-contiguous operation in CS16, 18, 19

#### 4.8.22.0 General

The purpose of NTC21, NTC21a and NTC21b is to test multi-RAT operations with NR.

Unless otherwise stated, for all test configurations in this section, the narrowest supported NR channel bandwidth and lowest SCS for that bandwidth shall be used in the test configuration.

Unless otherwise stated, the E-UTRA bandwidth shall be 5 MHz unless the BS does not support 5 MHz E-UTRA, in which case the E-UTRA bandwidth shall be the lowest supported bandwidth.

#### 4.8.22.1 NTC21 generation

NTC21 is only applicable for a BS that supports E-UTRA and NR. NTC21 is constructed using the following method:

- The Base Station RF Bandwidth shall be the declared maximum Base Station RF Bandwidth for non-contiguous operation. The Base Station RF Bandwidth consists of one sub-block gap and two sub-blocks located at the edges of the declared maximum Base Station RF Bandwidth.

- If NB-IoT operation in NR in-band is supported, place an NR carrier with NB-IoT operation in NR in-band adjacent to the lower Base Station RF Bandwidth edge. Place the power boosted NB-IoT RB at the lower outermost RB eligible for NB-IoT operation in NR in-band at the lower Base Station RF Bandwidth edge. The specified FOffset, RAT shall apply.

- If NB-IoT operation in NR in-band is not supported, place an NR carrier adjacent to the lower Base Station RF Bandwidth edge. The specified FOffset, RAT shall apply.

- If NB-IoT guard band operation is supported, place a 10 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost guard-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge and adjacent to the E-UTRA PRB edge as close as possible (i.e., away from the upper Base Station RF Bandwidth edge). The specified FOffset-RAT shall apply.

- If NB-IoT guard-band operation is not supported and NB-IoT in-band operation is supported, place a 5 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost in-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- If neither NB-IoT guard-band nor NB-IoT in-band operation is supported, place an E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- The sub-block edges adjacent to the sub-block gap shall be determined using the specified FOffset-RAT for the carrier adjacent to the sub-block gap.

#### 4.8.22.1A NTC21a generation

NTC21a is only applicable for a BS that supports GSM, E-UTRA and NR. NTC21a is constructed using the following method:

If the rated total output power and total number of supported carriers are not simultaneously supported in Multi-RAT operations, two instances of NTC21a shall be generated using the following values for rated total output power and the total number of supported carriers:

1) The rated total output power and the reduced number of supported carriers at the rated total output power in Multi-RAT operations

2) The reduced rated total output power at the total number of supported carriers in Multi-RAT operations and the total number of supported carriers.

If the rated total output power and total number of supported carriers are not simultaneously supported in Multi-RAT operations, tests that use NTC21a shall be performed using both instances 1) and 2) of NTC21a except:

1) Tests for modulation accuracy in which only NTC21a according to 2) shall be used.

2) If the reduced number of supported carriers is 6 or more, only instance 1) of NTC21a shall be used.

- The Base Station RF Bandwidth shall be the declared maximum Base Station RF Bandwidth for non-contiguous operation. The Base Station RF Bandwidth consists of one sub-block gap and two sub-blocks located at the edges of the declared maximum Base Station RF Bandwidth.

- Place a GSM carrier at the lower RF Bandwidth edge. The specified FOffset-RAT shall apply. Place one GSM carrier adjacent to the upper sub-block edge of the lower sub-block.

* If NB-IoT operation in NR in-band is supported, place NR carrier with NB-IoT operation in NR in-band in the middle of the lower sub-block bandwidth and place the power boosted NB-IoT RB at the lower outermost RB eligible for NB-IoT operation in NR in-band.
* If NB-IoT operation in NR in-band is supported, place a NR carrier in the middle of the lower sub-block bandwidth and:
* If NB-IoT guard band operation is supported, place a 10 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost guard-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge and adjacent to the E-UTRA PRB edge as close as possible (i.e., away from the upper Base Station RF Bandwidth edge). The specified FOffset-RAT shall apply.
* If NB-IoT guard-band operation is not supported and NB-IoT in-band operation is supported, place a 5 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost in-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.
* If neither NB-IoT guard-band nor NB-IoT in-band operation is supported, place a GSM carrier adjacent to the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- Place a GSM carrier adjacent to the lower sub-block edge of the upper sub-block. Place an E-UTRA carrier in the middle of the upper sub-block bandwidth.

- The nominal carrier spacing defined in subclause 4.5.1 shall apply. The sub-block edges adjacent to the sub-block gap shall be determined using the specified FOffset-RAT for the carrier adjacent to the sub-block gap.

#### 4.8.22.1B NTC21b generation

NTC21b is only applicable for a BS that supports UTRA, E-UTRA and NR. NTC21b is constructed using the following method:

If the rated total output power and total number of supported carriers are not simultaneously supported in Multi-RAT operations, two instances of NTC21b shall be generated using the following values for rated total output power and the total number of supported carriers:

1) The rated total output power and the reduced number of supported carriers at the rated total output power in Multi-RAT operations

2) The reduced rated total output power at the total number of supported carriers in Multi-RAT operations and the total number of supported carriers.

If the rated total output power and total number of supported carriers are not simultaneously supported in Multi-RAT operations, tests that use NTC21b shall be performed using both instances 1) and 2) of NTC21b except if the reduced number of supported carriers is 4 or more, only instance 1) of NTC21b shall be used.

- The Base Station RF Bandwidth shall be the declared maximum Base Station RF Bandwidth for non-contiguous operation. The Base Station RF Bandwidth consists of one sub-block gap and two sub-blocks located at the edges of the declared maximum Base Station RF Bandwidth.

- If NB-IoT operation in NR in-band is supported, place an NR carrier with NB-IoT operation in NR in-band adjacent to the lower Base Station RF Bandwidth edge. Place the power boosted NB-IoT RB at the lower outermost RB eligible for NB-IoT operation in NR in-band at the lower Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- If NB-IoT operation in NR in-band is not supported, place an NR carrier adjacent to the lower Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- If NB-IoT guard band operation is supported, place a 10 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost guard-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge and adjacent to the E-UTRA PRB edge as close as possible (i.e., away from the upper Base Station RF Bandwidth edge). The specified FOffset-RAT shall apply.

- If NB-IoT guard-band operation is not supported and NB-IoT in-band operation is supported, place a 5 MHz E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. Place the power boosted NB-IoT PRB at the outermost in-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- If neither NB-IoT guard-band nor NB-IoT in-band operation is supported, place an E-UTRA carrier adjacent to the upper Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply.

- Place a UTRA carrier adjacent to the lower sub-block edge of the upper sub-block.

- For transmitter tests, place one UTRA adjacent to the upper sub-block edge of the lower sub-block. The nominal carrier spacing defined in subclause 4.5.1 shall apply.

- The sub-block edges adjacent to the sub-block gap shall be determined using the specified FOffset-RAT for the carrier adjacent to the sub-block gap. The carrier(s) may be shifted maximum 100 kHz towards higher frequencies to align with the channel raster.

#### 4.8.22.2 NTC21 power allocation

a) Unless otherwise stated, set each carrier to the same power so that the sum of the carrier powers equals the rated total output power appropriate for the test configuration according to manufacturer’s declarations in subclause 4.7.2.

b) In case that NTC21 is configured for testing modulation quality, the power allocated per carrier for the RAT on which modulation quality is measured shall be the highest possible for the given modulation configuration according to the manufacturer’s declarations in subclause 4.7.2, unless that power is higher than the level defined by case a). The power of the remaining carriers from other RAT(s) shall be set to the same level as in case a).

If in the case of b) the power of one RAT needs to be reduced in order to meet the manufacture’s declaration the power in the other RAT(s) does not need to be increased.

### 4.8.23 TC22: Contiguous operation in CS17

#### 4.8.23.1 TC22 generation

TC22 is constructed using the following method:

- The Base Station RF Bandwidth shall be the declared maximum Base Station RF Bandwidth.

- Place a standalone NB-IoT carrier at the upper Base Station RF Bandwidth edge.

- If NB-IoT operation in NR in-band is supported, place a NR carrier with NB-IoT operation in NR in-band adjacent to the lower Base Station RF Bandwidth edge. Place the power boosted NB-IoT RB at the lower outermost RB eligible for NB-IoT operation in NR in-band at the lower Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply. Place a 5MHz / 15kHz SCS E-UTRA carrier adjacent to the 5MHz NR carrier.

- If NB-IoT operation in NR in-band is not supported and:

* If NB-IoT guard band operation is supported, place a 10 MHz E-UTRA carrier adjacent to the lower Base Station RF Bandwidth edge. Place the NB-IoT PRB at the outermost guard-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the lower Base Station RF Bandwidth edge and adjacent to the E-UTRA PRB edge as close as possible (i.e., away from the lower Base Station RF Bandwidth edge). The specified FOffset-RAT shall apply. Place a 5MHz / 15kHz SCS NR carrier adjacent to the 10 MHz E-UTRA carrier.
* If NB-IoT guard-band operation is not supported and NB-IoT in-band operation is supported, place a 5 MHz E-UTRA carrier adjacent to the lower Base Station RF Bandwidth edge. Place the NB-IoT PRB at the outermost in-band position eligible for NB-IoT PRB (according to subclause 4.5.3) at the lower Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply. Place a 5MHz / 15kHz SCS NR carrier adjacent to the 5 MHz E-UTRA carrier.
* If neither NB-IoT guard-band nor NB-IoT in-band operation is supported, place a 5MHz/15kHz SCS NR carrier adjacent to the lower Base Station RF Bandwidth edge. The specified FOffset-RAT shall apply. Place a 5 MHz E-UTRA carrier adjacent to the 5MHz / 15kHz SCS NR carrier.

- For transmitter tests, alternately add 5MHz E-UTRA carriers at the low end and NB-IoT standalone carriers at the high end adjacent to the already placed carriers until the Base Station RF Bandwidth is filled or the total number of supported carriers is reached. The nominal carrier spacing defined in subclause 4.5.1 shall apply.

- If NR 5MHz and/or E-UTRA 5/10 MHz channel bandwidth is not supported, the narrowest carrier shall be selected. If 15kHz SCS is not supported for particular NR operating band, the smallest supported SCS declared per operating band shall be selected.

#### 4.8.23.2 TC22 power allocation

Set the power of each carrier to the same power so that the sum of the carrier powers equals the rated total output power according to the manufacturer’s declaration in subclause 4.7.2.

**<Next of change>**

### 4.9.2 Test models

a) Unless otherwise stated, carriers within MSR test configurations used for transmitter tests shall be configured as follows:

- UTRA FDD carriers shall be configured according to TM1 as defined in TS 25.141 [10] subclause 6.1.1.1.

- UTRA TDD carriers shall be configured according to Table 6.1A as defined in TS 25.142 [12] subclause 6.2.4.1.2.

- E-UTRA carriers shall be configured according to E-TM1.1 as defined in subclause 6.1.1.1 of TS 36.141 [9], and data content of physical channels and signals as defined in subclause 6.1.2 of TS 36.141 [9].

For BC3 CS3, BC3 CS16 and BC3 CS17 BS testing, E-UTRA carriers shall be configured according to E-TM1.1\_BC3CS3 defined in Annex E.

For BC3 CS2 BS testing with NB-IoT inband and/or guard band, E-UTRA carriers shall be configured according to E-TM1.1\_BC3CS3 defined in Annex E.

- GSM carriers shall use GMSK modulation as defined in TS 51.021 [11] clause 6.2.2.

- NB-IoT carriers shall be configured according to N-TM as defined in TS 36.141 [9] subclauses 6.1.3, 6.1.4, 6.1.5 and 6.1.6.

- NR carriers shall be configured according to NR-FR1-TM1.1 as defined in subclause 4.9.2 of TS 38.141-1 [26], and data content of physical channels and signals as defined in subclause 4.9.2.3 of TS 38.141-1 [26].

For BC3 CS3, BC3 CS16 and BC3 CS17 BS testing, NR carriers shall be configured according to NR-TM1.1\_BC3CS3 defined in Annex E.

b) The configuration of the carriers in test configurations used for testing modulation quality and frequency error shall be as follows:

- For the case that modulation accuracy is measured for UTRA FDD, the UTRA FDD carriers shall be configured according to the supported TM1, TM4 and if HS-PDSCH transmission using 16QAM is supported also TM5 as defined in TS 25.141 [10] subclause 6.1.1.1, 6.1.1.4 and 6.1.1.4A whilst any remaining carriers from other RAT(s) shall be configured according to a).

- For the case that modulation accuracy is measured for UTRA TDD, the UTRA TDD carriers shall be configured according to the supported modulation in Table 6.2A, Table 6.39A, Table 6.39B, Table 6.39C, Table 6.39D, Table 6.40A, Table 6.40B, Table 6.41A, Table 6.41B as defined in TS 25.142 [12] subclause 6.3.4, 6.8.1, 6.8.2 and 6.8.3 whilst any remaining carriers from other RAT(s) shall be configured according to a).

- For the case that modulation accuracy is measured for E-UTRA, the E-UTRA carriers shall be configured according to the supported E-TM3.1, E-TM3.1a, E-TM3.1b, E-TM3.2, E-TM3.3 and E-TM2 as defined in subclauses 6.1.1.4, 6.1.1.5, 6.1.1.6 and 6.1.1.3 of TS 36.141 [9], and data content of physical channels and signals as defined in subclause 6.1.2 of TS 36.141 [9], whilst any remaining carriers from other RAT(s) shall be configured according to a).

For BC3 CS3, BC3 CS16 and BC3 CS17 BS testing, E-UTRA carriers shall be configured according to E-TM3.1\_BC3CS3, E-TM3.1a\_BC3CS3, E-TM3.1b\_BC3CS3, E-TM3.2\_BC3CS3, E-TM3.3\_BC3CS3, E-TM2\_BC3CS3, E-TM2a\_BC3CS3 and E-TM2b\_BC3CS3 defined in Annex E.

- For the case that modulation accuracy is measured for GSM, the GSM carriers shall be configured for the supported modulation according to TS 51.021 [11] clause 6.2.2 whilst any remaining carriers from other RAT(s) shall be configured according to a).

- For the case that modulation accuracy is measured for NR, the NR carriers shall be configured according to the supported NR-FR1-TM2, NR- FR1-TM2a, NR- FR1-TM3.1, NR- FR1-TM3.1a, NR- FR1-TM3.2 and NR- FR1-TM3.3, as defined in subclauses 4.9.2.2.3, 4.9.2.2.4, 4.9.2.2.5, 4.9.2.2.6, 4.9.2.2.7 and 4.9.2.2.8 of TS 38.141-1 [26], and data content of physical channels and signals as defined in subclause 4.9.2.3 of TS 38.141-1 [26], whilst any remaining carriers from other RAT(s) shall be configured according to a).

For the test of certain RF requirements clause 5 refers to the test configurations as defined in the single-RAT specifications. In this case, the transmitter test signals and test models as defined within the referred test specification for the RF requirement shall be used.

**<Next of change>**

# 5 Applicability of requirements and test configurations

The present clause defines for each RF test requirement the set of mandatory test configurations which shall be used for demonstrating conformance. This is specified in the Table 5.2-1 and Table 5.2-1a for single-RAT Multi-carrier, Table 5.1-1, Table 5.1-1a, Table 5.1-1b and Table 5.1-1c for multi-RAT Base Stations and Table 5.3-1 for multi-band capable Base Station.

Requirements apply according to the declared RAT Capability Set (CS) within each supported operating band of the MSR Base Station and the Band Category of the declared operating band (BC1, BC2 or BC3), as listed in the heading of each table. Some RF requirements listed in the tables may not be mandatory or they may apply only regionally. This is further specified for each requirement in clause 6 and 7, and in Table 4.3-1.

For a declared RAT Capability Set (CS) in Table 5.1-1, 5.1-1a, 5.1-1b, 5.1-1c and 5.2-1, only the requirements listed in the column for that CS apply. Requirements listed under CS other than the declared CS(s) need not be tested. In case the BS is declared to support more than one CS, the tests that are common between different supported CSs are not repeated.

For a BS declared to be capable of contiguous operation only, the test configuration(s) in Tables 5.1-1, 5.1-1c and 5.2-1 denoted by a “C” and entries that refer to single-RAT specifications shall be used for testing.

For a BS declared to be capable of contiguous and non-contiguous operation and where the parameters in the manufacture’s declaration according to subclause 4.7.2 are identical for contiguous and non-contiguous operation (within subgroup in case of CS7), the test configuration(s) in Table 5.1-1, 5.1-1c and 5.2-1 denoted by “CNC” and entries that refer to single-RAT specifications shall be used.

For a BS declared to be capable of contiguous and non-contiguous operation and where the parameters in the manufacture’s declaration according to subclause 4.7.2 are not identical for contiguous and non-contiguous operation (within subgroup in case of CS7), the test configuration(s) in Table 5.1-1, 5.1-1c and 5.2-1 denoted by “C/NC” and entries that refer to single-RAT specifications shall be used for testing.

For a BS declared to support NB-IoT operating in-band, the test configuration(s) in Table 5.1-1 and 5.2-1 denoted by “NI” and entries that refer to single-RAT specifications shall be used for testing. For a BS declared to support NB-IoT operating in-band, the test configuration(s) in Table 5.1-1c denoted by “NI” for BS capable of contiguous operation only, by “NCNI” for BS capable of contiguous and non-contiguous operation with same declared parameters, by “C/NCNI” for BS capable of contiguous and non-contiguous operation with different declared parameters and entries that refer to single-RAT specifications shall be used for testing.

For a BS declared to support NB-IoT operating in guard band, the test configuration(s) in Table 5.1-1 and 5.2-1 denoted by “NG” and entries that refer to single-RAT specifications shall be used for testing. For a BS declared to support NB-IoT operating in guard band, the test configuration(s) in Table 5.1-1c denoted by “NG” for BS capable of contiguous operation only, by “NCNG” for BS capable of contiguous and non-contiguous operation with same declared parameters, by “C/NCNG” for BS capable of contiguous and non-contiguous operation with different declared parameters and entries that refer to single-RAT specifications shall be used for testing.

For a BS declared to support NB-IoT operating in guard band and in-band for E-UTRA or NB-IoT operation in NR in-band, the test configuration(s) in Table 5.1-1, 5.1-1c and 5.2-1 denoted by “NG” or/and “NI” and entries that refer to single-RAT specifications shall be used for testing.For a BS declared to support NB-IoT standalone, the test configuration(s) in Table 5.1-1a, 5.1-1b, 5.1-1c and 5.2-1 and entries that refer to single-RAT specifications shall be used for testing.

For some of the RF test requirements entries within Tables 5.1-1 and 5.2-1 refer to the single-RAT specifications; this is denoted by "(TS 25.141)", "(TS 25.142)", "(TS 36.141)", "(TS 51.021)" or "(TS 38.141-1)". In this case the following shall apply:

- transmitter test signals and test models as defined within the referred test specification shall be used, see clause 4.9.2. For some RF requirements this comprises a mandatory test case in addition to a test case using the MSR test configurations defined in clause 4.8.

- for some RF requirements the initial conditions and test procedure as defined within the referred single-RAT test specification for the RF requirement shall be used. This is specified in further detail in clauses 6, 7 and 8 of the present document.

- for some RF requirements the test requirement as defined within the referred single-RAT test specification for the RF requirement shall be used. This is specified in further detail in clauses 6, 7 and 8 of the present document. In this case (see clause 4.1):

- The maximum acceptable uncertainty of the Test System for test requirements are defined in the respective referred test specification

- Test Tolerances are defined in the respective referred test specification.

- If the parameters in the manufacturer’s declarations according to subclause 4.7.2 are not identical for contiguous and non-contiguous operation, the parameters for contiguous operation shall be used for the test in the single RAT test specification.

For a BS declared to be capable of multi-band operation, the applicability of the requirement for each operating band is determined by the RAT configuration within that operating band as identified in Tables 5.1-1, 5.1-1c and 5.2-1, unless otherwise stated. The testing of multi-band capable BS shall be according to Table 5.3-1 as follows:

- For requirements test denoted by SBT (Single Band Test), the test configuration (s) in Table 5.1-1, 5.1-1c and 5.2-1 shall be used for each operating band depending on the RAT configuration within that band.

- For requirements test denoted by MBT (Multi-Band Test), the test configuration (s) in Table 5.3-1 shall be used depending on the Band Category of the declared operating band combination.

Table 5.1-1c: Test configurations for capability sets (CS16-19) for Multi-RAT capable BS

