**3GPP TSG-RAN WG4 Meeting #98-e *R4-2103883***

**Electronic Meeting, 25 January – 5 February, 2020**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **37.104** | **CR** | **0934** | **rev** | **1** | **Current version:** | **15.12.0** |  |
|  |
| *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:***  | CR to 37.104 on OBUE table headings and applicability |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | TEI15 |  | ***Date:*** | 2021-02-04 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *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 canbe 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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | The OBUE applicability tables headings are ambiguous, and sometimes not complete or fully aligned with the intended applicability:* Reference to BC is not consistent and, in some cases, incorrect
* Language is unclear, especially the use of “except for” and or/nor.
* The order of references to BC, frequency ranges, supported RATs etc. is inconsistent between headings, causing confusion and ambiguity
 |
|  |  |
| ***Summary of change:*** | The CR corrects the headings to align with the intended applicability, see also the guidance on Lists in TR 21.801. The revised headings are all written with the same structure: “<BS class> BS operating band unwanted emission mask (UEM) in <BC> bands <f. range> applicable for: <BS type 1>; <BS type 2>…; or <BS type x>…”Where <BS class> = “Wide Area”, “Medium range” or “Local Area” <BC> = BC1, BC2, BC3 or combination thereof <f range> = Limitation to frequency range for bands, e.g. “below 1 GHz” <BS type> = A set of conditions on supported RAT(s), specific bands, etc., always starting with “BS…”, separated by “,” and an “and” for the final condition. Condition on max power is always first.If there are multiple types, they are separated by “;”Examples:“**Wide Area** BS operating band unwanted emission mask (UEM) in **BC1 and BC3 bands** applicable for: BS **not supporting NR**; BS **operating NR in Band 1, 7 and/or 38 in Europe**; or BS **with standalone NB-IoT at the BS RF bandwidth edge (irrespective of NR support)**”“**Medium Range** BS operating band unwanted emission mask (UEM) in **BC1 and BC3 bands** applicable for: BS **with maximum output power 31 < PRated,c ≤ 38 dBm**, **supporting NR** and **not supporting UTRA**” Change marks are made over the complete heading text for each table, in order to make the full change visible and to ease the CR implementation by MCC. |
|  |  |
| ***Consequences if not approved:*** | OBUE table headings would remain ambiguous and, in some cases, incomplete or incorrect. |
|  |  |
| ***Clauses affected:*** | 3.3, 6.6.2.1, 6.6.2.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** | **X** |  |  Test specifications | 37.141 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Rev1: The applicability for BC3 has been corrected to align with the original text in some headings. “Or” is added to the penultimate applicable “BS type” as recommended in TR 21.801. |

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

ACLR Adjacent Channel Leakage Ratio

ACS Adjacent Channel Selectivity

ARFCN Absolute Radio Frequency Channel Number

AWGN Additive White Gaussian Noise

BC Band Category

BER Bit Error Ratio

BS Base Station

BTS Base Transceiver Station

CA Carrier Aggregation

CACLR Cumulative Adjacent Channel Leakage Ratio

CP Cyclic prefix

CW Continuous Wave

DB-DC-HSDPA Dual Band Dual Cell HSDPA

DC-HSDPA Dual Cell HSDPA

DC-HSUPA Dual Cell HSUPA

DTT Digital Terrestrial Television

EARFCN E-UTRA Absolute Radio Frequency Channel Number

EDGE Enhanced Data rates for GSM Evolution

EIRP Effective Isotropic Radiated Power

EVM Error Vector Magnitude

FCC Federal Communications Commission

FDD Frequency Division Duplex

FR Frequency Range

FRC Fixed Reference Channel

GP Guard Period (for E-UTRA TDD operation)

GSM Global System for Mobile Communications

HSDPA High Speed Downlink Packet Access

HSUPA High Speed Uplink Packet Access

ICS In-Channel Selectivity

ITU‑R Radiocommunication Sector of the ITU

LA Local Area

LNA Low Noise Amplifier

MB-MSR Multi-Band Multi-Standard Radio

MFCN Mobile/Fixed Communications Network

MIMO Multiple Input Multiple Output

MR Medium Range

MS Mobile Station

MSR Multi-Standard Radio

NB-IoT Narrowband - Internet of Things

NR New Radio

NR-ARFCN NR Absolute Radio Frequency Channel Number

NRS Narrowband Reference Signal

OBUE Operating Band Unwanted Emissions

PA Power Amplifier

PHS Personal Handyphone System

QPSK Quadrature Phase-Shift Keying

RAT Radio Access Technology

RB Resource Block (for E-UTRA and NR)

RF Radio Frequency

RMS Root Mean Square (value)

RS Reference Symbol

RX Receiver

SCS Sub-Carrier Spacing

SNR Signal-to-Noise Ratio

TDD Time Division Duplex

TX Transmitter

UARFCN UTRA Absolute Radio Frequency Channel Number

UE User Equipment

UEM operating band Unwanted Emissions Mask

WA Wide Area

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*End of change\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*Next changed section\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

### 6.6.2 Operating band unwanted emissions

Unless otherwise stated, 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. 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 [5] 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.

#### 6.6.2.1 General minimum requirement 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, the requirements apply 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, the requirements apply 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, the requirements apply inside any Inter RF Bandwidth gap.

Outside the Base Station RF Bandwidth edges, emissions shall not exceed the maximum levels specified in Tables 6.6.2.1-1 to 6.6.2.1-4 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 minimum requirements specified at the Base Station RF Bandwidth edges on each side of the Inter-RF Bandwidth gap. The minimum requirement for Base Station RF Bandwidth edge is specified in Table 6.6.2.1-1 to 6.6.2.1-4 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 Base Station 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 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 is no carrier 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 minimum requirements specified for the adjacent sub blocks on each side of the sub block gap. The minimum requirement for each sub block is specified in Tables 6.6.2.1-1 to 6.6.2.1-4 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.

- 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 6.6.2.1-1, 6.6.2.1-1b and 6.6.2.1-1c is specified in Table 6.6.2.1-0.

Table 6.6.2.1-0: 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 | UTRA supported (NOTE 1) | Applicable requirement table |
| None | Y/N | Y/N | 6.6.2.1-1 |
| In certain regions (NOTE 2), bands 1, 7, 38 | N | N | 6.6.2.1-1 |
| Any | Y | N | 6.6.2.1-1 |
| Any below 1GHz | N | N | 6.6.2.1-1b |
| Any above 1GHz except for, in certain regions (NOTE 2), bands 1, 7, 38 | N | N | 6.6.2.1-1c |
| NOTE 1: NR operation with UTRA is not supported in this specification.NOTE 2: Applicable only for operation in regions where Category B limits as defined in ITU-R Recommendation SM.329 [6] are used for which category B option 2 operating band unwanted emissions requirements as defined in TS 36.104 [4] and TS 38.104 [17] are applied. |

Table 6.6.2.1-1: WA BS OBUE in BC1 and BC3 bands applicable for: BS not supporting NR; BS operating NR in Band 1, 7 and/or 38 in Europe; or BS with standalone NB-IoT at the BS RF bandwidth edge (irrespective of NR support)

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7) |
| 0 MHz ≤ Δf < 0.2 MHz | 0.015MHz ≤ f\_offset < 0.215MHz  | -14 dBm | 30 kHz  |
| 0.2 MHz ≤ Δf < 1 MHz | 0.215MHz ≤ f\_offset < 1.015MHz |  (Note 4) | 30 kHz  |
| (Note 6) | 1.015MHz ≤ f\_offset < 1.5 MHz  | -26 dBm (Note 4) | 30 kHz  |
| 1 MHz ≤ Δf ≤ min(Δfmax, 10 MHz)  | 1.5 MHz ≤ f\_offset < min(f\_offsetmax, 10.5 MHz) | -13 dBm (Note 4) | 1 MHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax  | -15 dBm (Note 4, 8) | 1 MHz  |
| NOTE 1: For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub-blocks on each side of the sub-block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is 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/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).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 a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.1-1a 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, whichever is less stringent, shall apply for operating bands <1GHz. |

Table 6.6.2.1-1a: WA BS OBUE in BC1 and BC3 bands applicable for: BS 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 | 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 6.6.2.1-1b: WA BS OBUE in BC1 and BC3 bands ≤ 1 GHz applicable for: BS supporting NR, not supporting UTRA, and with no standalone NB-IoT carrier at the BS 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) | Measurement bandwidth (Note 7) |
| 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) | -14 dBm | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax  | -16 dBm (Note 8) | 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 6.6.2.1-1c: WA BS OBUE in BC1 and BC3 bands > 1 GHz for: BS supporting NR, not operating NR in Band 1, 7 and/or 38 in Europe, not supporting UTRA, and with no standalone NB-IoT carrier at the BS 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) | Measurement bandwidth (Note 7) |
| 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) | -14 dBm | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax  | -15 dBm (Note 8) | 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 6.6.2.1-2: MR BS OBUE in BC1 bands applicable for: BS with maximum output power 31 < PRated,c ≤ 38 dBm and not supporting NR