| Capability Set | NR + E-UTRA  NB-IoT in-band (Note 1) (Note 6)  NB-IoT guard band (Note 2)  (CS 16) | | NR + NB-IoT standalone + E-UTRA  NB-IoT in-band (Note 1) (Note 6)  NB-IoT guard band (Note 2)  (CS 17) | | GSM + NR + E-UTRA  NB-IoT in-band (Note 1, Note 6)  NB-IoT guard band (Note 2)  (CS 18) | UTRA + NR + E-UTRA  NB-IoT in-band (Note 1, Note 6)  NB-IoT guard band (Note 2)  (CS 19  ) |
| --- | --- | --- | --- | --- | --- | --- |
| BS test case | BC1 and BC2 | BC3 | BC1 and BC2 | BC3 | BC2 | BC1 and BC2 |
| **6.2 Base Station output power** | - | - | - | - |  |  |
| Base Station maximum output power | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG:TC22 | C: TC22  NI: TC22  NG:TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a |  |
| E-UTRA for DL RS power | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NB-IoT for DL RS power | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| UTRA FDD primary CPICH power | N/A | N/A | N/A | N/A | N/A | (TS 25.141) |
| UTRA FDD secondary CPICH power | N/A | N/A | N/A | N/A | N/A | (TS 25.141) |
| **6.3 Output power dynamics** | - | - | - | - | - | - |
| E-UTRA | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NB-IoT | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NR | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) |
| UTRA FDD | N/A | N/A | N/A | N/A | N/A | (TS 25.141) |
| GSM/EDGE | N/A | N/A | N/A | N/A | TC4b | N/A |
| **6.4 Transmit ON/OFF power** | - | - | - | - | - | - |
| Transmitter OFF power | N/A | C: TC21  CNC: NTC21 | N/A | C: TC22 | N/A | N/A |
| Transmitter transient period | N/A | C: TC21  CNC: NTC21 | N/A | C: TC22 | N/A | N/A |
| **6.5 Transmitted signal quality** | - | - | - | - | - | - |
| **6.5.1 Modulation quality** | - | - | - | - | - | - |
| E-UTRA | C: TC21  NI, NG: (Note 4)  CNC: TC21  NCNI, NCNG: (Note 4)  C/NC: NTC21, TC21  C/NCNI, C/NCNG: (Note 4) | C: TC21  NI, NG: (Note 4)  CNC: TC21  NCNI, NCNG: (Note 4)  C/NC: NTC21, TC21  C/NCNI, C/NCNG: (Note 4) | C: TC22  NI, NG: (Note 4) | C: TC22  NI, NG: (Note 4) | C: TC21a  NI, NG: (Note 4)  CNC: TC21a  NCNI, NCNG: (Note 4)  C/NC: NTC21a, TC21a  C/NCNI, C/NCNG: (Note 4) | C: TC21b  NI, NG: (Note 4)  CNC: TC21b  NCNI, NCNG: (Note 4)  C/NC: NTC21b, TC21b  C/NCNI, C/NCNG: (Note 4) |
| NB-IoT | N/A (Note 4) | N/A (Note 4) | Standalone: C: TC22  NI, NG: (Note 4) | Standalone C: TC22  NI, NG: (Note 4) | N/A (Note 4) | N/A (Note 4) |
| NR | C: TC21  CNC: TC21  C/NC: NTC21, TC21 | C: TC21  CNC: TC21  C/NC: NTC21, TC21 | C: TC22 | C: TC22 | C: TC21a  CNC: TC21a  C/NC: NTC21a, TC21a | C: TC21b  CNC: TC21b  C/NC: NTC21b, TC21b |
| UTRA FDD | N/A | N/A | N/A | N/A | N/A | C: TC21b  CNC: TC21b  C/NC: NTC21b, TC21b |
| GSM/EDGE | N/A | N/A | N/A | N/A | C: TC21a  CNC: TC21a  C/NC: NTC21a, TC21a | N/A |
| **6.5.2 Frequency error** | - | - | - | - | - | - |
| E-UTRA | Same TC as 6.5.1 | Same TC as 6.5.1 | Same TC as 6.5.1 | Same TC as 6.5.1 | Same TC as 6.5.1 | Same TC as 6.5.1 |
| NB-IoT | N/A (Note 4) | N/A (Note 4) | Same TC as 6.5.1 | Same TC as 6.5.1 | N/A (Note 4) | N/A (Note 4) |
| NR | Same TC as 6.5.1 | Same TC as 6.5.1 | Same TC as 6.5.1 | Same TC as 6.5.1 | Same TC as 6.5.1 | Same TC as 6.5.1 |
| UTRA FDD | N/A | N/A | N/A | N/A | N/A | Same TC as 6.5.1 |
| GSM/EDGE | N/A | N/A | N/A | N/A | Same TC as 6.5.1 | N/A |
| **6.5.3 Time alignment error** | - | - |  |  | - | - |
| E-UTRA | (TS 36.141)  NI, NG: (Note 4)  NCNI, NCNG: (Note 4)  C/NCNI, C/NCNG: (Note 4) | (TS 36.141)  NI, NG: (Note 4)  NCNI, NCNG: (Note 4)  C/NCNI, C/NCNG: (Note 4) | (TS 36.141)  NI, NG: (Note 4) | (TS 36.141)  NI, NG: (Note 4) | (TS 36.141)  NI, NG: (Note 4)  NCNI, NCNG: (Note 4)  C/NCNI, C/NCNG: (Note 4) | (TS 36.141)  NI, NG: (Note 4)  NCNI, NCNG: (Note 4)  C/NCNI, C/NCNG: (Note 4) |
| NB-IoT | N/A (Note 4) | N/A (Note 4) | Standalone: (TS 36.141)  NI, NG: (Note 4) | Standalone: (TS 36.141)  NI, NG: (Note 4) | N/A (Note 4) | N/A (Note 4) |
| NR | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) |
| UTRA FDD | N/A | N/A | N/A | N/A | N/A | (TS 25.141) |
| **6.6 Unwanted emissions** | - | - | - | - | - | - |
| **6.6.1 Transmitter spurious emissions** | - | - | - | - | - | - |
| (Category A) | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| (Category B) | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| Additional requirement for BC2 (Category B) | N/A | N/A | N/A | N/A | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | N/A |
| Protection of the BS receiver of own or different BS | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| Additional spurious emissions requirements | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| Co-location with other Base Stations | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| **6.6.2 Operating band unwanted emissions** | - | - | - | - | - | - |
| General requirement for Band Categories 1 and 3 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21  SC: (Note 3) | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21  SC: (Note 3) | C: TC22  NI: TC22  NG: TC22  SC: (Note 3) | C: TC22  NI: TC22  NG: TC22  SC: (Note 3) | N/A | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b  SC: (Note 3) |
| General requirement for Band Category 2 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21  SC: (Note 3) | N/A | C: TC22  NI: TC22  NG: TC22  SC: (Note 3) | N/A | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a  SC: (Note 3) | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b  SC: (Note 3) |
| Additional requirements | Compliance stated by manufacturer declaration | Compliance stated by manufacturer declaration | Compliance stated by manufacturer declaration | Compliance stated by manufacturer declaration | Compliance stated by manufacturer declaration | Compliance stated by manufacturer declaration |
| **6.6.3 Occupied bandwidth** | - | - | - | - | - | - |
| Minimum requirement | (TS 36.141)  (TS 38.141-1) | (TS 36.141)  (TS 38.141-1) | (TS 36.141)  (TS 38.141-1) | (TS 36.141)  (TS 38.141-1) | (TS 36.141)  (TS 38.141-1) | (TS 25.141)  (TS 36.141)  (TS 38.141-1) |
| **6.6.4 Adjacent Channel Leakage power Ratio (ACLR)** | - | - | - | - | - | - |
| E- UTRA | C: TC21  CNC: NTC21  C/NC: NTC21, TC21 | C: TC21  CNC: NTC21  C/NC: NTC21, TC21 | C: TC22 | C: TC22 | C: TC21a  CNC: NTC21a  C/NC: NTC21a, TC21a | C: TC21b  CNC: NTC21b  C/NC: NTC21b, TC21b |
| NB-IoT | NI: TC21  NG: TC21  NCNI: NTC21  NCNG: NTC21  C/NCNI, C/NCNG: NTC21, TC21 | NI: TC21  NG: TC21  NCNI: NTC21  NCNG: NTC21  C/NCNI, C/NCNG: NTC21, TC21 | TC22 | TC22 | NI: TC21a  NG: TC21a  NCNI: NTC21a  NCNG: NTC21a  C/NCNI, C/NCNG: NTC21a, TC21a | NI: TC21b  NG: TC21b  NCNI: NTC21b  NCNG: NTC21b  C/NCNI, C/NCNG: NTC21b, TC21b |
| NR | C: TC21  CNC: NTC21  C/NC: NTC21, TC21 | C: TC21  CNC: NTC21  C/NC: NTC21, TC21 | C: TC22 | C: TC22 | C: TC21a  CNC: NTC21a  C/NC: NTC21a, TC21a | C: TC21b  CNC: NTC21b  C/NC: NTC21b, TC21b |
| UTRA FDD | N/A | N/A | N/A | N/A | N/A | C: TC21b  CNC: NTC21b  C/NC: NTC21b, TC21b |
| Cumulative ACLR | CNC: NTC21  C/NC: NTC21 | CNC: NTC21  C/NC: NTC21 | N/A | N/A | CNC: NTC21a  C/NC: NTC21a | CNC: NTC21b  C/NC: NTC21b |
| **6.7 Transmitter intermodulation** | - | - | - | - |  |  |
| General requirement | Same TC as used in 6.6 | Same TC as used in 6.6 | Same TC as used in 6.6 | Same TC as used in 6.6 | Same TC as used in 6.6 | Same TC as used in 6.6 |
| Additional requirement (BC1 and BC2) | CNC: NTC21  C/NC: NTC21 | N/A | Same TC as used in 6.6 |  | CNC: NTC21a  C/NC: NTC21a | CNC: NTC21b  C/NC: NTC21b |
| Additional requirement (BC3) |  | Same TC as used in 6.6 |  | Same TC as used in 6.6 |  |  |
| **7.2 Reference sensitivity level** | - | - | - | - | - | - |
| E-UTRA | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NB-IoT | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NR | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) |
| UTRA FDD | N/A | N/A | N/A | N/A | N/A | (TS 25.141) |
| GSM/EDGE | N/A | N/A | N/A | N/A | TC5b | N/A |
| **7.3 Dynamic range** |  |  |  |  |  |  |
| E-UTRA | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NB-IoT | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NR | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) |
| UTRA FDD | N/A | N/A | N/A | N/A | N/A | (TS 25.141) |
| GSM/EDGE | N/A | N/A | N/A | N/A | TC5b | N/A |
| **7.4 In- band selectivity and blocking** | - | - | - | - |  |  |
| General blocking requirement | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| General narrowband blocking requirement | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| Additional narrowband blocking requirement for GSM/EDGE | N/A | N/A | N/A | N/A | TC5b | N/A |
| GSM/EDGE requirements for AM suppression | N/A | N/A | N/A | N/A | TC5b | N/A |
| Additional BC3 blocking requirement | N/A | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | N/A | C: TC22  NI: TC22  NG: TC22 | N/A | N/A |
| **7.5 Out-of-band blocking** | - | - | - | - |  |  |
| General requirement | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| Co-location requirement | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| **7.6 Receiver spurious emissions** | - | - | - | - | - | - |
| General requirement | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| Additional requirement for BC2 (Category B) | N/A | N/A | C: TC22  NI: TC22  NG: TC22 | N/A | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | N/A |
| **7.7 Receiver intermodulation** | - | - | - | - |  |  |
| General intermodulation requirement | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| General narrowband intermodulation requirement | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C, NI, NG: TC21  CNC, NCNI, NCNG: NTC21  C/NC, C/NCNI, C/NCNG: NTC21, TC21 | C: TC22  NI: TC22  NG: TC22 | C: TC22  NI: TC22  NG: TC22 | C, NI, NG: TC21a  CNC, NCNI, NCNG: NTC21a  C/NC, C/NCNI, C/NCNG: NTC21a, TC21a | C, NI, NG: TC21b  CNC, NCNI, NCNG: NTC21b  C/NC, C/NCNI, C/NCNG: NTC21b, TC21b |
| Additional narrowband intermodulation requirement for GSM/EDGE | N/A | N/A | N/A | N/A | TC5b | N/A |
| **7.8 In-channel selectivity** | - | - | - | - | - | - |
| E-UTRA requirement | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NB-IoT | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) | (TS 36.141) |
| NR | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) | (TS 38.141-1) |
| NOTE 1: The support of NB-IoT in-band operation in E-UTRA is optional and declared by the manufacturer. If not supported, the test configurations denoted by “NI” shall not be used for testing.  NOTE 2: The support of NB-IoT guard band operation in E-UTRA is optional and declared by the manufacturer. If not supported, the test configurations denoted by “NG” shall not be used for testing.  NOTE 3: For Operating band unwanted emissions, NR shall also be tested with SC with widest supported channel bandwidth and highest supported sub-carrier spacing.  NOTE 4: There is no specific test with NB-IoT for those requirements, tests could be performed using E-UTRA signal only, without NB-IoT.  NOTE 5: The support of NB-IoT operation in NR in-band is optional and declared by the manufacturer. If not supported, the test configurations denoted by “NI” shall not be used for testing. | | | | | | | |

**<Next of change>**

# 6 Transmitter characteristics

## 6.1 General

General test conditions for transmitter tests are given in clause 4, including interpretation of measurement results and configurations for testing. BS configurations for the tests are defined in subclause 4.10.

Unless otherwise stated, a BS declared to be capable of E-UTRA with NB-IoT in-band or guard band operations (or any combination with GSM and/or UTRA or NR) is only required to pass the transmitter tests for E-UTRA with NB-IoT in-band or guard band (or any combination with GSM and/or UTRA or NR); it is not required to perform the transmitter tests again for E-UTRA only (or any combination with GSM and/or UTRA or NR).

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 or NR) needs only to pass the transmitter tests for E-UTRA with guard band operation (or any combination with GSM and/or UTRA or NR).

Unless otherwise stated, a BS declared to be capable of NB-IoT operation in NR in-band(or any combination with GSM and/or UTRA or E-UTRA) is only required to pass the transmitter tests for NB-IoT operation in NR in-band (or any combination with GSM and/or UTRA or E-UTRA); it is not required to perform the transmitter tests again for NR only (or any combination with GSM and/or UTRA or E-UTRA).

## 6.6 Unwanted emissions

Unwanted emissions consist of out-of-band emissions and spurious emissions [13]. Out of band emissions are unwanted emissions immediately outside the channel bandwidth resulting from the modulation process and non-linearity in the transmitter but excluding 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 out of band emissions.

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 ΔfOBUE above and ΔfOBUE below each band. Emissions outside of this frequency range are limited by a spurious emissions requirement. The values of ΔfOBUE are defined in table 6.6-1. For a BS with multi-RAT operation where the individual RATs are in different RAT specific bands that partially or fully overlap; ΔfOBUE is according to the combined frequency range occupied by the overlapping bands.

Table 6.6-1: Maximum offset of OBUE outside the downlink operating band

|  |  |
| --- | --- |
| Operating band characteristics | ΔfOBUE [MHz] |
| FDL\_high – FDL\_low ≤ 200 MHz | 10 |
| 200 MHz < FDL\_high – FDL\_low ≤ 900 MHz | 40 |

There is in addition a requirement for occupied bandwidth and an ACLR requirement applicable for some RATs.

### 6.6.1 Transmitter spurious emissions

#### 6.6.1.1 Definition and applicability

The transmitter spurious emission limits apply from 9 kHz to 12.75 GHz, excluding the frequency range from ΔfOBUE below the lowest frequency of the downlink operating band up to ΔfOBUE above the highest frequency of the downlink operating band. 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 requirement in Table 6.6.1.3.1-2 in TS 37.104 [2], and specifically stated exceptions in Table 6.6.1.5.5-1 that apply also closer than ΔfOBUE from the downlink operating band. For some operating bands the upper frequency limit is higher than 12.75 GHz.

The requirements shall apply whatever the type of transmitter considered. It applies for all transmission modes foreseen by the manufacturer's specification. Unless otherwise stated, all requirements are measured as mean power (RMS).

#### 6.6.1.2 Minimum requirement

The minimum requirement is in TS 37.104 [2] subclause 6.6.1.

#### 6.6.1.3 Test purpose

This test measures conducted spurious emission from the MSR BS transmitter antenna connector, while the transmitter is in operation.

#### 6.6.1.4 Method of test

##### 6.6.1.4.1 Initial conditions

Test environment: normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: BRFBW, MRFBW and TRFBW single-band operation, see subclause 4.9.1; BRFBW\_T’RFBW and B’RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

1) Connect the BS antenna connector to a measurement receiver according to Annex D.1.1 using an attenuator or a directional coupler if necessary

2) Measurements shall use a measurement bandwidth in accordance to the conditions in TS 37.104 [2] subclause 6.6.1.

3) Detection mode: True RMS.

##### 6.6.1.4.2 Procedure

1) Set the Base Station to transmit at maximum power according to the applicable test configuration in clause 5 using the corresponding test models or set of physical channels in subclause 4.9.2.

2) Measure the emission at the specified frequencies with specified measurement bandwidth and note that the measured value does not exceed the specified value.

In addition, for a multi-band capable BS, the following step shall apply:

4) For multi-band capable BS and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band. For multi-band capable BS with separate antenna connector, the antenna connector not being under test in case of SBT or MBT shall be terminated.

#### 6.6.1.5 Test requirements

The measurement result in step 2 of 6.6.1.4.2 shall not exceed the maximum level specified in Table 6.6.1.5.1-1 to Table 6.6.1.5.6-1 if applicable for the BS under test.

The test requirements of either subclause 6.6.1.5.1 (Category A limits) or subclause 6.6.1.5.2 (Category B limits) shall apply. In addition for a BS operating in Band Category 2, the test requirements of 6.6.1.5.3 shall apply in case of Category B limits.

##### 6.6.1.5.1 Spurious emissions (Category A)

The power of any spurious emission shall not exceed the limits in Table 6.6.1.5.1-1

Table 6.6.1.5.1-1: BS Spurious emission limits, Category A

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Maximum level | Measurement Bandwidth | Note |
| 9kHz ‑ 150kHz | -13 dBm | 1 kHz | Note 1 |
| 150kHz ‑ 30MHz | 10 kHz | Note 1 |
| 30MHz ‑ 1GHz | 100 kHz | Note 1 |
| 1GHz ‑ 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 | Note 2, Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [13], s4.1  NOTE 2: Bandwidth as in ITU-R SM.329 [13], s4.1. Upper frequency as in ITU-R SM.329 [13], 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. | | | |

##### 6.6.1.5.2 Spurious emissions (Category B)

The power of any spurious emission shall not exceed the limits in Table 6.6.1.5.2-1

Table 6.6.1.5.2-1: 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 | Note 2, Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [13], s4.1  NOTE 2: Bandwidth as in ITU-R SM.329 [13], s4.1. Upper frequency as in ITU-R SM.329 [13], 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. | | | |

##### 6.6.1.5.3 Additional test requirement for BC2 (category B)

For a BS operating in Band Category 2 when GSM/EDGE is configured, the power of any spurious emission shall not exceed the limits in Table 6.6.1.5.3-1.

For BS capable of multi-band operation, the limits in Table 6.6.1.5.3-1 are only applicable when all supported operating bands belong to BC2 and GSM/EDGE is configured in all bands.

Table 6.6.1.5.3-1: Additional BS Spurious emissions limits for BC2, Category B

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Frequency offset from transmitter operating band edge (Note1) | Maximum Level | Measurement Bandwidth |
| 500 MHz ↔ 1 GHz | 10 – 20 MHz | -36 dBm | 300 kHz |
| 20 – 30 MHz | -36 dBm | 1 MHz |
| ≥ 30 MHz | -36 dBm | 3 MHz |
| 1 GHz ↔ 12.75 GHz | ≥ 30 MHz | -30 dBm | 3 MHz |
| NOTE 1: For BS capable of multi-band operation, the frequency offset is relative to the closest operating band. | | | |

##### 6.6.1.5.4 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 6.6.1.5.4-1, depending on the declared Base Station class and Band Category.

Table 6.6.1.5.4-1: 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 | FUL\_low – FUL\_high | -96 dBm | 100 kHz |  |
| Wide Area BS | BC2 | FUL\_low – FUL\_high | -98 dBm | 100 kHz |  |
| Medium Range BS | BC1,BC2 | FUL\_low – FUL\_high | -91 dBm | 100 kHz |  |
| Local Area BS | BC1,BC2 | FUL\_low – FUL\_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. | | | | | |

##### 6.6.1.5.5 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. An overview of regional requirements in the present document is given in subclause 4.4.

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 6.6.1.5.5-1 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 6.6.1.5.5-1 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 6.6.1.5.5-1 apply for the operating band supported at that antenna connector.

Table 6.6.1.5.5-1: 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| DCS1800  (Note 3) | 1805 ‑ 1880 MHz | -47 dBm | 100 kHz | This requirement does not apply to BS operating in band 3. |
| 1710 - 1785 MHz | -61 dBm | 100 kHz | This requirement does not apply to BS operating in band 3, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| PCS1900 | 1930 ‑ 1990 MHz | -47 dBm | 100 kHz | This requirement does not apply to BS operating in band 2, 25, band 36 or band 70. |
| 1850 ‑ 1910 MHz | -61 dBm | 100 kHz | This requirement does not apply to BS operating in band 2 or 25, since it is already covered by the requirement in sub-clause 6.6.1.5.4. This requirement does not apply to BS operating in band 35. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. 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 | 2110 - 2170 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 1 or 65 . |
| 1920 - 1980 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 1 or 65, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| UTRA FDD Band II or  E-UTRA Band 2 or NR Band n2 | 1930 - 1990 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 2, 25 or 70. |
| 1850 - 1910 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 2 or 25, since it is already covered by the requirement in sub-clause 6.6.1.5.4 |
| UTRA FDD Band III or  E-UTRA Band 3 or NR Band n3 (Note 3) | 1805 - 1880 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 3 or 9. |
| 1710 - 1785 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 3, since it is already covered by the requirement in sub-clause 6.6.1.5.4.  For BS operating in band 9, it applies for 1710 MHz to 1749.9 MHz and 1784.9 MHz to 1785 MHz, while the rest is covered in sub-clause 6.6.1.5.4. |
| UTRA FDD Band IV or  E-UTRA Band 4 | 2110 - 2155 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 4, 10 or 66. |
| 1710 - 1755 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 4, 10 or 66, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. For 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 or NR Band n18 | 860 - 890 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 6, 18, 19 |
| 815 - 830 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 18 since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| 830 - 845 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 6, 19, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| UTRA FDD Band VII or  E-UTRA Band 7 or NR Band n7 | 2620 - 2690 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 7. |
| 2500 - 2570 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 7, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| UTRA FDD Band IX or  E-UTRA Band 9 | 1844.9 - 1879.9 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 3 or 9. |
| 1749.9 - 1784.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 3 or 9, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| UTRA FDD Band X or  E-UTRA Band 10 | 2110 - 2170 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 4, 10 or 66. |
| 1710 - 1770 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 10 or 66, since it is already covered by the requirement in sub-clause 6.6.1.5.4. For BS operating in band 4, it applies for 1755 MHz to 1770 MHz, while the rest is covered in sub-clause 6.6.1.5.4. |
| UTRA FDD Band XI or XXI or  E-UTRA Band 11 or 21 | 1475.9 - 1510.9 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 11, 21, 32, 50, 74 or 75. |
| 1427.9 - 1447.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 11 or 74, since it is already covered by the requirement in sub-clause 6.6.1.5.4. This requirement does not apply to BS operating in band 32, 50, 51, 75 or 76. |
| 1447.9 – 1462.9 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 21 or 74, since it is already covered by the requirement in sub-clause 6.6.1.5.4. 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in subclause 6.6.1.5.4. 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, since it is already covered by the requirement in subclause 6.6.1.5.4. |
| UTRA FDD Band XXII or  E-UTRA Band 22 | 3510 – 3590 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 22, 42, 48, 49, 77 or 78. |
| 3410 – 3490 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 22, since it is already covered by the requirement in subclause 6.6.1.5.4. This requirement does not apply to Band 42 |
| E-UTRA Band 24 | 1525 – 1559 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 24. |
| 1626.5 – 1660.5 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 24, since it is already covered by the requirement in subclause 6.6.1.5.4. |
| UTRA FDD Band XXV or E-UTRA Band 25 or NR Band n25 | 1930 - 1995 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 2, 25 or 70. |
| 1850 - 1915 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 25, since it is already covered by the requirement in sub-clause 6.6.1.5.4. For BS operating in band 2, it applies for 1910 MHz to 1915 MHz, while the rest is covered in sub-clause 6.6.1.5.4. |
| UTRA FDD Band XXVI or E-UTRA Band 26 | 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. For BS operating in band 5, it applies for 814 MHz to 824 MHz, while the rest is covered in sub-clause 6.6.1.5.4. 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, since it is already covered by the requirement in subclause 6.6.1.5.4. For BS operating in Band 26, it applies for 807 MHz to 814 MHz, while the rest is covered in sub-clause 6.6.1.5.4. 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. This requirement does not apply to BS operating in Band 44. For BS operating in Band 67, it applies for 703-736MHz. For E-UTRA BS operating in Band 68, it applies for 728MHz to 733MHz. |
| 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 | 2350 - 2360 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 30 or 40. |
| 2305 - 2315 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 30, since it is already covered by the requirement in sub-clause 6.6.1.5.4. 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. This requirement does not apply to BS operating in band 72 or 73. |
| UTRA FDD Band XXXII or E-UTRA Band 32 | 1452 - 1496 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 | 1900 - 1920 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 | 2010 - 2025 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 | 1850 – 1910 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band 35 |
| UTRA TDD Band b) or E-UTRA Band 36 | 1930 - 1990 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 | 1910 - 1930 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, but is pending any future deployment. |
| UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38 | 2570 – 2620 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 | 1880 – 1920MHz | -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 | 2300 – 2400MHz | -52 dBm | 1 MHz | This is not applicable to BS operating in Band 30 or 40 |
| E-UTRA Band 41 or NR Band n41 | 2496 – 2690MHz | -52 dBm | 1 MHz | This is not applicable to BS operating in Band 41 or 53 |
| E-UTRA Band 42 | 3400 – 3600 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 | 3600 – 3800 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 | 1447 - 1467 MHz | -52 dBm | 1 MHz | This is not applicable to BS operating in Band 45 |
| E-UTRA Band 46 | 5150 - 5925 MHz | -52 dBm | 1 MHz | This is not applicable to BS operating in Band 46 |
| E-UTRA Band 47 | 5855 - 5925 MHz | -52 dBm | 1 MHz |  |
| E-UTRA Band 48 or NR Band n48 | 3550 – 3700 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 | 3550 – 3700 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 | 1432 - 1517 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 | 1427 - 1432 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 | 3300 – 3400 MHz | -52 dBm | 1 MHz | This is not applicable to BS operating in Band 42 or 52. |
| E-UTRA Band 53 | 2483.5 - 2495 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 | 2110 - 2200 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 1 or 65, |
| 1920 - 2010 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 65, since it is already covered by the requirement in sub-clause 6.6.1.5.4.  For BS operating in Band 1, it applies for 1980 MHz to 2010 MHz, while the rest is covered in sub-clause 6.6.1.5.4. |
| E-UTRA Band 66 or NR Band n66 | 2110 - 2200 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 4, 10, 23 or 66. |
| 1710 - 1780 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 66, since it is already covered by the requirement in clause 6.6.1.5.4. For BS operating in Band 4, it applies for 1755 MHz to 1780 MHz, while the rest is covered in clause 6.6.1.5.4. For BS operating in Band 10, it applies for 1770 MHz to 1780 MHz, while the rest is covered in clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. For BS operating in Band 28, it applies between 698 MHz and 703 MHz, while the rest is covered in sub-clause 6.6.1.5.4. |
| E-UTRA Band 69 | 2570 - 2620 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 | 1995 - 2020 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 2, 25 or 70 |
| 1695 – 1710 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 70, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| E-UTRA Band 74 or NR Band n74 | 1475 – 1518 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band 11, 21, 32, 50, 74 or 75. |
| 1427 – 1470 MHz | -49 dBm | 1MHz | This requirement does not apply to BS operating in Band 74, since it is already covered by the requirement in sub-clause 6.6.1.5.4. 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 | 1432 - 1517 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 | 1427 - 1432 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in Band 50, 51, 75 or 76. |
| NR Band n77 | 3300 MHz – 4200 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 | 3300 MHz – 3800 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 n80 | 1710 - 1785 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 3, since it is already covered by the requirement in sub-clause 6.6.1.5.4.  For BS operating in band 9, it applies for 1710 MHz to 1749.9 MHz and 1784.9 MHz to 1785 MHz, while the rest is covered in sub-clause 6.6.1.5.4. |
| NR Band n81 | 880 - 915 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 8, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| NR Band n82 | 832 - 862 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 20, since it is already covered by the requirement in subclause 6.6.1.5.4. |
| NR Band n83 | 703 - 748 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 28, since it is already covered by the requirement in sub-clause 6.6.1.5.4. This requirement does not apply to BS operating in Band 44. For BS operating in Band 67, it applies for 703-736MHz. For BS operating in Band 68, it applies for 728MHz to 733MHz. |
| NR Band n84 | 1920 - 1980 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 1 or 65, since it is already covered by the requirement in sub-clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. For BS operating in Band 29, it applies 1 MHz below the Band 29 downlink operating band (Note 7). |
| NR Band n86 | 1710 - 1780 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band 66, since it is already covered by the requirement in sub-clause 6.6.1.5.4. For BS operating in Band 4, it applies for 1755 MHz to 1780 MHz, while the rest is covered in sub-clause 6.6.1.5.4. For BS operating in Band 10, it applies for 1770 MHz to 1780 MHz, while the rest is covered in sub-clause 6.6.1.5.4. |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4 |
| 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. 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, since it is already covered by the requirement in sub-clause 6.6.1.5.4. For BS operating in Band 27, it applies 3 MHz below the Band 27 downlink operating band. |
| NOTE 5: Void | | | | |

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 6.6.1.5.5-1 do not apply for the 10 MHz frequency range immediately outside the downlink operating band (see Tables 4.4-1 and 4.4-2). Emission limits for this excluded frequency range may be covered by local or regional requirements.

NOTE 2: Table 6.6.1.5.5-1 assumes that two operating bands, where the frequency ranges in Table 4.4-1 or Table 4.4-2 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: For the protection of DCS1800, UTRA Band III, E-UTRA Band 3 or NR Band n3 in China, the frequency ranges of the downlink and uplink protection requirements are 1805 – 1850 MHz and 1710 – 1755 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 base stations(except in Band 46), special co-existence requirements may apply that are not covered by the 3GPP specifications.

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 ΔfOBUE below the lowest BS transmitter frequency of the downlink operating band and ΔfOBUE above the highest BS transmitter frequency of the downlink operating band.

The power of any spurious emission shall not exceed:

Table 6.6.1.5.5-2: BS Spurious emissions limits for BS for co-existence with PHS

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Maximum Level | Measurement Bandwidth | Note |
| 1884.5 ‑ 1915.7 MHz | -41 dBm | 300 kHz | Applicable for co-existence with PHS system operating in 1884.5-1915.7MHz |
| 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 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 6.6.1.5.5-3: Additional BS Spurious emissions limits for Band 41

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Maximum Level | Measurement Bandwidth | Note |
| 2505MHz – 2535MHz | -42dBm | 1 MHz |  |
| 2535MHz – 2655MHz | -22dBm | 1 MHz | Applicable at offsets ≥ 250% of channel bandwidth from carrier frequency |
| NOTE: This requirement applies for 10 or 20 MHz E-UTRA carriers allocated within 2545-2575MHz or 2595-2645MHz. | | | |

In addition to the requirements in subclauses 6.6.1.5.1 to 6.6.1.5.4 and above in the present subclause, the BS may have to comply with the applicable emission limits established by FCC Title 47 [8], 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 6.6.1.5.5-4: Additional BS Spurious emissions limits for Band 30

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Maximum Level | Measurement Bandwidth | Note |
| 2200MHz – 2345MHz | -45dBm | 1 MHz |  |
| 2362.5MHz – 2365MHz | -25dBm | 1 MHz |  |
| 2365MHz – 2367.5MHz | -40dBm | 1 MHz |  |
| 2367.5MHz – 2370MHz | -42dBm | 1 MHz |  |
| 2370MHz – 2395MHz | -45dBm | 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 6.6.1.5.5-5.

Table 6.6.1.5.5-5: Emissions limits for protection of adjacent band services

|  |  |  |  |
| --- | --- | --- | --- |
| Operating Band | Filter centre frequency, Ffilter | Maximum Level [dBm] | Measurement Bandwidth |
| 45 | Ffilter = 1467.5 | -20 | 1 MHz |
| Ffilter = 1468.5 | -23 | 1 MHz |
| Ffilter = 1469.5 | -26 | 1 MHz |
| Ffilter = 1470.5 | -33 | 1 MHz |
| Ffilter = 1471.5 | -40 | 1 MHz |
| 1472.5 MHz ≤ Ffilter ≤ 1491.5 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 6.6.1.5.5-6: Additional BS Spurious emissions limits for Band 48

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Maximum Level | Measurement Bandwidth | Note |
| 3530MHz – 3720MHz | -25dBm | 1 MHz | Applicable 10MHz from the assigned channel edge |
| 3100MHz – 3530MHz  3720MHz – 4200MHz | -40dBm | 1 MHz |  |

##### 6.6.1.5.6 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 6.6.1.5.6-1 for a BS where requirements for co-location with a BS type listed in the first column apply, depending on the declared Base Station class. For BS capable of multi-band operation, the exclusions and conditions in the Note column of Table 6.6.1.5.6-1 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 6.6.1.5.6-1 apply for the operating band supported at that antenna connector.

Table 6.6.1.5.6-1: 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 | 1710 - 1785 MHz | -98 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| PCS1900 | 1850 - 1910 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 | 1920 - 1980 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| UTRA FDD Band II or E-UTRA Band 2 or NR Band n2 | 1850 - 1910 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| UTRA FDD Band III or E-UTRA Band 3 or NR Band n3 | 1710 - 1785 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| UTRA FDD Band IV or E-UTRA Band 4 | 1710 - 1755 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 | 2500 - 2570 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| 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 | 1749.9 - 1784.9 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| UTRA FDD Band X or E-UTRA Band 10 | 1710 - 1770 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| UTRA FDD Band XI or E-UTRA Band 11 | 1427.9 - 1447.9 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 | 1447.9 – 1462.9 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 | 3410 – 3490 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 | 2000 - 2020 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| E-UTRA Band 24 | 1626.5 – 1660.5 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| UTRA FDD Band XXV or E-UTRA Band 25 or NR Band n25 | 1850 - 1915 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| UTRA FDD Band XXVI or E-UTRA Band 26 | 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 | 2305 - 2315 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 | 1900 - 1920 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 | 2010 - 2025 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 | 1850 – 1910 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 | 1930 - 1990 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band 2 and 36 |
| UTRA TDD Band c) or E-UTRA Band 37 | 1910 - 1930 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 ITU-R M.1036, but is pending any future deployment. |
| UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38 | 2570 – 2620 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band 38. |
| UTRA TDD Band f) or E-UTRA Band 39 or NR Band n39 | 1880 – 1920MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band 33 and 39 |
| UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40 | 2300 – 2400MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band 30 or 40 |
| E-UTRA Band 41 or NR Band n41 | 2496 – 2690MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band 41 or 53 |
| E-UTRA Band 42 | 3400 – 3600 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 | 3600 – 3800 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 | 1447 – 1467 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band 45 |
| E-UTRA Band 46 | 5150 – 5925 MHz | N/A | -91 dBm | -88 dBm | 100 kHz | This is not applicable to BS operating in Band 46 |
| E-UTRA Band 48 or NR Band n48 | 3550 – 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 | 3550 – 3700 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 | 1432 – 1517 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 |
| E-UTRA Band 51 or NR Band n51 | 1427 – 1432 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 | 3300 – 3400 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 | 2483.5 – 2495 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 | 1920 - 2010 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| E-UTRA Band 66 or NR Band n66 | 1710 – 1780 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 | 1695 – 1710 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 | 1427 – 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 | 3300 MHz – 4200 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 | 3300 MHz – 3800 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 n80 | 1710 – 1785 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 | 1920 – 1980 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| E-UTRA Band 85 | 698 - 716 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |
| NR Band n86 | 1710 – 1780 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 |  |

NOTE 1: As defined in the scope for spurious emissions in this subclause, the co-location requirements in Table 6.6.1.5.6-1 do not apply for the ΔfOBUE frequency range immediately outside the BS transmit frequency range of a downlink operating band (see Tables 4.4-1 and 4.4-2). 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 TR 25.942 [14].

NOTE 2: Table 6.6.1.5.6-1 assumes that two operating bands, where the corresponding BS transmit and receive frequency ranges in Table 4.4-1 or Table 4.4-2 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 the 3GPP 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 the 3GPP specifications.

### 6.6.2 Operating band unwanted emissions

#### 6.6.2.1 Definition and applicability

The Operating band unwanted emission limits are defined from ΔfOBUE below the lowest frequency of each supported downlink operating band to the lower Base Station RF Bandwidth edge located at FBW RF,low and from the upper Base Station RF Bandwidth edge located at FBW RF,high up to ΔfOBUE 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 ΔfOBUE are defined in table 6.6-1.

The requirements shall apply whatever the type of transmitter considered and for all transmission modes foreseen by the manufacturer's specification, except for any operating band with GSM/EDGE single RAT operation. The requirements in TS 45.005 [6] as defined in subclause 6.6.2.3 apply to an MSR Base Station for any operating band with GSM/EDGE single RAT operation in Band Category 2.

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.

#### 6.6.2.2 Minimum requirement

The minimum requirement is in TS 37.104 [2] subclause 6.6.2.1, 6.6.2.2, 6.6.2.3 and 6.6.2.4.

#### 6.6.2.3 Test purpose

This test measures the emissions of the MSR BS, close to the assigned channel bandwidth of the wanted signal, while the transmitter is in operation.

#### 6.6.2.4 Method of test

For some of the test cases Tables 5.1-1 and 5.2-1 refer to single-RAT specifications; see clause 5. In this case the following shall apply:

- For references to TS 25.141 [10], the method of test is specified in TS 25.141 [10], subclause 6.5.2.1.4.

- For references to TS 25.142 [12], the method of test is specified in TS 25.142 [12], subclause 6.6.2.1.4.

- For references to TS 36.141 [9], the method of test is specified in TS 36.141 [9], subclause 6.6.3.4.

- For references to TS 38.141-1 [26], the method of test is specified in TS 38.141-1 [26], subclause 6.6.4.4.

NOTE: In this case the test requirements of the present document defined in subclause 6.6.2.5 apply.

For GSM/EDGE single-RAT requirements, the method of test is specified in TS 51.021 [11], applicable parts of subclause 6.5.1, 6.5.2, 6.6.2 and 6.12.

For test requirements of operating band unwanted emissions using the MSR test configurations defined in subclause 4.8, the, method of test described in subclauses 6.6.2.4.1 and 6.6.2.4.2 applies.

##### 6.6.2.4.1 Initial conditions

Test environment: normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: BRFBW, MRFBW and TRFBW in single-band operation, see subclause 4.9.1; BRFBW\_T’RFBW and B’RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

1) Connect the signal analyzer to the Base Station antenna connector as shown in Annex D.1.1.

As a general rule, the resolution bandwidth of the measuring equipment should be equal to the measurement bandwidth. However, to improve measurement accuracy, sensitivity, efficiency and to avoid e.g. carrier leakage, 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.

2) Detection mode: True RMS.

##### 6.6.2.4.2 Procedure

1) Set the Base Station to transmit at maximum power according to the applicable test configuration in clause 5 using the corresponding test models or set of physical channels in subclause 4.9.2.

2) Step the centre frequency of the measurement filter in contiguous steps and measure the emission within the specified frequency ranges with the specified measurement bandwidth. For BS operating in multiple bands or non-contiguous spectrum, the emission within the Inter RF Bandwidth or sub-block gap shall be measured using the specified measurement bandwidth from the closest RF Bandwidth or sub block edge.

3) Repeat the test for the remaining test cases with channel set-up according to clause 5 and subclause 4.9.2.

In addition, for a multi-band capable BS, the following step shall apply:

4) For multi-band capable BS and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band. For multi-band capable BS with separate antenna connector, the antenna connector not being under test in case of SBT or MBT shall be terminated.

#### 6.6.2.5 Test requirement

##### 6.6.2.5.1 Test requirements 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 6.6.2.5.1-1 to 6.6.2.5.1-4 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\_offsetmax is the offset to the frequency ΔfOBUE outside the downlink operating band.

- Δfmax is equal to f\_offsetmax minus half of the bandwidth of the measuring filter.

For a BS operating in multiple bands, inside any Inter RF Bandwidth gaps with Wgap < 2\* ΔfOBUE, 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 Table 6.6.2.5.1-1 to 6.6.2.5.1-4 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\_offsetmax is equal to the Inter RF Bandwidth gap minus half of the bandwidth of the measuring filter.

- Δfmax is equal to f\_offsetmax 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 subclause for the largest frequency offset (Δfmax), of a band where there are no carriers transmitted shall apply from ΔfOBUE below the lowest frequency, up to ΔfOBUE 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 6.6.2.5.1-1 to 6.6.2.5.1-4 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\_offsetmax is equal to the sub block gap bandwidth minus half of the bandwidth of the measuring filter.

- Δfmax is equal to f\_offsetmax minus half of the bandwidth of the measuring filter.

Applicability of Wide Area operating band unwanted emission requirements in Tables 6.6.2.5.1-1/1a, 6.6.2.5.1-1c and 6.6.2.5.1-1d/1e is specified in Table 6.6.2.5.1-0.

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 [5] and TS 38.104 [27]. Option 2 also corresponds to the UTRA spectrum emission mask as defined in TS 25.104 [3].

Table 6.6.2.5.1-0: Applicability of operating band unwanted emission requirements for BC1 and BC3 Wide Area BS

|  |  |  |
| --- | --- | --- |
| NR Band operation | Standalone NB-IoT carrier adjacent to the BS RF bandwidth edge or UTRA supported | Applicable requirement table |
| None | Y/N | 6.6.2.5.1-1/1a (option 2) |
| In certain regions (NOTE 2), bands 1, 7, 38, 65 | N | 6.6.2.5.1-1/1a (option 2) |
| Any | Y | 6.6.2.5.1-1/1a (option 2) |
| Any below 1GHz | N | 6.6.2.5.1-1c (option 1) |
| Any above 1GHz except for, in certain regions (NOTE 2), bands 1, 7, 38, 65 | N | 6.6.2.5.1-1d/1e (option 1) |
| NOTE 1: Void.  NOTE 2: Applicable only for operation in regions where Category B limits as defined in ITU-R Recommendation SM.329 [13] are used for which category B option 2 operating band unwanted emissions requirements as defined in TS 36.104 [5] and TS 38.104 [27] are applied. | | |

Table 6.6.2.5.1-1: Wide Area BS operating band unwanted emission mask (UEM) for BC1 and BC3 bands ≤ 3GHz, option 2

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 0.2 MHz | 0.015MHz ≤ f\_offset < 0.215MHz | -12.5 dBm | 30 kHz |
| 0.2 MHz ≤ Δf < 1 MHz | 0.215MHz ≤ f\_offset < 1.015MHz | (Note 4) | 30 kHz |
| (Note 5) | 1.015MHz ≤ f\_offset < 1.5 MHz | -24.5 dBm (Note 4) | 30 kHz |
| 1 MHz ≤ Δf ≤  min(Δfmax, 10 MHz) | 1.5 MHz ≤ f\_offset < min(f\_offsetmax, 10.5 MHz) | -11.5 dBm (Note 4) | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -15dBm/MHz (for MSR BS supporting multi-band operation, either this limit or -16dBm/100kHz with correspondingly adjusted f\_offset shall apply for this frequency offset range for operating bands <1GHz).  NOTE2: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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.  NOTE 3: For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.5.1-1b apply for 0 MHz ≤ Δf < 0.15 MHz.  NOTE 4: For MSR BS supporting multi-band operation, either this limit or -16dBm/100kHz with correspondingly adjusted f\_offset shall apply for this frequency offset range for operating bands <1GHz. | | | |

Table 6.6.2.5.1-1a: Wide Area BS operating band unwanted emission mask (UEM) for BC1 and BC3 for bands > 3GHz, option 2

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 1, 2) | Measurement bandwidth (Note 4) |
| 0 MHz ≤ Δf < 0.2 MHz | 0.015MHz ≤ f\_offset < 0.215MHz | -12.2 dBm | 30 kHz |
| 0.2 MHz ≤ Δf < 1 MHz | 0.215MHz ≤ f\_offset < 1.015MHz |  | 30 kHz |
| (Note 3) | 1.015MHz ≤ f\_offset < 1.5 MHz | -24.2 dBm | 30 kHz |
| 1 MHz ≤ Δf ≤  min(Δfmax, 10 MHz) | 1.5 MHz ≤ f\_offset < min(f\_offsetmax, 10.5 MHz) | -11.2 dBm | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -15 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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -15dBm/MHz.  NOTE2: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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 6.6.2.5.1-1b: Wide Area operating band unwanted emission limits for operation in BC1 and BC3 bands ≤ 3GHz with standalone NB-IoT carrier 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 | Minimum requirement (Note 1, 2, 3, 4) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 0.05 MHz | 0.015 MHz ≤ f\_offset < 0.065 MHz |  | 30 kHz |
| 0.05 MHz ≤ Δf < 0.15 MHz | 0.065 MHz ≤ f\_offset < 0.165 MHz |  | 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 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. | | | |

Table 6.6.2.5.1-1c: Wide Area operating band unwanted emission mask (UEM) for BC1 and BC3 below 1 GHz, option 1

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | - 5.5dBm - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -12.5 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -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 RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth. Exception is f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be -16dBm/100kHz.  NOTE 2: 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 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 6.6.2.5.1-1d: Wide Area operating band unwanted emission mask (UEM) for BC1 and BC3 above 1 GHz and ≤ 3 GHz, option 1

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | - 5.5dBm - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -12.5 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be -15dBm/1MHz.  NOTE 2: 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 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 6.6.2.5.1-1e: Wide Area operating band unwanted emission mask (UEM) for BC1 and BC3 above 3 GHz, option 1

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | - 5.2dBm - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -12.2 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be -15dBm/1MHz.  NOTE 2: 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 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 6.6.2.5.1-2: Medium Range BS operating band unwanted emission mask (UEM) for BC1 for bands ≤ 3GHz, BS maximum output power 31 < PRated,c ≤ 38 dBm for BS either not supporting NR or supporting both NR and UTRA

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 0.6 MHz | 0.015MHz ≤ f\_offset < 0.615MHz | PRated,c - 56.5dB - 7/5(f\_offset/MHz-0.015)dB | 30 kHz |
| 0.6 MHz ≤ Δf < 1 MHz | 0.615MHz ≤ f\_offset < 1.015MHz | PRated,c - 51.5dB - 15(f\_offset/MHz-0.215)dB | 30 kHz |
| (Note 5) | 1.015MHz ≤ f\_offset < 1.5 MHz | PRated,c – 63.5 dB | 30 kHz |
| 1 MHz ≤ Δf ≤ 2.6 MHz | 1.5 MHz ≤ f\_offset < 3.1 MHz | PRated,c – 50.5 dB | 1 MHz |
| 2.6 MHz ≤ Δf ≤ 5 MHz | 3.1 MHz ≤ f\_offset < 5.5 MHz | min(PRated,c – 50.5 dB, -13.5dBm) | 1 MHz |
| 5 MHz ≤ Δf ≤ min(Δfmax, 10MHz) | 5.5 MHz ≤ f\_offset < min (f\_offsetmax, 10.5 MHz) | PRated,c – 54.5 dB | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | PRated,c -56dB (Note 7) | 1MHz |
| 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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be (PRated,c – 56 dB)/MHz.  NOTE2: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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.  NOTE 3: For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.5.1-2b apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.1-2a: Medium Range BS operating band unwanted emission mask (UEM) for BC1 for bands > 3GHz, BS maximum output power 31 < PRated,c ≤ 38 dBm for BS either not supporting NR or supporting both NR and UTRA

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 0.6 MHz | 0.015MHz ≤ f\_offset < 0.615MHz | PRated,c - 56.2dB - 7/5(f\_offset/MHz-0.015)dB | 30 kHz |
| 0.6 MHz ≤ Δf < 1 MHz | 0.615MHz ≤ f\_offset < 1.015MHz | PRated,c - 51.2dB - 15(f\_offset/MHz-0.215)dB | 30 kHz |
| (Note 5) | 1.015MHz ≤ f\_offset < 1.5 MHz | PRated,c – 63.2 dB | 30 kHz |
| 1 MHz ≤ Δf ≤ 2.6 MHz | 1.5 MHz ≤ f\_offset < 3.1 MHz | PRated,c – 50.2 dB | 1 MHz |
| 2.6 MHz ≤ Δf ≤ 5 MHz | 3.1 MHz ≤ f\_offset < 5.5 MHz | min(PRated,c – 50.2 dB, -13.2dBm) | 1 MHz |
| 5 MHz ≤ Δf ≤ min(Δfmax, 10MHz) | 5.5 MHz ≤ f\_offset < min(f\_offsetmax ,10.5MHz) | PRated,c – 54.2 dB | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | PRated,c -56dB (Note 7) | 1MHz |
| 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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be (PRated,c – 56 dB)/MHz.  NOTE2: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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 6.6.2.5.1-2b: Medium Range BS operating band unwanted emission mask (UEM) for BC1 for bands ≤ 3GHz with standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, BS maximum output power 31 < PRated,c ≤ 38 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2, 3) | Measurement bandwidth (Note 7) |
| 0 MHz ≤ Δf < 0.05 MHz  (Note 1) | 0.015 MHz ≤ f\_offset < 0.065 MHz | PRated,c - 36.5dB - 60(f\_offset/MHz-0.015)dB | 30 kHz |
| 0.05 MHz ≤ Δf < 0.15 MHz | 0.065 MHz ≤ f\_offset < 0.165 MHz | PRated,c - 39.5dB - 160(f\_offset/MHz-0.065)dB | 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 RF Bandwidth on each side of the Inter RF Bandwidth gap. | | | |

Table 6.6.2.5.1-2c: Medium Range BS operating band unwanted emission mask (UEM) for BS supporting NR and not supporting UTRA in BC1 bands ≤ 3GHz, BS maximum output power 31 < PRated,c ≤ 38 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | PRated,c – 51.5dB - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | PRated,c-58.5dB | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | Min(PRated,c-60dB, -25dBm) (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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be Min(PRated,c-60dB, -25dBm)/100kHz.  NOTE 2: 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 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 6.6.2.5.1-2b apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.1-2d: Medium Range BS operating band unwanted emission mask (UEM) for BS supporting NR and not supporting UTRA in BC1 bands >3GHz, BS maximum output power 31 < PRated,c ≤ 38 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | PRated,c – 51.2dB - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | PRated,c-58.2dB | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | Min(PRated,c-60dB, -25dBm) (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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be Min(PRated,c-60dB, -25dBm)/100kHz.  NOTE 2: 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 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 6.6.2.5.1-3: Medium Range BS operating band unwanted emission mask (UEM) for BC1 for bands ≤ 3GHz, BS maximum output power PRated,c ≤ 31 dBm for BS either not supporting NR or supporting both NR and UTRA

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 0.6 MHz | 0.015MHz ≤ f\_offset < 0.615MHz |  | 30 kHz |
| 0.6 MHz ≤ Δf < 1 MHz | 0.615MHz ≤ f\_offset < 1.015MHz |  | 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(Δfmax,10MHz) | 5.5 MHz ≤ f\_offset < min(f\_offsetmax,10.5MHz) | -23.5 dBm | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -25 dBm (Note 7) | 1MHz |
| 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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -25dBm/MHz.  NOTE2: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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.  NOTE 3: For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.5.1-3b apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.1-3a: Medium Range BS operating band unwanted emission mask (UEM) for BC1 for bands > 3GHz, BS maximum output power PRated,c ≤ 31 dBm for BS either not supporting NR or supporting both NR and UTRA

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 0.6 MHz | 0.015MHz ≤ f\_offset < 0.615MHz |  | 30 kHz |
| 0.6 MHz ≤ Δf < 1 MHz | 0.615MHz ≤ f\_offset < 1.015MHz |  | 30 kHz |
| (Note 5) | 1.015MHz ≤ 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(Δfmax,10MHz) | 5.5 MHz ≤ f\_offset < min(f\_offsetmax,10.5MHz) | -23.2 dBm | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -25 dBm (Note 7) | 1MHz |
| 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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -25dBm/MHz.  NOTE2: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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 6.6.2.5.1-3b: Medium Range BS operating band unwanted emission mask (UEM) for BC1 for bands ≤ 3GHz with standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, BS maximum output power PRated,c ≤ 31 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2, 3, 4) | Measurement bandwidth (Note 7) |
| 0 MHz ≤ Δf < 0.05 MHz  (Note 1) | 0.015 MHz ≤ f\_offset < 0.065 MHz |  | 30 kHz |
| 0.05 MHz ≤ Δf < 0.15 MHz | 0.065 MHz ≤ f\_offset < 0.165 MHz |  | 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 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. | | | |

Table 6.6.2.5.1-3c: Medium Range BS operating band unwanted emission mask (UEM) for BS supporting NR and not supporting UTRA in BC1 bands ≤ 3GHz, BS maximum output power PRated,c ≤ 31 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | - 20.5dBm - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -27.5 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be -29dBm/100kHz.  NOTE 2: 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 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 6.6.2.5.1-3b apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.1-3d: Medium Range BS operating band unwanted emission mask (UEM) for BS supporting NR and not supporting UTRA in BC1 bands >3GHz, BS maximum output power PRated,c ≤ 31 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 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, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -27.2 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be -29dBm/100kHz.  NOTE 2: 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 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 6.6.2.5.1-4: Local Area operating band unwanted emission mask (UEM) for BC1 for bands ≤ 3GHz

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 1, 2) | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -35.5 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -37dBm/100 kHz.  NOTE2: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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.  NOTE 3: For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.5.1-4b apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.1-4a: Local Area operating band unwanted emission mask (UEM) for BC1 for bands > 3GHz

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 1, 2 | Measurement bandwidth (Note 6) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -35.2 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -37dBm/100 kHz.  NOTE2: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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 6.6.2.5.1-4b: Local Area operating band unwanted emission mask (UEM) for BC1 for bands ≤ 3GHz with standalone NB-IoT carrier 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 | Minimum requirement (Note 1, 2, 3, 4) | Measurement bandwidth (Note 7) |
| 0 MHz ≤ Δf < 0.05 MHz  (Note 1) | 0.015 MHz ≤ f\_offset < 0.065 MHz |  | 30 kHz |
| 0.05 MHz ≤ Δf < 0.16 MHz | 0.065 MHz ≤ f\_offset < 0.175 MHz |  | 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 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: 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 Δfmax < ΔfOBUE.

##### 6.6.2.5.2 Test requirements 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 Table 6.6.2.5.2-1 to 6.6.2.5.2-8 below, where:

- Δf is the separation between the Base Station RF Bandwidth edge frequency and the nominal -3dB 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\_offsetmax is the offset to the frequency ΔfOBUE outside the downlink operating band.

- Δfmax is equal to f\_offsetmax minus half of the bandwidth of the measuring filter.

For a BS operating in multiple bands, inside any Inter RF Bandwidth gaps with Wgap < 2\* ΔfOBUE, 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 Table 6.6.2.5.2-1 to 6.6.2.5.2-8 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 carrier frequency.

- f\_offset is the separation between the Base Station RF Bandwidth edge frequency and the centre of the measuring filter.

- f\_offsetmax is equal to the Inter RF Bandwidth gap minus half of the bandwidth of the measuring filter.

- Δfmax is equal to f\_offsetmax 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 subclause for the largest frequency offset (Δfmax), of a band where there are no carriers transmitted shall apply from ΔfOBUE below the lowest frequency, up to ΔfOBUE 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 6.6.2.5.2-1 to 6.6.2.5.2-8 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\_offsetmax is equal to the sub block gap bandwidth minus half of the bandwidth of the measuring filter.

- Δfmax is equal to f\_offsetmax minus half of the bandwidth of the measuring filter.

Applicability of Wide Area operating band unwanted emission requirements in Tables 6.6.2.5.2-1, 6.6.2.5.2-2a and 6.6.2.5.2-2b is specified in Table 6.6.2.5.2-0.

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 [5] and TS 38.104 [27]. Option 2 also corresponds to the UTRA spectrum emission mask as defined in TS 25.104 [3] with GSM related modifications.

Table 6.6.2.5.2-0: Applicability of operating band unwanted emission requirements for BC2 Wide Area BS

|  |  |  |
| --- | --- | --- |
| NR Band operation | Standalone NB-IoT carrier adjacent to the BS RF bandwidth edge or UTRA or GSM supported | Applicable requirement table |
| None | Y/N | 6.6.2.5.2-1 (option 2) |
| In certain regions (NOTE 2), bands 3, 8 | N | 6.6.2.5.2-1 (option 2) |
| Any | Y | 6.6.2.5.2-1 (option 2) |
| Any below 1GHz except for, in certain regions (NOTE 2), band 8 | N | 6.6.2.5.2-2a (option 1) |
| Any above 1GHz except for, in certain regions (NOTE 2), bands 3 | N | 6.6.2.5.2-2b (option 1) |
| NOTE 1: Void.  NOTE 2: Applicable only for operation in regions where Category B limits as defined in ITU-R Recommendation SM.329 [13] are used for which category B option 2 operating band unwanted emissions requirements as defined in TS 36.104 [5] and TS 38.104 [27] are applied. | | |

Table 6.6.2.5.2-1: Wide Area BS operating band unwanted emission mask (UEM) for BC2, option 2

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 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 | (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(Δfmax, 10 MHz) | 1.5 MHz ≤ f\_offset < min(f\_offsetmax, 10.5 MHz) | -11.5 dBm (Note 4) | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -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 6.6.2.5-2 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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -15dBm/MHz (for MSR BS supporting multi-band operation, either this limit or -16dBm/100kHz with correspondingly adjusted f\_offset shall apply for this frequency offset range for operating bands <1GHz).  NOTE3: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE operation 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.  NOTE 4: For MSR BS supporting multi-band operation, either this limit or -16dBm/100kHz with correspondingly adjusted f\_offset shall apply for this frequency offset range for operating bands <1GHz. | | | |

Table 6.6.2.5.2-2: Wide Area BS operating band unwanted emission limits for operation in BC2 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 ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 5, 6, 7, 8) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 0.05 MHz | 0.015 MHz ≤ f\_offset < 0.065 MHz |  | 30 kHz |
| 0.05 MHz ≤ Δf < 0.15 MHz | 0.065 MHz ≤ f\_offset < 0.165 MHz |  | 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 gap < 2×ΔfOBUE 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.  NOTE 7: In case the carrier adjacent to the Base Station RF Bandwidth edge is a GSM/EDGE carrier, the value of X = PGSMcarrier – 43, where PGSMcarrier 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 RF bandwidth edge is a NB-IoT carrier, the value of X = PNB-IoTcarrier – 43, where PNB-IoTcarrier is the power level of the NB-IoT carrier adjacent to the RF bandwidth edge. In other cases, X = 0. | | | |

Table 6.6.2.5.2-2a: Wide Area operating band unwanted emission mask (UEM) for BC2 below 1GHz option 1

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | - 5.5dBm - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -12.5 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -16 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 or RF Bandwidth shall be scaled according to the measurement bandwidth of the near-end sub-block or RF Bandwidth. Exception is f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be -16dBm/100kHz.  NOTE 2: 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 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.  NOTE 3: For operation with an E-UTRA 1.4 or 3MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.5.2-2 apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.2-2b: Wide Area operating band unwanted emission mask (UEM) for BC2 above 1 GHz, option 1

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | - 5.5dBm - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf <  min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset <  min(10.05 MHz, f\_offsetmax) | -12.5 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -15 dBm (Note 10) | 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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be -15dBm/1MHz.  NOTE 2: 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 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.  NOTE 3: For operation with an E-UTRA 1.4 or 3MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.5.2-2 apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.2-3: Medium Range BS operating band unwanted emission mask (UEM) for BC2, BS maximum output power 31 < PRated,c ≤ 38 dBm for BS either not supporting NR or supporting NR with UTRA and/or GSM

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 2, 3) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 0.6 MHz  (Note 1) | 0.015MHz ≤ f\_offset < 0.615MHz | PRated,c - 56.5dB - 7/5(f\_offset/MHz-0.015)dB | 30 kHz |
| 0.6 MHz ≤ Δf < 1 MHz | 0.615MHz ≤ f\_offset < 1.015MHz | PRated,c - 51.5dB - 15(f\_offset/MHz-0.215)dB | 30 kHz |
| (Note 8) | 1.015MHz ≤ f\_offset < 1.5 MHz | PRated,c – 63.5 dB | 30 kHz |
| 1 MHz ≤ Δf ≤ 2.8 MHz | 1.5 MHz ≤ f\_offset < 3.3 MHz | PRated,c – 50.5 dB | 1 MHz |
| 2.8 MHz ≤ Δf ≤ 5 MHz | 3.3 MHz ≤ f\_offset < 5.5 MHz | min(PRated,c – 50.5 dB, -13.5dBm) | 1 MHz |
| 5 MHz ≤ Δf ≤ min(Δfmax, 10 MHz) | 5.5 MHz ≤ f\_offset < min(f\_offsetmax,10.5MHz) | PRated,c – 54.5 dB | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | PRated,c -56dB (Note 10) | 1MHz |
| 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 6.6.2.5.2-5 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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be (PRated,c – 56 dB)/MHz.  NOTE 3: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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 6.6.2.5.2-3a: Medium Range BS operating band unwanted emission mask (UEM) for BS supporting NR and neither supporting UTRA nor GSM in BC2 bands, BS maximum output power 31 < PRated,c ≤ 38 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | PRated,c – 51.5dB - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | PRated,c-58.5dB | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | Min(PRated,c-60dB, -25dBm) (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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be Min(PRated,c-60dB, -25dBm)/100kHz.  NOTE 2: 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 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 3MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.5.2-5 apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.2-4: Medium Range BS operating band unwanted emission mask (UEM) for BC2, BS maximum output power PRated,c ≤ 31 dBm for BS either not supporting NR or supporting NR with UTRA and/or GSM

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 2, 3) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 0.6 MHz  (Note 1) | 0.015MHz ≤ f\_offset < 0.615MHz |  | 30 kHz |
| 0.6 MHz ≤ Δf < 1 MHz | 0.615MHz ≤ f\_offset < 1.015MHz |  | 30 kHz |
| (Note 8) | 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(Δfmax,10MHz) | 5.5 MHz ≤ f\_offset < min(f\_offsetmax,10.5MHz) | -23.5 dBm | 1 MHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax | -25dBm (Note 10) | 1MHz |
| 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 6.6.2.5.2-6 apply for 0 MHz ≤ Δf < 0.15MHz.  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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -25dBm/MHz.  NOTE 3: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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 6.6.2.5.2-4a: Medium Range BS operating band unwanted emission mask (UEM) for BS supporting NR and neither supporting UTRA nor GSM in BC2 bands, BS maximum output power PRated,c ≤ 31 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | - 20.5dBm - 7/5(f\_offset/MHz-0.05)dB | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -27.5 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -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 f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the minimum requirement within sub-block gaps shall be -29dBm/100kHz.  NOTE 2: 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 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 3MHz carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.5.2-6 apply for 0 MHz ≤ Δf < 0.15 MHz. | | | |

Table 6.6.2.5.2-5: Medium Range operating band unwanted emission limits for operation in BC2 with GSM/EDGE or standalone NB-IoT or E-UTRA 1.4 or 3 MHz carriers adjacent to the Base Station RF Bandwidth edge, BS maximum output power 31 < PRated,c ≤ 38 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 5, 6) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 0.05 MHz | 0.015 MHz ≤ f\_offset < 0.065 MHz | PRated,c - 36.5dB - 60(f\_offset/MHz-0.015)dB | 30 kHz |
| 0.05 MHz ≤ Δf < 0.15 MHz | 0.065 MHz ≤ f\_offset < 0.165 MHz | PRated,c - 39.5dB - 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×ΔfOBUE 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 6.6.2.5.2-6: Medium Range operating band unwanted emission limits for operation in BC2 with GSM/EDGE or standalone NB-IoT or E-UTRA 1.4 or 3 MHz carriers adjacent to the Base Station RF Bandwidth edge, BS maximum output power PRatedc ≤ 31 dBm

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 5, 6, 7) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 0.05 MHz | 0.015 MHz ≤ f\_offset < 0.065 MHz |  | 30 kHz |
| 0.05 MHz ≤ Δf < 0.15 MHz | 0.065 MHz ≤ f\_offset < 0.165 MHz |  | 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×ΔfOBUE 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.  NOTE 7: In case the carrier adjacent to the Base Station RF Bandwidth edge is a GSM/EDGE carrier, the value of X = PGSMcarrier – 31, where PGSMcarrier 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 RF bandwidth edge is a NB-IoT carrier, the value of X = PNB-IoTcarrier – 31, where PNB-IoTcarrier is the power level of the NB-IoT carrier adjacent to the RF bandwidth edge. In other cases, X = 0. | | | |

Table 6.6.2.5.2-7: Local Area operating band unwanted emission mask (UEM) for BC2

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 2, 3) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 5 MHz  (Note 1) | 0.05 MHz ≤ f\_offset < 5.05 MHz |  | 100 kHz |
| 5 MHz ≤ Δf < min(10 MHz, Δfmax) | 5.05 MHz ≤ f\_offset < min(10.05 MHz, f\_offsetmax) | -35.5 dBm | 100 kHz |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -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 6.6.2.5.2-8 apply for 0 MHz ≤ Δf < 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 of contributions from adjacent sub blocks on each side of the sub block gap. Exception is f ≥ 10MHz from both adjacent sub blocks on each side of the sub-block gap, where the test requirement within sub-block gaps shall be -37dBm/100 kHz.  NOTE 3: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE 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 6.6.2.5.2-8: Local Area operating band unwanted emission limits for operation in BC2 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 ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement (Note 5, 6, 7) | Measurement bandwidth (Note 9) |
| 0 MHz ≤ Δf < 0.05 MHz | 0.015 MHz ≤ f\_offset < 0.065 MHz |  | 30 kHz |
| 0.05 MHz ≤ Δf < 0.16 MHz | 0.065 MHz ≤ f\_offset < 0.175 MHz |  | 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×ΔfOBUE 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.  NOTE 7: In case the carrier adjacent to the Base Station RF Bandwidth edge is a GSM/EDGE carrier, the value of X = PGSMcarrier – 24, where PGSMcarrier 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 RF bandwidth edge is a NB-IoT carrier, the value of X = PNB-IoTcarrier – 24, where PNB-IoTcarrier is the power level of the NB-IoT carrier adjacent to the RF bandwidth edge. In other cases, X = 0. | | | |

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 Δfmax < ΔfOBUE.

##### 6.6.2.5.3 Test requirements for GSM/EDGE single-RAT requirements

The following test requirements and the corresponding test method specified in TS 51.021 [11] apply to an MSR Base Station for any operating band with GSM/EDGE single RAT operation in Band Category 2:

- Spectrum due to the modulation and wide band noise*,* applicable parts of subclause 6.5.1.

- Spectrum due to switching transients, applicable parts of subclause 6.5.2.

- Emission requirement for frequency offsets of between 2 and 10 MHz outside relevant transmit band, applicable parts of subclause 6.6.2.

- Intra BTS Intermodulation, applicable parts of subclause 6.12.

##### 6.6.2.5.4 Test requirements for additional requirements

6.6.2.5.4.1 Limits in FCC Title 47

In addition to the requirements in subclauses 6.6.2.5.1 and 6.6.2.5.2, the BS may have to comply with the applicable emission limits established by FCC Title 47 [8], when deployed in regions where those limits are applied, and under the conditions declared by the manufacturer.

6.6.2.5.4.2 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 each supported 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 of each supported band.

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.

6.6.2.5.4.3 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 Ffilter according to Table 6.6.2.5.4.3-1, shall not exceed the maximum emission level PEM,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 6.6.2.5.4.3-1: Declared emissions levels for protection of DTT

|  |  |  |
| --- | --- | --- |
| Filter centre frequency, Ffilter | Measurement bandwidth | Declared emission level [dBm] |
| Ffilter = 8\*N + 306 (MHz);  21 ≤ N ≤ 60 | 8 MHz | PEM,N |

NOTE: The regional requirement is defined in terms of EIRP (effective isotropic radiated power), 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. Compliance with the regional requirement can be determined using the method outlined in Annex G of TS 36.104 [5].

6.6.2.5.4.4 Co-existence with services in adjacent frequency bands

This requirement may be applied for the protection of systems operating in frequency bands adjacent to Band 1 as defined in subclause 4.5, in geographic areas in which both an adjacent band service and UTRA and/or E-UTRA are deployed.

The power of any spurious emission shall not exceed:

Table 6.6.2.5.4.4-1: Emissions limits for protection of adjacent band services

|  |  |  |  |
| --- | --- | --- | --- |
| Operating Band | Frequency range | Maximum Level | Measurement Bandwidth |
| 1 | 2100-2105 MHz | -30 + 3.4 ⋅ (f - 2100 MHz) dBm | 1 MHz |
| 2175-2180 MHz | -30 + 3.4 ⋅ (2180 MHz - f) dBm | 1 MHz |

6.6.2.5.4.5 Additional requirements for band 41

The following requirement may apply to BS operating in Band 41 in certain regions. Emissions shall not exceed the maximum levels specified in Table 6.6.2.5.4.5-1 below, where:

- Δf is the separation between the Base Station RF Bandwidth edge frequency and the nominal -3dB 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.

Table 6.6.2.5.4.5-1: Additional operating band unwanted emission limits Band 41

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel bandwidth | Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Test requirement | Measurement bandwidth |
| 10 MHz | 10 MHz ≤ Δf < 20 MHz | 10.5 MHz ≤ f\_offset < 19.5 MHz | -22 dBm | 1 MHz |
| 20 MHz | 20 MHz ≤ Δf < 40 MHz | 20.5 MHz ≤ f\_offset < 39.5 MHz | -22 dBm | 1 MHz |
| NOTE: This requirement applies for E-UTRA carriers allocated within 2545-2575MHz or 2595-2645MHz. | | | | |

6.6.2.5.4.6 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 1452-1492 MHz, in Band 75 within 1432-1517 MHz and in Band 76 within 1427-1432 MHz. The level of operating band unwanted emissions, measured on centre frequencies f\_offset with filter bandwidth, according to Table 6.6.2.5.4.6-1, shall neither exceed the maximum emission level PEM,B32,B75,B76,a , PEM,B32,B75,B76,b nor PEM,B32,B75,B76,c declared by the manufacturer.

For Band 32, this requirement applies in the frequency range 1452-1492 MHz when non-Mobile/Fixed Communications Network (MFCN) services are deployed in adjacent frequency ranges, while it applies also within 1427-1452 MHz and/or 1492-1517 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 1427-1517 MHz. For Band 76, this requirement applies in the frequency range 1432-1517 MHz even though part of the range falls in the spurious domain.

Table 6.6.2.5.4.6-1: Declared operating band 32, 75 and 76 unwanted emission within 1427-1517 MHz

|  |  |  |
| --- | --- | --- |
| Frequency offset of measurement filter centre frequency, f\_offset | Declared emission level [dBm] | Measurement bandwidth |
| 2.5 MHz | PEM,B32,B75,B76,a | 5 MHz |
| 7.5 MHz | PEM,B32,B75,B76,b | 5 MHz |
| 12.5 MHz ≤ f\_offset ≤ f\_offsetmax | PEM,B32,B75,B76,c | 5 MHz |
| NOTE: For Band 32, when non-MFCN services are deployed in the adjacent bands, f\_offsetmax denotes the frequency difference between the lower Base Station RF Bandwidth edge and 1454.5 MHz, and the frequency difference between the upper Base Station RF Bandwidth edge and 1489.5 MHz for the set channel position. For Band 32, when MFCN services are deployed in the adjacent frequencies, Band 75 and Band 76, f\_offsetmax denotes the frequency difference between the lower Base Station RF Bandwidth edge and 1429.5 MHz, and the frequency difference between the upper Base Station RF Bandwidth edge and 1514.5 MHz for the set channel position | | |

NOTE: The regional requirement, included in [25], 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 [5].

In certain regions, the following requirement may apply to BS operating in Band 32 within 1452-1492MHz for the protection of non-MFCN services in spectrum adjacent to the frequency range 1452-1492 MHz. The level of emissions, measured on centre frequencies Ffilter with filter bandwidth according to Table 6.6.2.5.4.6-2, shall neither exceed the maximum emission level PEM,B32,d nor PEM,B32,e declared by the manufacturer. This requirement applies in the frequency range 1429-1518MHz even though part of the range falls in the spurious domain.

Table 6.6.2.5.4.6-2: Operating band 32 declared emission outside 1452-1492 MHz

|  |  |  |
| --- | --- | --- |
| Filter centre frequency, Ffilter | Declared emission level [dBm] | Measurement bandwidth |
| 1429.5 MHz ≤ Ffilter ≤ 1448.5 MHz | PEM,B32,d | 1 MHz |
| Ffilter = 1450.5 MHz | PEM,B32,e | 3 MHz |
| Ffilter = 1493.5 MHz | PEM,B32,e | 3 MHz |
| 1495.5 MHz ≤ Ffilter ≤ 1517.5 MHz | PEM,B32,d | 1 MHz |

NOTE: The regional requirement, included in [24], is defined in terms of EIRP, 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 [5].

In certain regions, the following requirement may apply to BS operating in Band 50 and Band 75 within 1492-1517 MHz and in Band 74 within 1492-1518 MHz. The level of emissions, measured on centre frequencies Ffilter with filter bandwidth according to Table 6.6.2.5.4.6-3, shall neither exceed the maximum emission level PEM,B50,B74,B75,a nor PEM,B50,B74,B75,b declared by the manufacturer.

Table 6.6.2.5.4.6-3: Operating band 50, 74 and 75 declared emission above 1518 MHz

|  |  |  |
| --- | --- | --- |
| Filter centre frequency, Ffilter | Declared emission level [dBm] | Measurement bandwidth |
| 1518.5 MHz ≤ Ffilter ≤ 1519.5 MHz | PEM,B50,B74,B75,a | 1 MHz |
| 1520.5 MHz ≤ Ffilter ≤ 1558.5 MHz | PEM,B50,B74,B75,b | 1 MHz |

NOTE: The regional requirement, included in [25], is defined in terms of EIRP, 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.

In certain regions, the following requirement may apply to E-UTRA or NR BS operating in Band 50 and Band 75 within 1432-1452 MHz, and in Band 51 and Band 76. Emissions shall not exceed the maximum levels specified in Table 6.6.2.5.4.6-4.

Table 6.6.2.5.4.6-4: Additional operating band unwanted emission limits for BS operating in Band 50 and 75 within 1432-1452 MHz, and in Band 51 and 76

|  |  |  |
| --- | --- | --- |
| Filter centre frequency, Ffilter | Maximum Level [dBm] | Measurement Bandwidth |
| Ffilter = 1413.5 MHz | -42 | 27 MHz |

6.6.2.5.4.7 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 6.6.2.4.9-1.

Table 6.6.2.5.4.7-1: Additional operating band unwanted emission limits for Band 48

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel bandwidth | Frequency offset of measurement filter ‑3dB 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 |

6.6.2.5.4.8 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 6.6.2.5.4.8-1.

Table 6.6.2.5.4.8-1: Additional operating band unwanted emission limits for Band 53

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Channel bandwidth [MHz] | Frequency range [MHz] | Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement | Measurement bandwidth |
| 1.4, 3, 5 | 2400 - 2477.5 | 6 MHz ≤ Δf < 83.5 MHz | 6.5 MHz ≤ f\_offset < 83 MHz | -25 dBm | 1 MHz |
| 10 | 2400 - 2473.5 | 10 MHz ≤ Δf < 83.5 MHz | 10.5 MHz ≤ f\_offset < 83 MHz | -25 dBm | 1 MHz |
| 1.4, 3, 5 | 2477.5 - 2478.5 | 5 MHz ≤ Δf < 6 MHz | 5.5 MHz | -13 dBm | 1 MHz |
| 10 | 2473.5 - 2478.5 | 5 MHz ≤ Δf < 10 MHz | 5.5 MHz ≤ f\_offset < 9.5 MHz | -13 dBm | 1 MHz |
| All | 2478.5 - 2483.5 | 0 MHz ≤ Δf < 5 MHz | 0.5 MHz ≤ f\_offset < 4.5 MHz | -10 dBm | 1 MHz |
| 1.4, 3, 5 | 2495 - 2501 | 0 MHz ≤ Δf < 6 MHz | 0.5 MHz ≤ f\_offset < 5.5 MHz | -13 dBm | 1 MHz |
| 10 | 2495 - 2505 | 0 MHz ≤ Δf < 10 MHz | 0.5 MHz ≤ f\_offset < 9.5 MHz | -13 dBm | 1 MHz |
| 1.4, 3, 5 | 2501 - 2690 | 6 MHz ≤ Δf < 195 MHz | 6.5 MHz ≤ f\_offset < 194.5 MHz | -25 dBm | 1 MHz |
| 10 | 2505 - 2690 | 10 MHz ≤ Δf < 195 MHz | 10.5 MHz ≤ f\_offset < 194.5 MHz | -25 dBm | 1 MHz |

### 6.6.3 Occupied bandwidth

#### 6.6.3.1 Definition and applicability

The occupied bandwidth is the 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 /2 of the total mean transmitted power. See also ITU-R Recommendation SM.328 [15].

The value of /2 shall be taken as 0.5%.

#### 6.6.3.2 Minimum requirements

The minimum requirement is in TS 37.104 [2] subclause 6.6.3.

#### 6.6.3.3 Test purpose

The occupied bandwidth, defined in the Radio Regulations of the International Telecommunication Union ITU, is a useful concept for specifying the spectral properties of a given emission in the simplest possible manner; see also ITU-R Recommendation SM.328 [15]. The test purpose is to verify that the emission of the BS does not occupy an excessive bandwidth for the service to be provided and is, therefore, not likely to create interference to other users of the spectrum beyond undue limits.

#### 6.6.3.4 Method of test

For this requirement Tables 5.1-1 and 5.2-1 refer to single-RAT specifications; see clause 5. The following shall apply:

- For references to TS 25.141 [10], the method of test is specified in TS 25.141 [10], subclause 6.5.1.4.

- For references to TS 25.142 [12], the method of test is specified in TS 25.142 [12], subclause 6.6.1.4.

- For references to TS 36.141 [9], the method of test is specified in TS 36.141 [9], subclause 6.6.1.4.

- For references to TS 38.141-1 [26], the method of test is specified in TS 38.141-1 [26], subclause 6.6.2.4.

In addition, for a multi-band capable BS, the following steps hall apply:

- For multi-band capable BS and single band tests, repeat the tests per involved band where single carrier test models shall apply, with no carrier activated in the other band. In addition, when contiguous CA is supported, single band test configurations and test models shall apply with no carrier activated in the other band.

For multi-band capable BS with separate antenna connector, the antenna connector not being under test shall be terminated.

#### 6.6.3.5 Test requirement

The occupied bandwidth of a single carrier shall be less than the values listed in Table 6.6.3.5-1. For E-UTRA intra-band contiguous carrier aggregation, test requirement in clause 6.6.1.5 of TS 36.141 [9] applies for the E-UTRA component carriers that are aggregated. For NR intra-band contiguous carrier aggregation, test requirement in clause 6.6.2.5 of TS 38.141-1 [26] applies for the NR component carriers that are aggregated.

Table 6.6.3.5-1: Occupied bandwidth

|  |  |
| --- | --- |
| RAT | Occupied bandwidth limit |
| E-UTRA and NR | BWChannel |
| UTRA FDD | 5 MHz |
| 1.28 Mcps UTRA TDD | 1.6 MHz |
| NB-IoT | 200 kHz |

### 6.6.4 Adjacent Channel Leakage Power Ratio (ACLR)

#### 6.6.4.1 Definition and applicability

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

#### 6.6.4.2 Minimum requirement

The minimum requirement is in TS 37.104 [2] subclause 6.6.4.

#### 6.6.4.3 Test purpose

To verify that the adjacent channel leakage power ratio requirement shall be met as specified by the minimum requirement.

#### 6.6.4.4 Method of test

For this requirement Tables 5.1-1 and 5.2-1 also refer to single-RAT specifications for UTRA; see clause 5. The following shall apply for references to UTRA single-RAT specifications:

- For references to TS 25.141 [10], the method of test is specified in TS 25.141 [10], subclause 6.5.2.2.4.

- For references to TS 25.142 [12], the method of test is specified in TS 25.142 [12], subclause 6.6.2.2.4.

For NR and E-UTRA ACLR requirement outside the Base Station RF Bandwidth edges and the ACLR requirement applied inside sub-block gap, in addition, for non-contiguous spectrum operation or Inter RF Bandwidth gap for multi-band operation using, the test configurations defined in subclause 4.8, the method of test described in subclauses 6.6.4.4.1 and 6.6.4.4.2 applies.

##### 6.6.4.4.1 Initial conditions

Test environment: normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: BRFBW, MRFBW and TRFBW in single-band operation; see subclause 4.9.1; BRFBW\_T’RFBW and B’RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

1) Connect the signal analyzer to the Base Station antenna connector as shown in Annex D.1.1.

2) The measurement device characteristics shall be:

- measurement filter bandwidth: defined in subclause 6.6.4.5;

- detection mode: true RMS voltage or true average power.

##### 6.6.4.4.2 Procedure

1) Set the Base Station to transmit at maximum power according to the applicable test configuration in clause 5 using the corresponding test models or set of physical channels in subclause 4.9.2.

2) For E-UTRA or NB-IoT, measure ACLR outside the Base Station RF Bandwidth edges and ACLR inside sub-block gap or Inter RF Bandwidth gap, in addition, for non-contiguous spectrum operation as specified in subclause 6.6.4.5.1. For NR, measure ACLR outside the Base Station RF Bandwidth edges and ACLR inside sub-block gap or Inter RF Bandwidth gap, in addition, for non-contiguous spectrum operation as specified in subclause 6.6.4.5.6.

3) For UTRA FDD, measure ACLR inside sub-block gap or Inter RF Bandwidth gap as specified in subclause 6.6.4.5.2.

4) Measure Cumulative Adjacent Channel Leakage Power Ratio (CACLR) inside sub-block gap or the Inter RF Bandwidth gap as specified in subclause 6.6.4.5.4.

In addition, for a multi-band capable BS, the following step shall apply:

5) For multi-band capable BS and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band. For multi-band capable BS with separate antenna connector, the antenna connector not being under test in case of SBT or MBT shall be terminated.

#### 6.6.4.5 Test requirements

##### 6.6.4.5.1 E-UTRA test requirement

For E-UTRA, the test requirement is specified in Tables 6.6.4.5.1-1 and 6.6.4.5.1-2, and applies outside the Base Station RF Bandwidth or Maximum Radio Bandwidth.

For a BS operating in non-contiguous spectrum, the ACLR also applies for the first adjacent channel inside any sub-blockgap with a gap size Wgap ≥ 15MHz. The ACLR requirement for the second adjacent channel applies inside any sub-block gap with a gap size Wgap ≥ 20 MHz. The CACLR test requirement in subclause 6.6.4.5.4 applies in sub block gaps for the frequency ranges defined in Table 6.6.4.5.4-1.

For a BS operating in multiple bands, where multiple bands are mapped onto the same antenna connector, the ACLR also applies for the first adjacent channel inside any Inter RF Bandwidth gap with a gap size Wgap ≥ 15MHz. The ACLR requirement for the second adjacent channel applies inside any Inter RF Bandwidth gap with a gap size Wgap ≥ 20 MHz. The CACLR requirement in subclause 6.6.4.5.4 applies in Inter RF Bandwidth gaps for the frequency ranges defined in Table 6.6.4.5.4-1.

The requirement applies during the transmitter on period.

The ACLR is defined with a square filter of bandwidth equal to the transmission bandwidth configuration of the transmitted signal (BWConfig) centred on the assigned channel frequency and a filter centered 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 -13dBm/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 -32dBm/MHz shall apply, whichever is less stringent.

For operation in paired spectrum, the ACLR shall be higher than the value specified in Table 6.6.4.5.1-1.

Table 6.6.4.5.1-1: Base Station ACLR in paired spectrum

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel bandwidth of E-UTRA Lowest/ Highest Carrier transmitted BWChannel [MHz] | BS adjacent channel centre frequency offset below the lower or above the upper Base Station RF Bandwidth edge | Assumed adjacent channel carrier | Filter on the adjacent channel frequency and corresponding filter bandwidth | ACLR limit |
| 1.4, 3.0, 5, 10, 15, 20 | 0.5 x BWChannel | E-UTRA of same BW | Square (BWConfig) | 44.2 dB |
| 1.5 x BWChannel | E-UTRA of same BW | Square (BWConfig) | 44.2 dB |
| 2.5 MHz | 3.84 Mcps UTRA | RRC (3.84 Mcps) | 44.2 dB |
| 7.5 MHz | 3.84 Mcps UTRA | RRC (3.84 Mcps) | 44.2 dB |
| NOTE 1: BWChannel and BWConfig 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 TS 25.104 [3], 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 6.6.4.5.1‑2.

Table 6.6.4.5.1-2: Base Station ACLR in unpaired spectrum with synchronized operation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel bandwidth of E-UTRA Lowest/ Highest Carrier transmitted BWChannel [MHz] | BS adjacent channel centre frequency offset below the lower or above the upper Base StationRF Bandwidth edge | Assumed adjacent channel carrier | Filter on the adjacent channel frequency and corresponding filter bandwidth | ACLR limit |
| 1.4, 3 | 0.5 x BWChannel | E-UTRA of same BW | Square (BWConfig) | 44.2 dB |
| 1.5 x BWChannel | E-UTRA of same BW | Square (BWConfig) | 44.2 dB |
| 0.8 MHz | 1.28 Mcps UTRA | RRC (1.28 Mcps) | 44.2 dB |
| 2.4 MHz | 1.28 Mcps UTRA | RRC (1.28 Mcps) | 44.2 dB |
| 5, 10, 15, 20 | 0.5 x BWChannel | E-UTRA of same BW | Square (BWConfig) | 44.2 dB |
| 1.5 x BWChannel | E-UTRA of same BW | Square (BWConfig) | 44.2 dB |
| 0.8 MHz | 1.28 Mcps UTRA | RRC (1.28 Mcps) | 44.2 dB |
| 2.4 MHz | 1.28 Mcps UTRA | RRC (1.28 Mcps) | 44.2 dB |
| 2.5 MHz | 3.84 Mcps UTRA | RRC (3.84 Mcps) | 44.2 dB |
| 7.5 MHz | 3.84 Mcps UTRA | RRC (3.84 Mcps) | 44.2 dB |
| 5 MHz | 7.68 Mcps UTRA | RRC (7.68 Mcps) | 44.2 dB |
| 15 MHz | 7.68 Mcps UTRA | RRC (7.68 Mcps) | 44.2 dB |
| NOTE 1: BWChannel and BWConfig 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 TS 25.105 [4], with a chip rate as defined in this table. | | | | |

For operation in non-contiguous paired spectrum, the ACLR shall be higher than the value specified in Table 6.6.4.5.1‑3.

Table 6.6.4.5.1-3: Base Station ACLR in non-contiguous paired spectrum

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sub-block gap size (Wgap) where the limit applies | BS adjacent channel centre frequency offset below or above the sub-block edge (inside the gap) | Assumed adjacent channel carrier | Filter on the adjacent channel frequency and corresponding filter bandwidth | ACLR limit |
| Wgap ≥ 15 MHz | 2.5 MHz | 3.84 Mcps UTRA | RRC (3.84 Mcps) | 44.2 dB |
| Wgap ≥ 20 MHz | 7.5 MHz | 3.84 Mcps UTRA | RRC (3.84 Mcps) | 44.2 dB |
| NOTE: The RRC filter shall be equivalent to the transmit pulse shape filter defined in TS 25.104 [3], with a chip rate as defined in this table. | | | | |

For operation in non-contiguous unpaired spectrum, the ACLR shall be higher than the value specified in Table 6.6.4.5.1‑4.

Table 6.6.4.5.1-4: Base Station ACLR in non-contiguous unpaired spectrum

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sub-block gap size (Wgap) where the limit applies | BS adjacent channel centre frequency offset below or above the sub-block edge (inside the gap) | Assumed adjacent channel carrier | Filter on the adjacent channel frequency and corresponding filter bandwidth | ACLR limit |
| Wgap ≥ 15 MHz | 2.5 MHz | 5MHz E-UTRA | Square (BWConfig) | 44.2 dB |
| Wgap ≥ 20 MHz | 7.5 MHz | 5MHz E-UTRA | Square (BWConfig) | 44.2 dB |

##### 6.6.4.5.2 UTRA FDD test requirement

For UTRA FDD, the test requirement is specified in TS 25.141 [10] subclause 6.5.2.2.5, and applies outside the Base Station RF Bandwidth or Maximum Radio Bandwidth.

For a BS operating in non-contiguous spectrum, ACLR requirement also applies for the first adjacent channel, inside any sub-block gap with a gap size Wgap ≥ 15 MHz. The ACLR requirement for the second adjacent channel applies inside any sub-block gap with a gap size Wgap ≥ 20 MHz. The CACLR test requirement in subclause 6.6.4.5.4 applies in sub block gaps for the frequency ranges defined in Table 6.6.4.5.4-1.

For a BS operating in multiple bands, where multiple bands are mapped onto the same antenna connector, ACLR requirement also applies for the first adjacent channel, inside any Inter RF Bandwidth gap with a gap size Wgap ≥ 15 MHz. The ACLR requirement for the second adjacent channel applies inside any Inter RF Bandwidth gap with a gap size Wgap ≥ 20 MHz. The CACLR requirement in subclause 6.6.4.5.4 applies in Inter RF Bandwidth gaps for the frequency ranges defined in Table 6.6.4.5.4-1.

##### 6.6.4.5.3 UTRA TDD test requirement

For UTRA TDD, the test requirement is specified in TS 25.142 [12] subclause 6.6.2.2.5, and applies outside the Base Station RF Bandwidth or Maximum Radio Bandwidth.

##### 6.6.4.5.4 Cumulative ACLR requirement in non-contiguous spectrum

The following test requirement applies for sub-block or Inter RF Bandwidth gap sizes listed in Table 6.6.4.5.4-1,

- 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 Base Station RF Bandwidth edges.

The requirement applies to adjacent channels of NR, 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 6.6.4.5.4-1 and the filters on the assigned channels are defined in Table 6.6.4.5.4-2.

NOTE: If the RAT on the assigned channel frequencies is different, the filters used are also different.

For Wide Area Category A BS, either the CACLR limits in Table 6.6.4.5.4-1 or the absolute limit of -13dBm/MHz shall apply, whichever is less stringent.

For Wide Area Category B BS, either the CACLR limits in Table 6.6.4.5.4-1 or the absolute limit of -15dBm/MHz shall apply, whichever is less stringent.

For Medium Range BS, either the CACLR limits in Table 6.6.4.4-1 or the absolute limit of -25 dBm/MHz shall apply, whichever is less stringent.

For Local Area BS, either the CACLR limits in Table 6.6.4.4-1 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 6.6.4.5.4-1.

Table 6.6.4.5.4-1: Base Station CACLR in non-contiguous spectrum or multiple bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Band Category | Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies (MHz) | 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 |
| BC1, BC2 | 5 ≤ Wgap < 15 (Note 3) | 2.5 MHz | 3.84 Mcps UTRA | RRC (3.84 Mcps) | 44.2 dB |
| BC1, BC2 | 10 ≤ Wgap < 20 (Note 3) | 7.5 MHz | 3.84 Mcps UTRA | RRC (3.84 Mcps) | 44.2 dB |
| BC3 | 5 ≤ Wgap < 15 (Note 3) | 2.5 MHz | 5MHz E-UTRA | Square (BWConfig) | 44.2 dB |
| BC3 | 10 < Wgap < 20 (Note 3) | 7.5 MHz | 5MHz E-UTRA | Square (BWConfig) | 44.2 dB |
| BC1, BC2, BC3 | 5 ≤ Wgap < 45 (Note 4) | 2.5 MHz | 5 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| BC1, BC2, BC3 | 10 ≤ Wgap < 50 (Note 4) | 7.5 MHz | 5 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| BC1, BC2, BC3 | 20 ≤ Wgap < 30 (Note 3, 5) | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| BC1, BC2, BC3 | 20 ≤ Wgap < 60 (Note 4) | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| BC1, BC2, BC3 | 40 ≤ Wgap < 50 (Note 3, 5) | 30 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| BC1, BC2, BC3 | 40 ≤ Wgap < 80 (Note 4) | 30 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| NOTE 1: For BC1 and BC2 the RRC filter shall be equivalent to the transmit pulse shape filter defined in TS 25.104 [3], with a chip rate as defined in this table.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: Applicable in case the *channel bandwidth* of the carrier transmitted at the other edge of the gap is 5, 10, 15, 20 MHz.  NOTE 4: 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.  NOTE 5: Applicable in case the *channel bandwidth* of the lowest/highest NR carrier transmitted is 25, 30, 40, 50, 60, 70, 80, 90, 100 MHz. | | | | | |

Table 6.6.4.5.4-2: 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 |
| UTRA FDD | RRC (3.84 Mcps) |
| NR | NR of same BW with SCS that provides largest transmission bandwidth configuration |
| NOTE: The RRC filter shall be equivalent to the transmit pulse shape filter defined in TS 25.104 [3], with a chip rate as defined in this table. | |

##### 6.6.4.5.5 NB-IoT test requirement

For NB-IoT in-band and guard band operation, the E-UTRA minimum requirement specified in section 6.6.4.5.1 shall apply.

For NB-IoT operation in NR in-band, the NR minimum requirement specified in section 6.6.4.5.6 shall apply.

For NB-IoT standalone operation, the ACLR shall be higher than the value specified in Table 6.6.4.5.5-1.

Table 6.6.4.5.5-1: Base Station ACLR for NB-IoT standalone operation

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel bandwidth of standalone NB-IoT lowest/highest carrier transmitted BWChannel | 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 |
| 200 kHz | 300 kHz | Standalone NB-IoT | Square (BWConfigl) | 39.2 dB |
| 500 kHz | Standalone NB-IoT | Square (BWConfig) | 49.2 dB |
| NOTE 1: BWConfig is the transmission bandwidth configuration of the E-UTRA Lowest/Highest Carrier transmitted on the assigned channel frequency. | | | | |

##### 6.6.4.5.6 NR test requirement

For NR, the requirements shall apply outside the Base Station RF Bandwidth or Radio Bandwidth whatever the type of transmitter considered (single carrier or multi-carrier) and for all transmission modes foreseen by the manufacturer’s specification.

For a BS operating in non-contiguous spectrum, the ACLR requirement shall apply in *sub-block gaps* for the frequency ranges defined in table 6.6.4.5.6-2a, while the CACLR requirement shall apply in *sub-block gaps* for the frequency ranges defined in table 6.6.4.5.4-1.

For BS operating in multiple bands, where multiple bands are mapped onto the same *antenna connector*, the ACLR requirement shall apply in *Inter RF Bandwidth gaps* for the frequency ranges defined in table 6.6.4.5.6-2a, while the CACLR requirement in subclause 6.6.4.5.4 shall apply in *Inter RF Bandwidth gaps* for the frequency ranges defined in table 6.6.4.5.4-1.

The requirement shall apply during the *transmitter ON period*. The ACLR is defined with a square filter of bandwidth equal to the transmission bandwidth configuration of the transmitted signal (BWConfig) centred on the assigned channel frequency and a filter centred on the adjacent channel frequency according to the tables below.

The ACLR absolute *limit* in table 6.6.4.5.6-2 or the ACLR (CACLR) *limit* in table 6.6.4.5.6-1, 6.6.4.5.6-2a or 6.6.4.5.4-1, whichever is less stringent, shall apply for each *antenna connector*.

For operation in paired and unpaired spectrum, the ACLR shall be higher than the value specified in table 6.6.4.5.6‑1.

Table 6.6.4.5.6-1: Base station ACLR limit

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Channel bandwidth* of lowest/highest NR carrier transmitted BWChannel [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 |
| 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90,100 | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 44.2 dB |
| 2 x BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 44.2 dB |
| BWChannel /2 + 2.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 44.2 dB (Note 3) |
| BWChannel /2 + 7.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 44.2 dB (Note 3) |
| NOTE 1: BWChannel and BWConfig are the *channel bandwidth* and transmission bandwidth configuration of the lowest/highest NR carrier transmitted on the assigned channel frequency.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: The requirements are applicable when the band is also defined for E-UTRA or UTRA. | | | | |

The ACLR absolute limit is specified in table 6.6.4.5.6‑2.

Table 6.6.4.5.6-2: Base station ACLR absolute limit

|  |  |
| --- | --- |
| BS category / BS class | ACLR absolute limit |
| Category A Wide Area BS | -13 dBm/MHz |
| Category B Wide Area BS | -15 dBm/MHz |
| Medium Range BS | -25 dBm/MHz |
| Local Area BS | -32 dBm/MHz |

For operation in non-contiguous spectrum or multiple bands, the ACLR shall be higher than the value specified in Table 6.6.4.5.6‑2a.

Table 6.6.4.5.6-2a: Base Station ACLR limit in non-contiguous spectrum or multiple bands

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *Channel bandwidth* of lowest/highest NR carrier transmitted BWChannel [MHz] | Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies [MHz] | BS adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap) | Assumed adjacent channel carrier | Filter on the adjacent channel frequency and corresponding filter bandwidth | ACLR limit |
| 5, 10, 15, 20 | Wgap ≥ 15 (Note 3)  Wgap ≥ 45 (Note 4) | 2.5 MHz | 5 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| Wgap ≥ 20 (Note 3)  Wgap ≥ 50 (Note 4) | 7.5 MHz | 5 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| 25, 30, 40, 50, 60, 70, 80, 90, 100 | Wgap ≥ 60 (Note 4)  Wgap ≥ 30 (Note 3) | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| Wgap ≥ 80 (Note 4)  Wgap ≥ 50 (Note 3) | 30 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 44.2 dB |
| NOTE 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.  NOTE 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).  NOTE 3: Applicable in case the *channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 5, 10, 15, 20 MHz.  NOTE 4: 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. | | | | | |

**<Next of change>**

# 7 Receiver characteristics

## 7.1 General

General test conditions for receiver tests are given in clause 4, including interpretation of measurement results and configurations for testing. BS configurations for the tests are defined in subclause 4.10.

Unless otherwise stated the requirements in clause 7 apply during the Base Station receive period.

Unless otherwise stated, a BS declared to be capable of E-UTRA with NB-IoT in-band or guard band operations (or any combination with GSM and/or UTRA and/or NR) is only required to pass the receiver tests for E-UTRA with NB-IoT in-band or guard band (or any combination with GSM and/or UTRA and/or NR); it is not required to perform the receiver tests again for E-UTRA only (or any combination with GSM and/or UTRA and/or NR).

For a BS declared to be capable of E-UTRA (and where applicable NR) with NB-IoT in-band operations, it is not required to perform the receiver test for subPRB allocation.

Unless otherwise stated, a BS declared to be capable of NB-IoT operation in NR in-band (or any combination with GSM and/or UTRA and/or E-UTRA) is only required to pass the receiver tests for NB-IoT operation in NR in-band (or any combination with GSM and/or UTRA and/or E-UTRA); it is not required to perform the receiver tests again for NR only (or any combination with GSM and/or UTRA and/or E-UTRA).

For a BS declared to be capable of NB-IoT operation in NR in-band (and where applicable E-UTRA) , it is not required to perform the receiver test for subPRB allocation.

## 7.4 In-band selectivity and blocking

### 7.4.1 Definition and applicability

The in-band selectivity and blocking characteristics are measures of the receiver ability to receive a wanted signal at its assigned channel in the presence of an unwanted interferer inside the operating band and are defined by a wideband and a narrowband blocking requirement.

The in-band blocking requirement applies from FUL\_low - ΔfOOB to FUL\_high + ΔfOOB, excluding the downlink frequency range of the FDD *operating band*. The values of ΔfOOB are defined in table 7.4.1-1. For a BS with multi-RAT operation where the individual RATs are in different RAT specific bands that partially or fully overlap; ΔfOOB is according to the combined frequency range occupied by the overlapping bands.

Table 7.4.1-1: Maximum ΔfOOB offset outside the uplink operating band

|  |  |
| --- | --- |
| *Operating band* characteristics | ΔfOOB [MHz] |
| 200 MHz ≥ FUL\_high – FUL\_low | 20 |
| 200 MHz < FUL\_high – FUL\_low ≤ 900 MHz | 60 |

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 in-band selectivity and blocking receiver tests for E-UTRA with guard band operation (or any combination with GSM and/or UTRA). It’s not required to perform the in-band selectivity and blocking receiver tests again for E-UTRA with in-band operation (or any combination with GSM and/or UTRA).

### 7.4.2 Minimum requirement

The minimum requirement is in TS 37.104 [2] subclauses 7.4.1, 7.4.2, 7.4.3, 7.4.4, and 7.4.5.

### 7.4.3 Test purpose

The test stresses the ability of the BS receiver to withstand high-level interference from unwanted signals at specified frequency offsets without undue degradation of its sensitivity.

### 7.4.4 Method of test

#### 7.4.4.1 Initial conditions

Test environment: Normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: MRFBW in single-band operation, see subclause 4.9.1, BRFBW\_T’RFBW and B’RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

1) Set up the equipment as shown in Annex D.2.1.

2) Generate the wanted signal according to the applicable test configuration (see clause 5) using applicable reference measurement channel to the BS under test as follows:

- For E-UTRA see Annex A.1 in TS 36.141 [9].

- For UTRA FDD see Annex A.2 in TS 25.141 [10].

- For UTRA TDD see Annex A.2.1 in TS 25.142 [12].

- For GSM see subclause 7.6.2 in TS 51.021 [11] and Annex P in TS 45.005 [6] for reference channels to test.

- For NB-IoT see Annex A.1 in TS 36.141 [9].

- For NR see Annex A.1 in TS 38.141-1 [26].

#### 7.4.4.2 Procedure for general blocking

1) Set the BS to transmit with the carrier set-up and power allocation according to the applicable test configuration(s) (see clause 5).

2) Adjust the signal generators to the type of interfering signal, levels and the frequency offsets as specified in Table 7.4.5.1-1.

3) The interfering signal shall be swept with a step size of 1 MHz starting from the minimum offset to the channel edges of the wanted signals as specified in Table 7.4.5.1-1

4) Measure the performance of the wanted signal at the BS receiver, as defined in subclause 7.4.5, for the relevant carriers specified by the test configuration in subclause 4.8.

In addition, for a multi-band capable BS with separate antenna connectors, the following steps shall apply:

5) For single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

6) For multi-band tests, the interfering signal shall first be applied on the same port as the wanted signal. The test shall be repeated with the interfering signal applied on the other port (if any) mapped to the same receiver as wanted signal. Any antenna connector with no signal applied shall be terminated.

7) Repeat step 6 with the wanted signal for the other band(s) applied on the respective port(s).

#### 7.4.4.3 Procedure for narrowband blocking

1) Set the BS to transmit with the carrier set-up and power allocation according to the applicable test configuration(s) (see clause 5).

2) Adjust the signal generators to the type of interfering signal, levels and the frequency offsets as specified in Tables 7.4.5.2-1 and 7.4.5.2-2.

3) Set-up and sweep the interfering RB centre frequency offset to the channel edge of the wanted signal according to Tables 7.4.5.2-1 and 7.4.5.2-2.

4) Measure the performance of the wanted signal at the BS receiver, as defined in subclause 7.4.5, for the relevant carriers specified by the test configuration in subclause 4.8.

In addition, for a multi-band capable BS with separate antenna connectors, the following steps shall apply:

5) For single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

6) For multi-band tests, the interfering signal shall first be applied on the same port as the wanted signal. The test shall be repeated with the interfering signal applied on the other port (if any) mapped to the same receiver as the wanted signal. Any antenna connector with no signal applied shall be terminated.

7) Repeat step 6 with the wanted signal for the other band(s) applied on the respective port(s).

#### 7.4.4.4 Procedure for additional narrowband blocking for GSM/EDGE

For a BS declared to support CS1 to CS6 or CS9 to CS13, the GSM/EDGE in-band blocking method of test is stated in TS 51.021 [11], applicable parts of subclause 7.6.

The conditions specified in TS 45.005 [6], Annex P.2.1 apply for GSM/EDGE in-band narrowband blocking.

If a BS is declared to support CS7 or CS15, the steps in subclause 7.4.4.4.1 and 7.4.4.4.2 for testing additional narrowband blocking for GSM/EDGE shall apply:

##### 7.4.4.4.1 Initial conditions for additional narrowband blocking for GSM/EDGE for CS7 and CS15

Test environment: Normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: MRFBW in single-band operation, see subclause 4.9.1,

1) Set up the equipment as shown in Annex D.2.1.

2) Generate the wanted signal according to the applicable test configuration (see clause 5) using applicable reference measurement channel to the BS under test as follows:

- For GSM see subclause 7.6.2 in TS 51.021 [11] and Annex P.2.1 in TS 45.005 [6] for reference channels to test.

##### 7.4.4.4.2 Procedure for additional narrowband blocking for GSM/EDGE for CS7 and CS15

1) Set the BS according to the applicable test configuration(s) (see clause 5).

2) Adjust the GSM/EDGE signal generator to the wanted signal levels as specified in TS 51.021, applicable parts of subclauses 7.6.

3) Set-up the interfering signal as specified in TS 51.021, applicable parts of subclauses 7.6.

4) Measure the performance of the GSM/EDGE wanted signal at the BS receiver, as defined in TS 51.021, applicable parts of subclause 7.6.

In addition, for multi-band capable BS and single band tests, repeat the procedure above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band. Any antenna connector with no signal applied shall be terminated.

#### 7.4.4.5 Procedure for GSM/EDGE AM suppression

For a BS declared to support CS1 to CS6, the GSM/EDGE in-band blocking method of test is stated in TS 51.021 [11], applicable parts of subclause 7.8.

The conditions specified in TS 45.005 [6], Annex P.2.3 apply for GSM/EDGE AM suppression.

If a BS is declared to support CS7, the steps in subclause 7.4.4.5.1 and 7.4.4.5.2 for testing additional narrowband blocking for GSM/EDGE shall apply:

##### 7.4.4.5.1 Initial conditions for GSM/EDGE AM suppression for CS7 and CS15

Test environment: Normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: MRFBW in single-band operation, see subclause 4.9.1.

1) Set up the equipment as shown in Annex D.2.1.

2) Generate the wanted signal according to the applicable test configuration (see clause 5) using applicable reference measurement channel to the BS under test as follows:

- For GSM see subclause 7.8 in TS 51.021 [11] and Annex P.2.3 in TS 45.005 [6] for reference channels to test.

##### 7.4.4.5.2 Procedure for GSM/EDGE AM suppression for CS7 and CS15

1) Set the BS according to the applicable test configuration(s) (see clause 5).

2) Adjust the GSM/EDGE signal generator to the wanted signal levels as specified in TS 51.021, applicable parts of subclauses 7.8.

3) Set-up the interfering signal as specified in TS 51.021, applicable parts of subclauses 7.8.

4) Measure the performance of the GSM/EDGE wanted signal at the BS receiver, as defined in TS 51.021, applicable parts of subclause 7.8.

In addition, for multi-band capable BS and single band tests, repeat the procedure above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band. Any antenna connector with no signal applied shall be terminated.

#### 7.4.4.6 Procedure for additional BC3 blocking requirement

1) Adjust the signal generators to the type of interfering signal, levels and the frequency offsets as specified in Table 7.4.5.5-1

2) Measure the performance of the wanted signal at the BS receiver, as defined in subclause 7.4.5, for the relevant carriers specified by the test configuration in subclause 4.8.

### 7.4.5 Test requirements

#### 7.4.5.1 General blocking test requirement

For the general blocking requirement, the interfering signal shall be a UTRA FDD signal as specified in Annex A.1 for a UTRA, E-UTRA, NB-IOT, GSM/EDGE or NR (≤ 20 MHz) wanted signal. The interfering signal shall be a 20 MHz E-UTRA signal for NR wanted signal channel bandwidth greater than 20MHz.

The requirement is applicable outside the Base Station RF Bandwidth or Maximum Radio Bandwidth. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges or Maximum Radio Bandwidth edges.

For BS operating in non-contiguous spectrum, the requirement applies in addition inside any sub-block gap, in case the sub-block gap size is at least 15MHz. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

For BS capable of multi-band operation, the requirement applies in addition inside any Inter RF Bandwidth gap, in case the gap size is at least 15MHz. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges inside the Inter RF Bandwidth gap.

For the wanted and interfering signal coupled to the Base Station antenna input, using the parameters in Table 7.4.5.1-1 and 7.4.5.1-2, the following requirements shall be met:

- For any measured E-UTRA carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [3], subclause 7.2.

- For any measured UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [4], subclause 7.2.

- For any measured GSM/EDGE carrier, the conditions are specified in TS 45.005 [6], Annex P.2.1.

- For any measured NB-IoT carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured NR carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 38.104 [27], subclause 7.2.

For BS capable of multi-band operation, the requirement applies according to Table 7.4.5.1‑1 for the in-band blocking frequency ranges of each supported operating band.

Table 7.4.5.1-1: General blocking requirement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Base Station Type | Mean power of interfering signal [dBm] | Wanted Signal mean power [dBm]  (Note 1) | Centre Frequency of Interfering Signal | Interfering signal centre frequency minimum frequency offset from the Base Station RF Bandwidth edge or sub-block edge inside a gap [MHz] |
| Wide Area BS | -40+y (Note 7) | PREFSENS + x dB  (Note 2) | FUL\_low - ΔfOOB to FUL\_high + ΔfOOB (Note 8) | ± (7.5 + z) (Note 9) |
| Medium Range BS | -35+y (Note 7) | PREFSENS + x dB  (Note 3, 6) |
| Local Area BS | -30+y (Note 7) | PREFSENS + x dB  (Note 4, 6) |
| NOTE 1: PREFSENS depends on the RAT, the BS class and on the channel bandwidth, see subclause 7.2 in TS 37.104.  NOTE 2: For WA BS, “x” is equal to 6 in case of NR or E-UTRA or UTRA or NB-IoT wanted signals and equal to 3 in case of GSM/EDGE wanted signal.  NOTE 3: For MR BS supporting GSM and/or UTRA, “x” is equal to 6 in case of UTRA wanted signals, 9 in case of NR or E-UTRA or NB-IoT wanted signal and 3 in case of GSM/EDGE wanted signal.  NOTE 4: For LA BS supporting GSM and/or UTRA, “x” is equal to 11 in case of NR or E-UTRA or NB-IoT wanted signal, 6 in case of UTRA wanted signal and equal to 3 in case of GSM/EDGE wanted signal.  NOTE 5: For a BS capable of multi-band operation, “x” in Note 2, 3, 4, 6 applies in case of interfering signals that are in the in-band blocking frequency range of the operating band where the wanted signal is present or in an adjacent or overlapping band. For other in-band blocking frequency ranges of the interfering signal for the supported operating bands, “x” is equal to 1.4 dB.  NOTE 6: For a BS neither supporting UTRA nor GSM, x is equal to 6 for all BS classes if NR is supported, otherwise “x” is equal to 9 for MR BS or 11 for LA BS if NR is not supported.  NOTE 7: For a BS supporting NR but neither UTRA nor GSM, “y” is equal to -3 for the WA and MR BS class and -5 for the LA BS class. For all other cases, “y” is equal to zero for all BS classes.  NOTE 8: The downlink frequency range of an FDD operating band is excluded from the general blocking requirement.  NOTE 9: For NR wanted signal channel bandwidth greater than 20 MHz, z = 22.5. For all other cases, z = 0. | | | | |

Table 7.4.5.1-2: Void

NOTE: The requirement in Table 7.4.5.1-1 assumes that two operating bands, where the downlink operating band (see Table 4.4-1 and Table 4.4-2) of one band would be within the in-band blocking region of the other band, are not deployed in the same geographical area.

#### 7.4.5.2 General narrowband blocking test requirement

For the narrowband blocking requirement, the interfering signal shall be an E-UTRA 1RB signal as specified in Annex A.3.

The requirement is applicable outside the Base Station RF Bandwidth or Maximum Radio Bandwidth. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges or Maximum Radio Bandwidth edges.

For BS operating in non-contiguous spectrum, the requirement applies in addition inside any sub-block gap, in case the sub-block gap size is at least 3MHz. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

For BS capable of multi-band operation, the requirement applies in addition inside any Inter RF Bandwidth gap in case the gap size is at least 3MHz. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges inside the Inter RF Bandwidth gap.

For the wanted and interfering signal coupled to the Base Station antenna input, using the parameters in Table 7.4.5.2-1 the following requirements shall be met:

- For any measured E-UTRA carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [3], subclause 7.2.

- For any measured UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [4], subclause 7.2.

- For any measured GSM/EDGE carrier, the conditions are specified in TS 45.005 [6], Annex P.2.1.

- For any measured NB-IoT carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured NR carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 38.104 [27], subclause 7.2.

Table 7.4.5.2-1: Narrowband blocking requirement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Base Station Type | RAT of the carrier | Wanted signal mean power [dBm]  (Note 1, 2, 6) | Interfering signal mean power [dBm] | Interfering RB (Note 3) centre frequency offset from the Base Station RF Bandwidth edge or sub-block edge inside a gap [kHz] |
| Wide Area BS | NR, E-UTRA, NB-IoT (Note 4), UTRA and GSM/EDGE | PREFSENS + x dB (Note 2) | -49 | ±(240 +m\*180),  m=0, 1, 2, 3, 4, 9, 14 (Note 5)  ±(550 +m\*180),  m=0, 1, 2, 3, 4, 29, 54, 79, 99 (Note 6, 7) |
| Medium Range BS | -44 |
| Local Area BS | -41 |
| NOTE 1: PREFSENS depends on the RAT, the BS class and on the channel bandwidth, see subclause 7.2 in TS 37.104.  NOTE 2: “x” is equal to 6 in case of NR, E-UTRA or UTRA wanted signals and equal to 3 in case of GSM/EDGE wanted signal. “x” is specified in Table 7.4.5.2-2 for NB-IoT operation in E-UTRA in-band/guard band and NB-IoT standalone, and in Table 7.4.5.2-3 for NB-IoT operation in NR in-band.  NOTE 3: Interfering signal (E-UTRA 3MHz) consisting of one resource block positioned at the stated offset, the channel bandwidth of the interfering signal is located adjacently to the Base Station RF Bandwidth edge.  NOTE 4: For NB-IoT, the mentioned desensitized values consider only one NB-IoT PRB in the guard band, which is placed adjacent to the E-UTRA PRB edge as close as possible (i.e., away from edge of channel bandwidth).  NOTE 5: Applicable for *channel bandwidths* equal to or below 20 MHz.  NOTE 6: Applicable for *channel bandwidths* above 20 MHz*.*  NOTE 6: 7.5 kHz shift is not applied to the wanted signal of NR.  NOTE 7: The centre of the interfering RB refers to the frequency location between the two central subcarriers. | | | | |

Table 7.4.5.2-2: “x” for NB-IoT wanted signals operation in E-UTRA in-band/guard band and NB-IoT standalone

|  |  |  |
| --- | --- | --- |
| Operation mode | LTE channel bandwidth for in-band/guard band operation | x |
| Standalone | - | 12 |
| In Band | 3 MHz | 11 |
| 5 MHz | 9 |
| 10 MHz | 6 |
| 15 MHz | 6 |
| 20 MHz | 6 |
| Guard band | 5 MHz | 13 |
| 10 MHz | 6 |
| 15 MHz | 6 |
| 20 MHz | 6 |

Table 7.4.5.2-3: “x” for NB-IoT wanted signals operation in NR in-band

|  |  |  |
| --- | --- | --- |
| Operation mode | NR channel bandwidth for in-band operation | x |
| In Band | 5 MHz | 9 |
| ≥ 10 MHz | 6 |

#### 7.4.5.3 Additional narrowband blocking test requirement for GSM/EDGE

The GSM/EDGE in-band blocking test requirements are stated in TS 51.021 [11], applicable parts of subclause 7.6.

The conditions specified in TS 45.005 [6], Annex P.2.1 apply for GSM/EDGE in-band narrowband blocking.

#### 7.4.5.4 GSM/EDGE test requirements for AM suppression

The GSM/EDGE in-band blocking test requirements are stated in TS 51.021 [11], applicable parts of subclause 7.8.

The conditions specified in TS 45.005 [6], Annex P.2.3 apply for GSM/EDGE AM suppression.

#### 7.4.5.5 Additional BC3 blocking test requirement

The interfering signal is a 1.28Mcps UTRA TDD modulated signal as specified in Annex A.2.

The requirement is applicable outside the Base Station RF Bandwidth or Maximum Radio Bandwidth. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges or Maximum Radio Bandwidth edges.

For BS capable of multi-band operation, the requirement applies in addition inside any Inter RF Bandwidth gap, in case the gap size is at least 4.8MHz. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges inside the Inter RF Bandwidth gap.

For the wanted and interfering signal coupled to the Base Station antenna input, using the parameters in Table 7.4.5.5-1, the following requirements shall be met:

- For any measured E-UTRA TDD carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [4], subclause 7.2.

Table 7.4.5.5-1: Additional blocking requirement for Band Category 3

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating Band | Centre Frequency of Interfering Signal [MHz] | | | Interfering Signal mean power [dBm] | Wanted Signal mean power [dBm] | Interfering signal centre frequency minimum frequency offset from the Base Station RF Bandwidth edge [MHz] |
| 33 - 40 | (FUL\_low - 20) | to | (FUL\_high + 20) | -40, | PREFSENS + 6 dB\* | ±2.4 |
| NOTE\*: PREFSENS depends on the RAT and on the channel bandwidth, see section 7.2. | | | | | | |

## 7.5 Out-of-band blocking

### 7.5.1 Definition and applicability

The Out-of-band blocking characteristic is a measure of the receiver ability to receive a wanted signal at its assigned channel in the presence of an unwanted interferer outside the uplink operating band.

The blocking performance requirement applies as specified in the Table 7.5.5.1-1 and Table 7.5.5.2-1.

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 out-of-band blocking tests for E-UTRA with guard band operation (or any combination with GSM and/or UTRA). It’s not required to perform the out-of-band blocking receiver tests again for E-UTRA with in-band operation (or any combination with GSM and/or UTRA and/or NR).

### 7.5.2 Minimum requirement

The general minimum requirement is in TS 37.104 [2] subclause 7.5.1. The co-location minimum requirement is in TS 37.104 [2] subclause 7.5.2.

### 7.5.3 Test purpose

The test stresses the ability of the BS receiver to withstand high-level interference from unwanted signals at specified frequency bands, without undue degradation of its sensitivity.

### 7.5.4 Method of test

#### 7.5.4.1 Initial conditions

Test environment: normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: MRFBW in single-band operation, see subclause 4.9.1, BRFBW\_T’RFBW and B’RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

In addition, in multi-band operation:

- For BRFBW\_T’RFBW, out-of-band blocking testing above the highest operating band may be omitted

- For B’RFBW\_TRFBW, out-of-band blocking testing below the lowest operating band may be omitted

1) Set up the equipment as shown in Annex D.2.1.

2) Generate the wanted signal according to the applicable test configuration (see clause 5) using reference measurement channel to the BS under test as follows:

- For E-UTRA see Annex A.1 in TS 36.141 [9].

- For UTRA FDD see Annex A.2 in TS 25.141 [10].

- For UTRA TDD see Annex A.2.1 in TS 25.142 [12].

- For GSM see subclause 7.6.2 in TS 51.021 [11] and Annex P in TS 45.005 [6] for reference channels to test.

- For NB-IoT see Annex A.1 in TS 36.141 [9].

- For NR see Annex A.1 in TS 38.141-1 [26].

#### 7.5.4.2 Procedure

1) Set the BS to transmit with the carrier set-up and power allocation according to the applicable test configuration(s) (see clause 5).

The transmitter may be turned off for the out-of-band blocker tests when the frequency of the blocker is such that no IM2 or IM3 products fall inside the bandwidth of the wanted signal.

2) Adjust the signal generators to the type of interfering signals, levels and the frequency offsets as specified for general test requirements in Table 7.5.5.1-1 and, when applicable, for co-location test requirements in Table 7.5.5.2-1.

3) The CW interfering signal shall be swept with a step size of 1 MHz within the specified range.

4) Measure the performance of the wanted signal at the BS receiver, as defined in the subclause 7.5.5, for the relevant carriers specified by the test configuration in subclause 4.8.

In addition, for a multi-band capable BS with separate antenna connectors, the following steps shall apply:

5) For single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band.

6) For multi-band tests, the interfering signal shall first be applied on the same port as the wanted signal. The test shall be repeated with the interfering signal applied on the other port (if any) mapped to the same receiver as the wanted signal. Any antenna connector with no signal applied shall be terminated.

7) Repeat step 6 with the wanted signal for the other band(s) applied on the respective port(s).

### 7.5.5 Test requirements

#### 7.5.5.1 General out-of-band blocking test requirements

For a wanted and an interfering signal coupled to BS antenna input using the parameters in Table 7.5.5.1-1, the following requirements shall be met:

- For any measured E-UTRA carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [3], subclause 7.2.

- For any measured UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [4], subclause 7.2.

- For any measured GSM/EDGE carrier, the conditions are specified in TS 45.005 [6], Annex P.2.1.

- For any measured NB-IoT carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured NR carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 38.104 [27], subclause 7.2.

For BS capable of multi-band operation, the requirement applies for each supported operating band. The in-band blocking frequency ranges of all supported operating bands according to Table 7.4.5.1-2 shall be excluded from the requirement.

The out-of-band blocking requirement applies from 1 MHz to FUL\_low - ΔfOOB and from FUL\_high + ΔfOOB up to 12750 MHz, including the downlink frequency range of the FDD *operating band* for BS supporting FDD. ΔfOOB is defined in table 7.4.1-1.

Table 7.5.5.1-1: Out-of-band blocking performance requirement

|  |  |  |
| --- | --- | --- |
| Interfering Signal mean power [dBm] | Wanted Signal mean power [dBm] | Type of Interfering Signal |
| -15 (NOTE2) | PREFSENS +xdB (NOTE1) | CW carrier |
| NOTE1: PREFSENS depends on the RAT, the BS class and the channel bandwidth, see subclause 7.2.  “x” is equal to 6 in case of NR, E-UTRA, UTRA or NB-IoT wanted signals and equal to 3 in case of GSM/EDGE wanted signal.  NOTE2: For NB-IoT, up to 24 exceptions are allowed for  spurious response frequencies in each wanted signal frequency when measured using a 1MHz step size. For these exceptions the above throughput requirement shall be met when the blocking signal is set to a level of -40 dBm for 15 kHz subcarrier spacing and -46 dBm for 3.75 kHz subcarrier spacing. In addition, each group of exceptions shall not exceed three contiguous measurements using a 1MHz step size. | | |

#### 7.5.5.2 Co-location test requirements

This additional blocking requirement may be applied for the protection of BS receivers when NR, E-UTRA, UTRA, CDMA or GSM/EDGE BS operating in a different frequency band are co-located with a BS.

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

For a wanted and an interfering signal coupled to BS antenna input using the parameters in Table 7.5.5.2-1, the following requirements shall be met:

- For any measured E-UTRA carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [3], subclause 7.2.

- For any measured UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [4], subclause 7.2.

- For any measured GSM/EDGE carrier, the conditions are specified in TS 45.005 [6], Annex P.2.1.

- For any measured NB-IoT carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured NR carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 38.104 [27], subclause 7.2.

Table 7.5.5.2-1: Blocking requirement for co-location with BS in other frequency bands

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Type of co-located BS | Centre Frequency of Interfering Signal (MHz) | Interfering Signal mean power for WA BS (dBm) | Interfering Signal mean power for MR BS (dBm) | Interfering Signal mean power for LA BS (dBm) | Wanted Signal mean power (dBm) | Type of Interfering Signal |
| GSM850 or CDMA850 | 869 – 894 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| GSM900 | 921 – 960 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| DCS1800 | 1805 – 1880  (Note 4) | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| PCS1900 | 1930 – 1990 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band I or E-UTRA Band 1 or NR Band n1 | 2110 – 2170 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band II or E-UTRA Band 2 or NR Band n2 | 1930 – 1990 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band III or E-UTRA Band 3 or NR Band n3 | 1805 – 1880  (Note 4) | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band IV or E-UTRA Band 4 | 2110 – 2155 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band V or E-UTRA Band 5 or NR Band n5 | 869 – 894 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band VI or E-UTRA Band 6 | 875 – 885 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band VII or E-UTRA Band 7 or NR Band n7 | 2620 – 2690 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band VIII or E-UTRA Band 8 or NR Band n8 | 925 – 960 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band IX or E-UTRA Band 9 | 1844.9 – 1879.9 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band X or E-UTRA Band 10 | 2110 – 2170 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XI or E-UTRA Band 11 | 1475.9 - 1495.9 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XII or E-UTRA Band 12 or NR Band n12 | 729 - 746 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XIIII or E-UTRA Band 13 | 746 - 756 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XIV or E-UTRA Band 14 or NR Band n14 | 758 - 768 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 17 | 734 - 746 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 18 or NR Band n18 | 860 - 875 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XIX or E-UTRA Band 19 | 875 - 890 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XX or E-UTRA Band 20 or NR Band n20 | 791 - 821 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XXI or E-UTRA Band 21 | 1495.9 – 1510.9 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XXII or E-UTRA Band 22 | 3510 – 3590 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 23 | 2180 - 2200 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 24 | 1525 – 1559 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XXV or E-UTRA Band 25 or NR Band n25 | 1930 – 1995 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA FDD Band XXVI or E-UTRA Band 26 | 859 – 894 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 27 | 852 - 869 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 28 or NR Band n28 | 758 – 803 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 29 or NR Band n29 | 717-728 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + 6dB\* | CW carrier |
| E-UTRA Band 30 or NR Band n30 | 2350-2360 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 31 | 462.5–467.5 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + 6dB\* | CW carrier |
| UTRA FDD Band XXXII or E-UTRA Band 32 | 1452 – 1496  (NOTE 5) | +16\*\* | +8\*\* | -6\*\* | PREFSENS + 6dB\* | CW carrier |
| UTRA TDD Band a) or E-UTRA Band 33 | 1900-1920 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA TDD Band a) or E-UTRA Band 34 or NR Band n34 | 2010-2025 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA TDD Band b) or E-UTRA Band 35 | 1850-1910 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA TDD Band b) or E-UTRA Band 36 | 1930-1990 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA TDD Band c) or E-UTRA Band 37 | 1910-1930 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA TDD Band d) or E-UTRA Band 38 or NR Band n38 | 2570-2620 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA TDD Band f) or E-UTRA Band 39 or NR Band n39 | 1880-1920 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| UTRA TDD Band e) or E-UTRA Band 40 or NR Band n40 | 2300-2400 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 41 or NR Band n41 | 2496 - 2690 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 42 | 3400 – 3600 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 43 | 3600 – 3800 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 44 | 703 - 803 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 45 | 1447 - 1467 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 46 | 5150 - 5925 | N/A | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 48 or NR Band n48 | 3550 - 3700 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 49 | 3550 - 3700 | N/A | N/A | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 50 or NR Band n50 | 1432 - 1517 | +16 | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 51 or NR Band n51 | 1427 - 1432 | N/A | N/A | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 52 | 3300 – 3400 | +16\*\* | +8 | -6 | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 53 | 2483.5 – 2495 | N/A | +8 | -6 | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 65 or NR Band n65 | 2110 – 2200 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 66 or NR Band n66 | 2110 – 2200 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 67 | 738 – 758 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 68 | 753 – 783 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 69 | 2570-2620 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 70 or NR Band n70 | 1995 - 2020 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 71 or NR Band n71 | 617 - 652 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 72 | 461 - 466 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 73 | 460 - 465 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 74 or NR Band n74 | 1475 - 1518 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 75 or NR Band n75 | 1432 - 1517 | +16\*\* | +8\*\* | -6\*\* | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 76 or NR Band n76 | 1427 - 1432 | N/A | N/A | -6\*\* | PREFSENS + x dB\* | CW carrier |
| NR Band n77 | 3300 - 4200 | +16\*\* | +8 | -6 | PREFSENS + x dB\* | CW carrier |
| NR Band n78 | 3300 - 3800 | +16\*\* | +8 | -6 | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 85 | 728 - 746 | +16\*\* | +8 | -6 | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 87 | 420 – 425 | +16\*\* | +8 | -6 | PREFSENS + x dB\* | CW carrier |
| E-UTRA Band 88 | 422 – 427 | +16\*\* | +8 | -6 | PREFSENS + x dB\* | CW carrier |
| NOTE 1 (\*):PREFSENS depends on the RAT, the BS class and the channel bandwidth, see subclause 7.2. "x" is equal to 3 in case of GSM/EDGE wanted signal and equal to 6 in case of NR, UTRA or E-UTRA wanted signals.  NOTE 2: Except for a BS operating in Band 13, these requirements do not apply when the interfering signal falls within any of the supported uplink operating band or in the ΔfOOB immediately outside any of the supported uplink operating band. For a BS operating in band 13 the requirements do not apply when the interfering signal falls within the frequency range 768-797MHz.  NOTE 3: Some combinations of bands may not be possible to co-site based on the requirements above. The current state-of-the-art technology does not allow a single generic solution for co-location of UTRA TDD or E-UTRA TDD or NR TDD with E-UTRA FDD or NR FDD 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 TR 25.942 [14].  NOTE 4: In China, the blocking requirement for co-location with DCS1800 and Band III BS is only applicable in the frequency range 1805-1850MHz.  NOTE 5: For a BS operating in band 11, 21 or 74, the requirement for co-location with Band 32 applies for interfering signal within the frequency range 1475.9-1495.9 MHz.  NOTE 6: Co-located TDD base stations that are synchronized and using the same or adjacent operating band can receive without special co-location requirements. For unsynchronized base stations, special co-location requirements may apply that are not covered by the 3GPP specifications.  NOTE 7 (\*\*): For NB-IoT, up to 24 exceptions are allowed for spurious response frequencies in each wanted signal frequency when measured using a 1MHz step size. For these exceptions the above throughput requirement shall be met when the blocking signal is set to a level of -40 dBm for 15 kHz subcarrier spacing and -46 dBm for 3.75 kHz subcarrier spacing. In addition, each group of exceptions shall not exceed three contiguous measurements using a 1MHz step size. | | | | | | |

## 7.6 Receiver spurious emissions

### 7.6.1 Definition and applicability

The receiver spurious emissions power is the power of emissions generated or amplified in a receiver that appear at the BS receiver antenna connector. The requirements apply to all BS with separate RX and TX antenna ports. In this case for FDD BS the test shall be performed when both TX and RX are on, with the TX port terminated.

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 subclause 6.6.1 are valid.

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.

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’s 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).

### 7.6.2 Minimum requirements

The minimum requirement is in TS 37.104 [2] subclause 7.6.1.

### 7.6.3 Test purpose

The test purpose is to verify the ability of the BS to limit the interference caused by receiver spurious emissions to other systems.

### 7.6.4 Method of test

#### 7.6.4.1 Initial conditions

Test environment: Normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: MRFBW in single-band operation, see subclause 4.9.1, BRFBW\_T’RFBW and B’RFBW\_TRFBW in multi-band operation, see subclause 4.9.1.

1) Set up the equipment as shown in Annex D.2.1.

#### 7.6.4.2 Procedure

1) Set the measurement equipment parameters as specified in Table 7.6.5.1-1. For BC2, the parameters in Table 7.6.5.2-1 apply in addition.

2) Set the BS to transmit with the carrier set-up and power allocation according to the applicable test configuration(s) (see clause 5).

3) Measure the spurious emissions over each frequency range described in subclause 7.6.5.

In addition, for a multi-band capable BS, the following step shall apply:

4) For multi-band capable BS and single band tests, repeat the steps above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band. For multi-band capable BS with separate antenna connector, the antenna connector not being under test in case of SBT or MBT shall be terminated.

### 7.6.5 Test requirements

#### 7.6.5.1 General test requirements

The power of any spurious emission shall not exceed the levels in Table 7.6.5.1-1.

Table 7.6.5.1-1: 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 FBW RF,DL,low - ΔfOBUE to FBW RF,DL,high + ΔfOBUE 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 7.6.5.1-1, the power of any spurious emission shall not exceed the additional spurious emissions requirements in subclause 6.6.1.5.5 and in case of FDD BS (for BC1 and BC2) emission shall not exceed the levels specified for protection of the BS receivers of own or different BS in subclause 6.6.1.5.4. In addition, the requirements for co-location with other Base Stations specified in subclause 6.6.1.5.6 may also be applied.

#### 7.6.5.2 Additional test requirement for BC2 (Category B)

For a BS operating in Band Category 2 when GSM/EDGE is configured and where Category B spurious emissions apply, the power of any spurious emissions shall not exceed the limits in Table 7.6.5.2-1.

For BS capable of multi-band operation, the limits in Table 7.6.5.2-1 are only applicable when all supported operating bands belong to BC2 and GSM/EDGE is configured in all bands.

Table 7.6.5.2-1: Additional BS spurious emissions limits for BC2, Category B

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range | Frequency offset from transmitter operating band edge (Note 1) | Maximum level | Measurement Bandwidth |
| 500 MHz – 1 GHz | 10 – 20 MHz | -57 dBm | 300 kHz |
| 20 – 30 MHz | -57 dBm | 1 MHz |
| ≥ 30 MHz | -57 dBm | 3 MHz |
| 1 GHz – 12.75 GHz | ≥ 30 MHz | -47 dBm | 3 MHz |
| NOTE 1: For BS capable of multi-band operation, the frequency offset is relative to the closest supported operating band. | | | |

## 7.7 Receiver intermodulation

### 7.7.1 Definition and applicability

Third and higher order mixing of the two interfering RF signals can produce an interfering signal in the band of the desired channel. Intermodulation response rejection is a measure of the capability of the receiver to receive a wanted signal on its assigned channel frequency in the presence of two interfering signals which have a specific frequency relationship to the wanted signal.

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 intermodulation tests for E-UTRA with guard band operation (or any combination with GSM and/or UTRA). It’s not required to perform the receiver intermodulation tests again for E-UTRA with in-band operation (or any combination with GSM and/or UTRA).

### 7.7.2 Minimum requirement

The minimum requirement is in TS 37.104 [2], subclauses 7.7.1, 7.7.2 and 7.7.3.

### 7.7.3 Test purpose

The test purpose is to verify the ability of the BS receiver to inhibit the generation of intermodulation products in its non-linear elements caused by the presence of two high-level interfering signals at frequencies with a specific relationship to the frequency of the wanted signal.

### 7.7.4 Method of test

#### 7.7.4.1 Initial conditions

Test environment: Normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: In single-band operation: MRFBW if TC6 is applicable; BRFBW and TRFBW for other TC, see subclause 4.9.1, Table 5.1-1 and Table 5.2-1. In multi- band operation: BRFBW\_T’RFBW and B’RFBW\_TRFBW, see subclause 4.9.1.

1) Set-up the measurement system as shown in Annex D.2.3.

2) Generate the wanted signal according to the applicable test configuration (see clause 5) using reference measurement channel to the BS under test as follows:

- For E-UTRA see Annex A.1 in TS 36.141 [9].

- For UTRA FDD see Annex A.2 in TS 25.141 [10].

- For UTRA TDD see Annex A.2.1 in TS 25.142 [12].

- For GSM see subclause 7.7.2 in TS 51.021 [11] and Annex P in TS 45.005 [6] for reference channels to test.

- For NB-IoT see Annex A.1 in TS 36.141 [9].

- For NR see Annex A.1 in TS 38.141-1 [26].

#### 7.7.4.2 Procedure for general and narrowband intermodulation

1) Adjust the signal generators to the type of interfering signals, levels and the frequency offsets as specified in Table 7.7.5.1-1 and Table 7.7.5.1-2 for general intermodulation requirement, and Table 7.7.5.2-1 and Table 7.7.5.2-2 for narrowband intermodulation requirement.

2) Measure the performance of the wanted signal at the BS receiver, as defined in subclause 7.7.5.1 and 7.7.5.2, for the relevant carriers specified by the test configuration in subclause 4.8.

In addition, for a multi-band capable BS with separate antenna connectors, the following steps shall apply:

3) For single band tests, repeat the steps above per involved band where single band test configurations shall apply with no carrier activated in the other band.

4) For multi-band tests, the interfering signal shall first be applied on the same port as the wanted signal. The test shall be repeated with the interfering signal applied on the other port (if any) mapped to the same receiver as the wanted signal. Any antenna connector with no signal applied shall be terminated.

5) Repeat step 6 with the wanted signal for the other band(s) applied on the respective port(s).

#### 7.7.4.3 Procedure for additional narrowband intermodulation for GSM/EDGE

For a BS declared to support CS1 to CS6 or CS9 to CS13, the GSM/EDGE MC-BTS receiver intermodulation method of test is stated in TS 51.021 [11], applicable parts of subclause 7.7, shall apply for GSM/EDGE carriers.

The conditions specified in TS 45.005 [6], Annex P.2.2 apply for the GSM/EDGE intermodulation requirement.

If a BS is declared to support CS7 or CS15, the steps in subclause 7.7.4.3.1 and 7.7.4.3.2 for testing additional narrowband blocking for GSM/EDGE shall apply:

##### 7.7.4.3.1 Initial conditions for additional narrowband intermodulation for GSM/EDGE for CS7 and CS15

Test environment: Normal; see Annex B.2.

Base Station RF Bandwidth positions to be tested: MRFBW in single-band operation, see subclause 4.9.1,

1) Set up the equipment as shown in Annex D.2.3.

2) Generate the wanted signal according to the applicable test configuration (see clause 5) using applicable reference measurement channel to the BS under test as follows:

- For GSM see subclause 7.7 in TS 51.021 [11] and Annex P.2.2 in TS 45.005 [6] for reference channels to test.

##### 7.7.4.3.2 Procedure for additional narrowband intermodulation for GSM/EDGE for CS7 and CS15

1) Set the BS according to the applicable test configuration(s) (see clause 5).

2) Adjust the GSM/EDGE signal generator to the wanted signal levels as specified in TS 51.021, applicable parts of subclauses 7.7.

3) Set-up the interfering signal as specified in TS 51.021, applicable parts of subclauses 7.7.

4) Measure the performance of the GSM/EDGE wanted signal at the BS receiver, as defined in TS 51.021, applicable parts of subclause 7.7.

In addition, for multi-band capable BS and single band tests, repeat the procedure above per involved band where single band test configurations and test models shall apply with no carrier activated in the other band. Any antenna connector with no signal applied shall be terminated.

### 7.7.5 Test requirements

#### 7.7.5.1 General intermodulation test requirement

Interfering signals shall be a CW signal and an E-UTRA or UTRA signal, as specified in Annex A.

The requirement is applicable outside the Base Station RF Bandwidth or Maximum Radio Bandwidth. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges or Maximum Radio Bandwidth edges.

For BS capable of multi-band operation, the requirement applies in addition inside any Inter RF Bandwidth gap, in case the gap size is at least twice as wide as the UTRA/E-UTRA interfering signal centre frequency offset from the Base Station RF Bandwidth edge. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges inside the Inter RF Bandwidth gap.

For the wanted signal at the assigned channel frequency and two interfering signals coupled to the Base Station antenna input, using the parameters in Table 7.7.5.1-1 and 7.7.5.1-2, the following requirements shall be met:

- For any measured E-UTRA carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [3], subclause 7.2.

- For any measured UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [4], subclause 7.2.

- For any measured GSM/EDGE carrier, the conditions are specified in TS 45.005 [6], Annex P.2.2.

- For any measured NB-IoT carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured NR carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 38.104 [27], subclause 7.2.

Table 7.7.5.1-1: General intermodulation requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Base Station Type | Mean power of interfering signals [dBm] | Wanted Signal mean power [dBm] | Type of interfering signal |
| Wide Area BS | -48+y (Note 6) | PREFSENS +x dB (Note 2) | See Table 7.7.5.1-2 |
| Medium Range BS | -44+y (Note 6) | PREFSENS +x dB (Note 3, 5) |
| Local Area BS | -38+y (Note 6) | PREFSENS +x dB (Note 4, 5) |
| NOTE 1: PREFSENS depends on the RAT, the BS class and on the channel bandwidth, see subclause 7.2 in TS 37.104 [2]. For E-UTRA channel bandwidths 10, 15 and 20 MHz this requirement shall apply only for a FRC A1-3 mapped to the frequency range at the channel edge adjacent to the interfering signals.  NOTE 2: For WA BS, “x” is equal to 6 in case of NR or E-UTRA or UTRA or NB-IoT wanted signals and equal to 3 in case of GSM/EDGE wanted signal.  NOTE 3: For MR BS supporting GSM and/or UTRA, “x” is equal to 6 in case of UTRA wanted signals, 9 in case of NR or E-UTRA or NB-IoT wanted signal and equal to 3 in case of GSM/EDGE wanted signal.  NOTE 4: For LA BS supporting GSM and/or UTRA, “x” is equal to 12 in case of NR or E-UTRA or NB-IoT wanted signals, 6 in case of UTRA wanted signal and equal to 3 in case of GSM/EDGE wanted signal.  NOTE 5: For a BS neither supporting GSM nor UTRA, x is equal to 6 for all BS classes if NR is supported, or x is equal to 9 for MR and 12 for LA BS if NR is not supported.  NOTE 6: For a BS supporting NR but neither UTRA nor GSM; “y” is equal to -4 for the WA BS class, -3 for the MR BS class and -6 for the LA BS class. For all other cases, “y” is equal to zero for all BS classes. | | | |

Table 7.7.5.1-2: Interfering signals for intermodulation requirement

|  |  |  |
| --- | --- | --- |
| RAT of the carrier adjacent to the upper/lower Base Station RF Bandwidth edge | Interfering signal centre frequency offset from the Base Station RF Bandwidth edge [MHz] | Type of interfering signal |
| E-UTRA 1.4 MHz | ±2.0 (BC1 and BC3) /  ±2.1 (BC2) | CW |
| ±4.9 | 1.4MHz E-UTRA signal |
| E-UTRA 3 MHz or E-UTRA with NB-IoT in-band | ±4.4 (BC1 and BC3) /  ±4.5 (BC2) | CW |
| ±10.5 | 3MHz E-UTRA signal |
| UTRA FDD and  E-UTRA or E-UTRA with NB-IoT in-band/guard band 5 MHz | ±7.5 | CW |
| ±17.5 | 5MHz E-UTRA signal |
| E-UTRA or E-UTRA with NB-IoT in-band/guard band 10 MHz | ±7.375 | CW |
| ±17.5 | 5MHz E-UTRA signal |
| E-UTRA or E-UTRA with NB-IoT in-band/guard band15 MHz | ±7.25 | CW |
| ±17.5 | 5MHz E-UTRA signal |
| E-UTRA or E-UTRA with NB-IoT in-band/guard band 20 MHz | ±7.125 | CW |
| ±17.5 | 5MHz E-UTRA signal |
| GSM/EDGE | ±7.575 | CW |
| ±17.5 | 5MHz E-UTRA signal |
| NB-IoT standalone | ±7.575 | CW |
| ±17.5 | 5MHz E-UTRA signal |
| 1.28 Mcps UTRA TDD | ±2.3 (BC3) | CW |
| ±5.6 (BC3) | 1.28Mcps UTRA TDD signal |
| NR or NR with NB-IoT in NR in-band 5 MHz | [±7.5] | CW |
| [±17.5] | 5MHz E-UTRA signal |
| NR or NR with NB-IoT in-band10 MHz | [±7.45] | CW |
| [±17.5] | 5MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 15 MHz | [±7.43] | CW |
| [±17.5] | 5MHz E-UTRA signal |
| NR or NR with NB-IoT in-band/guard band 20 MHz | [±7.38] | CW |
| [±17.5] | 5MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 25 MHz | [±7.45] | CW |
| [±25] | 20MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 30 MHz | [±7.43] | CW |
| [±25] | 20MHz E-UTRA signal |
| NR or NR with NB-IoT in-band/guard band 40 MHz | [±7.45] | CW |
| [±25] | 20MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 50 MHz | [±7.35] | CW |
| [±25] | 20MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 60 MHz | [±7.49] | CW |
| [±25] | 20MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 70 MHz | [±7.42] | CW |
| [±25] | 20MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 80 MHz | [±7.44] | CW |
| [±25] | 20MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 90 MHz | [±25] | CW |
| [±7.43] | 20MHz E-UTRA signal |
| NR or NR with NB-IoT in-band 100 MHz | [±7.45] | CW |
| [±25] | 20MHz E-UTRA signal |

#### 7.7.5.2 General narrowband intermodulation test requirement

Interfering signals shall be a CW signal and an E-UTRA 1RB signal, as specified in Annex A.

The requirement is applicable outside the Base Station RF Bandwidth or Maximum Radio Bandwidth. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges or Maximum Radio Bandwidth edges.

For BS operating in non-contiguous spectrum within each supported operating band, the requirement applies in addition inside any sub-block gap in case the sub-block gap is at least as wide as the channel bandwidth of the E-UTRA interfering signal in Table 7.7.5.2-2. The interfering signal offset is defined relative to the sub-block edges inside the gap.

For BS capable of multi-band operation, the requirement applies in addition inside any Inter RF Bandwidth gap in case the gap size is at least as wide as the E-UTRA interfering signal in Table 7.7.5.2-2. The interfering signal offset is defined relative to the Base Station RF Bandwidth edges inside the Inter RF Bandwidth gap.

For the wanted signal at the assigned channel frequency and two interfering signals coupled to the Base Station antenna input, using the parameters in Table 7.7.5.2-1 and 7.7.5.2-2, the following requirements shall be met:

- For any measured E-UTRA carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [3], subclause 7.2.

- For any measured UTRA TDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.105 [4], subclause 7.2.

- For any measured GSM/EDGE carrier, the conditions are specified in TS 45.005 [6], Annex P.2.2.

- For any measured NB-IoT carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 36.104 [5], subclause 7.2.

- For any measured NR carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in TS 38.104 [27], subclause 7.2.

Table 7.7.5.2-1: General narrowband intermodulation requirement

|  |  |  |  |
| --- | --- | --- | --- |
| Base Station Type | Mean power of interfering signals [dBm] | Wanted Signal mean power [dBm] | Type of interfering signal |
| Wide Area BS | -52 | PREFSENS +x dB (NOTE 1) | See Table 7.7.5.2-2 |
| Medium Range BS | -47 |
| Local Area BS | -44 |
| NOTE 1: PREFSENS depends on the RAT, the BS class and on the channel bandwidth, see subclause 7.2 in TS 37.104. "x" is equal to 6 in case of NR, NB-IoT, E-UTRA or UTRA wanted signals and equal to 3 in case of GSM/EDGE wanted signal. | | | |







Table 7.7.5.2-2: Interfering signals for narrowband intermodulation requirement

|  |  |  |
| --- | --- | --- |
| RAT of the carrier adjacent to the upper/lower Base Station RF Bandwidth edge or sub-block edge | Interfering signal centre frequency offset from the Base Station RF Bandwidthedge or sub-block edge inside a gap [kHz] | Type of interfering signal |
| E-UTRA 1.4 MHz | ±260 (BC1 and BC3) /  ±270 (BC2) | CW |
| ±970 (BC1 and BC3) /  ±790 (BC2) | 1.4 MHz E-UTRA signal, 1 RB (NOTE 1) |
| E-UTRA or E-UTRA with NB-IoT in-band 3 MHz | ±260 (BC1 and BC3) /  ±270 (BC2) | CW |
| ±960 (BC1 and BC3) /  ±780 (BC2) | 3.0 MHz E-UTRA signal, 1 RB (NOTE 1) |
| E-UTRA or E-UTRA with NB-IoT in-band/guard band 5 MHz | ±360 (NOTE 3) | CW |
| ±1060 | 5 MHz E-UTRA signal, 1 RB (NOTE 1) |
| E-UTRA or E-UTRA with NB-IoT in-band/guard band 10 MHz  (NOTE 2) | ±325 (NOTE 3) | CW |
| ±1240 | 5 MHz E-UTRA signal, 1 RB (NOTE 1) |
| E-UTRA or E-UTRA with NB-IoT in-band/guard band 15 MHz  (NOTE 2) | ±380 (NOTE 3) | CW |
| ±1600 | 5MHz E-UTRA signal, 1 RB (NOTE 1) |
| E-UTRA or E-UTRA with NB-IoT in-band/guard band 20 MHz  (NOTE 2) | ±345 (NOTE 3) | CW |
| ±1780 | 5MHz E-UTRA signal, 1 RB (NOTE 1) |
| UTRA FDD | ±345 (BC1 and BC2) | CW |
| ±1780 (BC1 and BC2) | 5MHz E-UTRA signal, 1 RB (NOTE 1) |
| GSM/EDGE | ±340 | CW |
| ±880 | 5MHz E-UTRA signal, 1 RB (NOTE 1) |
| NB-IoT standalone | ±340 | CW |
| ±880 | 5MHz E-UTRA signal, 1 RB (NOTE 1) |
| 1.28Mcps UTRA TDD | ±190 (BC3) | CW |
| ±970 (BC3) | 1.4 MHz E-UTRA signal, 1 RB (NOTE 1) |
| NR or NR with NB-IoT in-band 5 MHz | [±360] | CW |
| [±1420] | E-UTRA signal, 1 RB (NOTE 1) |
| NR 10 MHz | [±325] | CW |
| [±1780] | E-UTRA signal, 1 RB (NOTE 1) |
| NR or NR with *NB-IoT operation in NR in-band* 15 MHz (Note 2) | [±380] | CW |
| [±1600] | E-UTRA signal, 1 RB (NOTE 1) |
| NR or NR with NB-IoT in-band 20 MHz (Note 2) | [±345] | CW |
| [±1780] | E-UTRA signal, 1 RB (NOTE 1) |
| NR or NR with NB-IoT in-band 25 MHz (Note 2) | [±325] | CW |
| [±1990] | E-UTRA signal, 1 RB (NOTE 1) |
| NR or NR with NB-IoT in-band 30 MHz (Note 2) | [±320] | CW |
| [±1990] | E-UTRA signal, 1 RB (NOTE 1) |
| NR or NR with NB-IoT in-band 40 MHz (Note 2) | [±310] | CW |
| [±2710] | E-UTRA signal, 1 RB (NOTE 1) |
| NR or NR with NB-IoT in-band 50 MHz (Note 2) | [±330] | CW |
| [±3250] | E-UTRA signal, 1 RB (NOTE 1) |
| NR 60 MHz (Note 2) | [±350] | CW |
| [±3790] | E-UTRA signal, 1 RB (NOTE 1) |
| NR 70 MHz (Note 2) | [±400] | CW |
| [±4870] | E-UTRA signal, 1 RB (NOTE 1) |
| NR 80 MHz (Note 2) | [±390] | CW |
| [±4870] | E-UTRA signal, 1 RB (NOTE 1) |
| NR 90 MHz (Note 2) | [±340] | CW |
| [±5770] | E-UTRA signal, 1 RB (NOTE 1) |
| NR 100 MHz (Note 2) | [±340] | CW |
| [±5770] | E-UTRA signal, 1 RB (NOTE 1) |
| NOTE 1: Interfering signal consisting of one resource block positioned at the stated offset, the channel bandwidth of the interfering signal is located adjacently to the Base Station RF Bandwidth edge or sub-block edge inside a gap.  NOTE 2: This requirement shall apply only for an E-UTRA FRC A1-3 or NR G-FRC mapped to the frequency range at the channel edge adjacent to the interfering signals.  NOTE 3: The frequency offset shall be adjusted to accommodate the IMD product to fall in the NB-IoT RB for NB-IoT in-band/guard band operation.  NOTE 4: The frequency offset shall be adjusted to accommodate the IMD product to fall in the NB-IoT RB for NB-IoT in-band/guard band operation.  NOTE 5: If a BS RF receiver fails the test of the requirement, the test shall be performed with the CW interfering signal frequency shifted away from the wanted signal by 180 kHz and the E-UTRA interfering signal frequency shifted away from the wanted signal by 360 kHz. If the BS RF receiver still fails the test after the frequency shift, then the BS RF receiver shall be deemed to fail the requirement. | | |

#### 7.7.5.3 Additional narrowband intermodulation test requirement for GSM/EDGE

The GSM/EDGE MC-BTS receiver intermodulation test requirements are stated in TS 51.021 [11], applicable parts of subclause 7.7, shall apply for GSM/EDGE carriers.

The conditions specified in TS 45.005 [6], Annex P.2.2 apply for the GSM/EDGE intermodulation requirement.

## 7.8 In-channel selectivity

### 7.8.1 Definition and applicability

In-channel selectivity (ICS) is a measure of the receiver ability to receive a wanted signal at its assigned resource block locations in the presence of an interfering signal received at a larger power spectral density. In this condition a throughput requirement shall be met for a specified reference measurement channel. This requirement is applicable for NR, NR with NB-IoT operation in NR in-band, E-UTRA carriers and E-UTRA with NB-IoT in-band operation carrier.

### 7.8.2 Minimum requirement

The minimum requirement is in TS 37.104 [2] subclause 7.8.1.

### 7.8.3 Test purpose

The purpose of this test is to verify the BS receiver ability to suppress the IQ leakage.

### 7.8.4 Method of testing

For this requirement Tables 5.1-1 and 5.2-1 refer to single-RAT specifications; see clause 5. The following shall apply:

- For references to TS 36.141 [9], the method of test is specified in TS 36.141 [9], subclause 7.4.4.

- For references to TS 38.141-1 [26], the method of test is specified in TS 38.141-1 [26], subclause 7.8.4.

In addition, for a multi-band capable BS, the following step shall apply:

- For multi-band capable BS and single band tests, repeat the tests per involved band with no carrier activated in the other band. For multi-band capable BS with separate antenna connector, the antenna connector not being under test shall be terminated.

### 7.8.5 Test requirements

The test requirements are in TS 36.141 [9], subclause 7.4.5 and in TS 38.141-1 [26], subclause 7.8.5.

Annex C (informative):  
Test Tolerances and Derivation of test requirements

The test requirements explicitly defined in this specification have been calculated by relaxing the minimum requirements of the core specification using the Test Tolerances defined here. When the Test Tolerance is zero, the test requirement will be the same as the minimum requirement. When the Test Tolerance is non-zero, the test requirements will differ from the minimum requirements, and the formula used for this relaxation is given in the following tables.

Test requirements which are included by reference to TS 25.141 [10], TS 25.142[12], TS 36.141[9] or TS 51.021[11] have been calculated within the referred test specification using the Test Tolerances defined therein.

The Test Tolerances are derived from Test System uncertainties, regulatory requirements and criticality to system performance. As a result, the Test Tolerances may sometimes be set to zero.

The test tolerances should not be modified for any reason e.g. to take account of commonly known test system errors (such as mismatch, cable loss, etc.).

Note that a formula for applying Test Tolerances is provided for all tests, even those with a test tolerance of zero. This is necessary in the case where the Test System uncertainty is greater than that allowed in subclause 4.1.2. In this event, the excess error shall be subtracted from the defined test tolerance in order to generate the correct tightened test requirements as defined in this Annex.

Unless otherwise stated, the uncertainties in subclause 4.1.2 apply to the Test System for testing E-UTRA, UTRA, GSM/EDGE and NB-IoT MSR BS.

**<Next of change>**

# C.2 Measurement of receiver

Table C.2-1: Derivation of test requirements (Receiver tests)

|  |  |  |  |
| --- | --- | --- | --- |
| Test | Minimum Requirement in TS 37.104 | Test Tolerance (TT) | Test Requirement |
| 7.4.5.1 In-band selectivity and blocking, General blocking requirement | Wanted Signal mean power = PREFSENS + x dB, where x is equal to 6 in case of E-UTRA or UTRA or NB-IoT or NR and equal to 3 in case of GSM/EDGE.  Interferer signal mean power:  -40 dBm. | 0 dB | Formula: Wanted signal power + TT.  Interferer signal power unchanged. |
| 7.4.5.2 In-band selectivity and blocking, General narrowband blocking requirement | Wanted Signal mean power = PREFSENS + x dB, where x is equal to 6 in case of NR or E-UTRA or UTRA and equal to 3 in case of GSM/EDGE, and equal to the following in case of NB-IoT.  For in-band NB-IoT, 1.4 MHz and 3 MHz BW:  X = 11  For in-band NB-IoT, 5 MHz BW:  X = 9  For in-band NB-IoT, 10MHz, 15MHz and 20MHz BW:  X = 6  For guard-band NB-IoT, 5 MHz BW:  X = 13  For guard-band NB-IoT, 10MHz, 15MHz and 20MHz BW:  X = 6  For standalone NB-IoT, 200 kHz BW:  X = 12  For NB-IoT operation within NR in-band:  For 5 MHz BW:X = 9  For channel BW ≥ 10MHz, X = 6.    Interferer signal mean power:  -49 dBm. | 0 dB | Formula: Wanted signal power + TT.  Interferer signal power unchanged. |
| 7.4.5.5 In-band selectivity and blocking, Additional BC3 requirement | Wanted Signal mean power = PREFSENS + x dB, where x is equal to 6 in case of NR or E-UTRA or UTRA [or NB-IoT].  Interferer signal mean power:  -40 dBm. | 0 dB | Formula: Wanted signal power + TT.  Interferer signal power unchanged. |
| 7.5.5.1 Out-of-band blocking, General requirement | Wanted Signal mean power = PREFSENS + x dB, where x is equal to 6 in case of NR or E-UTRA or UTRA or NB-IoT and equal to 3 in case of GSM/EDGE.  Interferer signal mean power:  -15 dBm. | 0 dB | Formula: Wanted signal power + TT.  Interferer signal power unchanged. |
| 7.5.5.2 Out-of-band blocking, Co-location | Wanted Signal mean power = PREFSENS + x dB, where x is equal to 6 in case of NR or E-UTRA or UTRA or NB-IoT and equal to 3 in case of GSM/EDGE.  Interferer signal mean power:  +16 dBm. | 0 dB | Formula: Wanted signal power + TT.  Interferer signal power unchanged. |
| 7.6.5 Receiver spurious emissions | Maximum level defined in Tables 7.6.5.1-1 and 7.6.5.2-1 of TS 37.104 [2]. | 0 dB | Formula: Maximum level + TT |
| 7.7.5.1 Receiver intermodulation, General requirement | Wanted Signal mean power = PREFSENS + x dB, where x is equal to 6 in case of NR or E-UTRA or UTRA or NB-IoT and equal to 3 in case of GSM/EDGE.  Interferer signal mean power:  -48 dBm. | 0 dB | Formula: Wanted signal mean power + TT.  CW interferer signal power unchanged.  Modulated interferer signal power unchanged. |
| 7.7.5.2 Receiver intermodulation, General narrowband requirement | Wanted Signal mean power = PREFSENS + x dB, where x is equal to 6 in case of NR or E-UTRA or UTRA or NB-IoT and equal to 3 in case of GSM/EDGE.  Interferer signal mean power:  -52 dBm. | 0 dB | Formula: Wanted signal mean power + TT.  CW interferer signal power unchanged.  Modulated interferer signal power unchanged. |

**<Next of change>**

Annex E (normative):  
E-UTRA Test model for BC3 CS3 BS

# E.0 BC3 CS3 Test model description

The set-up of physical channels for E-UTRA TDD in part of BC3 CS3, BC3 CS16 and BC3 CS17 (and CS2 when NB-IoT in-band and/or guard band is supported) BS transmitter tests shall be according to the applicable test models shown below. A detailed reference to the applicable test model is made in subclause 4.9.2.

The parameters in 36.141 subclause 6.1.1 shall be reused by the test models in E.1 to E.6 (E.2 shall not be used for BC3 CS2 BS testing when NB-IoT in-band and/or guard band is supported) with the following exceptions,

- Duration is 30 subframes (30ms), e.g. number of frames for the test model is 3.

- Uplink/downlink configuration 1 and special subframe configuration 7 shall be used as shown in table E-1.

Table E-1: Configurations

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Downlink-to-Uplink  Switch-point periodicity | Number of UL/DL sub-frames per half frame (10 ms) | | DwPTS | GP | UpPTS |
| DL | UL |
| a) 5ms | a) 2 | a) 2 | a) |  |  |

The test models in E.1 to E.6 shall be constructed based on the corresponding test model in 36.141 along with the principles on data mapping between the test models in E.1 to E.6 and the test models in 36.141 Subclause 6.1.1.1 to 6.1.1.6 as shown in Table E-2.

Table E-2: Numbers () of the boosted PRBs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Frame1** | **Subframe 0** | **Subframe 1** | **Subframe 4** | **Subframe 5** | **Subframe 6** | **Subframe 9** |
| **Note** | NOTE 1 | NOTE 1 | NOTE 2 | NOTE 1 | NOTE 3 | NOTE 1 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Frame2** | **Subframe 0** | **Subframe 1** | **Subframe 4** | **Subframe 5** | **Subframe 6** | **Subframe 9** |
| **Note** | NOTE 1 | NOTE 1 | NOTE 4 | NOTE 1 | NOTE 3 | NOTE 1 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Frame3** | **Subframe 0** | **Subframe 1** | **Subframe 4** | **Subframe 5** | **Subframe 6** | **Subframe 9** |
| **Note** | NOTE 5 | NOTE 3 | NOTE 6 | NOTE 7 | NOTE 3 | NOTE 8 |

NOTE 1: The data in this subframe shall re-use the same data as specified in the corresponding subframe of the corresponding test models in 36.141 subclause 6.1.1.

NOTE 2: The data in this subframe shall re-use the same data as specifiedin subframe 7 of Frame 1 in the corresponding test model in 36.141 subclause 6.1.1.

NOTE 3: The data in this subframe shall re-use the same data as specified in subframe 1 of Frame 1 in the corresponding test model in 36.141 subclause 6.1.1.

NOTE 4: The data in this subframe shall re-use the same data as specifiedin subframe 8 of Frame 1 in the corresponding test model in 36.141 subclause 6.1.1.

NOTE 5: The data in this subframe shall re-use the same data as specifiedin subframe 7 of Frame 2 in the corresponding test model in 36.141 subclause 6.1.1.

NOTE 6: The data in this subframe shall re-use the same data as specified in subframe 8 of Frame 2 in the corresponding test model in 36.141 subclause 6.1.1.

NOTE 7: The data in this subframe shall re-use the same data as specified in subframe 6 of Frame 1 in the corresponding test model in 36.141 subclause 6.1.1.

NOTE 8: The data in this subframe shall re-use the same data as specified in subframe 6 of Frame 2 in the corresponding test model in 36.141 subclause 6.1.1.

# E.0A BC3 CS16/17 Test model description

The set-up of physical channels for NR TDD in part of BC3 CS16/17 BS transmitter tests shall be according to the applicable test models shown below. A detailed reference to the applicable test model is made in subclause 4.9.2.

The parameters in TS 38.141-1 [26] subclause 4.9.2.2 shall be reused by the test models in E.1A to E.6A with the following exceptions:

- Duration is 3 radio frames (30ms).

Table E.0A-1: Configurations

|  |  |  |  |
| --- | --- | --- | --- |
| Field name | 15 kHz SCS | 30 kHz SCS | 60 kHz SCS |
| *Tdd-UL-DL-Configuration* |  | | |
| *referenceSubcarrierSpacing* | 15 | 30 | 60 |
| Periodicity (ms) for *dl-UL-TransmissionPeriodicity* | 5 | 5 | 5 |
| *nrofDownlinkSlots* | 1 | 2 | 4 |
| *nrofDownlinkSymbols* | 0 | 0 | 0 |
| *nrofUplinkSlots* | 0 | 0 | 0 |
| *nrofUplinkSymbols* | 0 | 0 | 0 |
| *Tdd-UL-DL-ConfigDedicated* |  | | |
| *nrofDownlinkSymbols* | For Slot#1: 10 | For Slot#3: 6 | For Slot#6:12  For Slot#7:0 |
| *nrofUplinkSymbols* | For Slot#1: 2 | For Slot#3: 4 | For Slot#6:0  For Slot#7:8 |
| *slotIndex* | 1 | 3 | 6,7 |
| *nrofDownlinkSymbols* | 10 | 6 | 12,0 |
| *nrofUplinkSymbols* | 2 | 4 | 0,8 |
| *slotIndex* | 2,3 | 4,5,6,7 | 8,9,10,11,12,13,14,15 |
| *symbols* | allUplink | allUplink | allUplink |
| *slotIndex* | 4 | 2,8,9 | 4,5,16,17,18,19 |
| *symbols* | allDownlink | allDownlink | allDownlink |

The test models in E.1a to E.6a shall be constructed based on the corresponding test model in TS 38.141-1 [26].

# E.0B BC3 CS16/17 Test model description

The set-up of physical channels for NR TDD in part of BC3 CS16/17 BS transmitter tests considering NB-IoT operation in NR in-band shall be according to the applicable test models shown below. A detailed reference to the applicable test model is made in subclause 4.9.2.

The parameters in TS 38.141-1 [26] subclause 4.9.2.2 shall be reused by the test models in E.1A to E.6A with the following exceptions:

- Duration is 3 radio frames (30ms).

Table E.0B-1: Configurations

|  |  |
| --- | --- |
| Field name | 15 kHz SCS |
| *Tdd-UL-DL-Configuration* |  |
| *referenceSubcarrierSpacing* | 15 |
| Periodicity (ms) for *dl-UL-TransmissionPeriodicity* | 5 |
| *nrofDownlinkSlots* | 1 |
| *nrofDownlinkSymbols* | 0 |
| *nrofUplinkSlots* | 0 |
| *nrofUplinkSymbols* | 0 |
| *Tdd-UL-DL-Configuration* |  |
| *nrofDownlinkSymbols* | For Slot#1: 10 |
| *nrofUplinkSymbols* | For Slot#1: 2 |
| *slotIndex* | 1 |
| *nrofDownlinkSymbols* | 11 |
| *nrofUplinkSymbols* | 2 |
| *slotIndex* | 2,3 |
| *symbols* | allUplink |
| *slotIndex* | 4 |
| *symbols* | allDownlink |

# E.1 E-UTRA Test Model 1.1 (E-TM1.1\_BC3CS3)

This test model shall be constructed based on E-TM1.1 in TS 36.141 [9] subclause 6.1.1.1 according to the data mapping principals elaborated in Table E-2.

# E.1A NR FR1 Test Model 1.1 (NR-FR1-TM1.1\_BC3CS16/17)

This test model shall be constructed based on NR-FR1-TM1.1 in TS 38.141-1 [26] subclause 4.9.2.2.1.

# E.2 E-UTRA Test Model 1.2 (E-TM1.2\_BC3CS3)

This test model shall be constructed based on E-TM1.2 in TS 36.141 [9] subclause 6.1.1.2 according to the data mapping principles elaborated in Table E-2.

This Test Model shall not be used when testing for BC3 CS2 BS and when NB-IoT in-band and/or guard band is supported.

# E.2A NR FR1 Test Model 1.2 (NR-FR1-TM1.2\_BC3CS16/17)

This test model shall be constructed based on NR-FR1-TM1.2 in TS 38.141-1 [26] subclause 4.9.2.2.2.

# E.3 E-UTRA Test Model 2 (E-TM2\_BC3CS3)

This test model shall be constructed based on E-TM2 in TS 36.141 [9] subclause 6.1.1.3 according to the data mapping principles elaborated in Table E-2.

# E.3A NR FR1 Test Model 2 (NR-FR1-TM2\_BC3CS16/17)

This test model shall be constructed based on NR-FR1-TM2 in TS 38.141-1 [26] subclause 4.9.2.2.3.

# E.3B NR FR1 Test Model 2a (NR-FR1-TM2a\_BC3CS16/17)

This test model shall be constructed based on NR-FR1-TM2a in TS 38.141-1 [26] subclause 4.9.2.2.4.

# E.3C E-UTRA Test Model 2a (E-TM2a\_BC3CS3)

This test model shall be constructed based on E-TM2a in TS 36.141 [9] subclause 6.1.1.3a according to the data mapping principles elaborated in Table E-2.

# E.3D E-UTRA Test Model 2b (E-TM2b\_BC3CS3)

This test model shall be constructed based on E-TM2b in TS 36.141 [9] subclause 6.1.1.3b according to the data mapping principles elaborated in Table E-2.

# E.4 E-UTRA Test Model 3.1 (E-TM3.1\_BC3CS3)

This test model shall be constructed based on E-TM3.1 in TS 36.141 [9] subclause 6.1.1.4 according to the data mapping principles elaborated in Table E-2.

# E.4Y E-UTRA Test Model 3.1a (E-TM3.1a\_BC3CS3)

This test model shall be constructed based on E-TM3.1a in TS 36.141 [9] subclause 6.1.1.4a according to the data mapping principles elaborated in Table E-2.

# E.4Z E-UTRA Test Model 3.1b (E-TM3.1b\_BC3CS3)

This test model shall be constructed based on E-TM3.1b in TS 36.141 [9] subclause 6.1.1.4b according to the data mapping principles elaborated in Table E-2.

# E.4ZA NR Test Model 3.1a (NR-FR1-TM3.1a\_BC3CS16/17)

This test model shall be constructed based on NR-FR1-TM3.1a in TS 38.141-1 [26] subclause 4.9.2.2.6.

# E.4A NR FR1 Test Model 3.1 (NR-FR1-TM3.1\_BC3CS16/17)

This test model shall be constructed based on NR-FR1-TM3.1 in TS 38.141-1 [26] subclause 4.9.2.2.5.

# E.5 E-UTRA Test Model 3.2 (E-TM3.2\_BC3CS3)

This test model shall be constructed based on E-TM3.2 in TS 36.141 [9] subclause 6.1.1.5 according to the data mapping principles elaborated in Table E-2.

# E.5A NR FR1 Test Model 3.2 (NR-FR1-TM3.2\_BC3CS16/17)

This test model shall be constructed based on NR-FR1-TM3.2 in TS 38.141-1 [26] subclause 4.9.2.2.7.

# E.6 E-UTRA Test Model 3.3 (E-TM3.3\_BC3CS3)

This test model shall be constructed based on E-TM3.3 in TS 36.141 [9] subclause 6.1.1.6 according to the data mapping principles elaborated in Table E-2.

# E.6A NR FR1 Test Model 3.3 (NR-FR1-TM3.3\_BC3CS16/17)

This test model shall be constructed based on NR-FR1-TM3.3 in TS 38.141-1 [26] subclause 4.9.2.2.8.

**<End of change>**