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7) |
| 0 MHz ≤ Δf < 0.6 MHz | 0.015MHz ≤ f\_offset < 0.615MHz  | PRated,c - 58dB - 5/3(f\_offset/MHz-0.015)dB | 30 kHz  |
| 0.6 MHz ≤ Δf < 1 MHz | 0.615MHz ≤ f\_offset < 1.015MHz | PRated,c - 53dB - 15(f\_offset/MHz-0.215)dB | 30 kHz  |
| (Note 6) | 1.015MHz ≤ f\_offset < 1.5 MHz  | PRated,c - 65dB | 30 kHz  |
| 1 MHz ≤ Δf ≤ 2.6 MHz | 1.5 MHz ≤ f\_offset < 3.1 MHz | PRated,c - 52dB | 1 MHz  |
| 2.6 MHz ≤ Δf ≤ 5 MHz | 3.1 MHz ≤ f\_offset < 5.5 MHz | min(PRated,c - 52dB, -15dBm) | 1 MHz |
| 5 MHz ≤ Δf ≤ Δfmax | 5.5 MHz ≤ f\_offset < f\_offsetmax  | PRated,c - 56dB | 1 MHz  |
| NOTE 1: For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is 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 (PRated,c- 56 dB) /MHz. 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 a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.1-2a apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.1-2a: MR BS OBUE in BC1 and BC3 bands applicable for: BS with maximum output power 31 < PRated ≤ 38 dBm and 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) | Measurement bandwidth (Note 7) |
| 0 MHz ≤ Δf < 0.05 MHz(Note 1) | 0.015 MHz ≤ f\_offset < 0.065 MHz  | PRated,c - 38dB - 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 - 41dB - 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 6.6.2.1-2b: MR BS OBUE in BC1 bands applicable for: BS with maximum output power 31 < PRated,c ≤ 38 dBm, supporting NR, and not supporting UTRA

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | PRated,c - 53dB - 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-60dB | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | Min(PRated,c-60dB, -25dBm) (Note 8) | 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 6.6.2.1-2a apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.1-3: MR BS OBUE in BC1 bands applicable for: BS with maximum output power PRated,c ≤ 31 dBm and not supporting NR

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7) |
| 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 6) | 1.015MHz ≤ f\_offset < 1.5 MHz  | -34 dBm | 30 kHz  |
| 1 MHz ≤ Δf ≤ 5 MHz | 1.5 MHz ≤ f\_offset < 5.5 MHz | -21 dBm | 1 MHz  |
| 5 MHz ≤ Δf ≤ Δfmax | 5.5 MHz ≤ f\_offset < f\_offsetmax  | -25 dBm | 1 MHz  |
| NOTE 1: For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap, where the contribution from the far-end sub-block shall be scaled according to the measurement bandwidth of the near-end sub-block. Exception is 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 -25 dBm/MHz.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 a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.1-3a apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.1-3a: MR BS OBUE in BC1 and BC3 bands applicable for: BS with maximum output power PRated,c ≤ 31 dBm BS and 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 < 0.15 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 6.6.2.1-3b: MR BS OBUE in BC1 bands applicable for: BS with maximum output power PRated,c ≤ 31 dBm, supporting NR, and not supporting UTRA

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7) |
| 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) | -29 dBm | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -29 dBm (Note 8) | 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 6.6.2.1-3a apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.1-4: LA BS OBUE in BC1 bands

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7) |
| 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) | -37 dBm | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax  | -37 dBm (Note 8) | 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. 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 -37dBm/100 kHz.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.NOTE 3: For operation with a standalone NB-IoT carrier adjacent to the Base Station RF Bandwidth edge, the limits in Table 6.6.2.1-14a apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.1-4a: LA BS OBUE in BC1 and BC3 bands applicable for: BS 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. |

#### 6.6.2.2 General minimum requirement for Band Category 2

For a BS operating in Band Category 2 the requirement applies outside the Base Station RF Bandwidth edges. In addition, for a BS operating in non-contiguous spectrum, it applies inside any sub-block gap.

Outside the Base Station RF Bandwidth edges, emissions shall not exceed the maximum levels specified in Tables 6.6.2.2-1 to 6.6.2.2-8 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 minimum requirements specified at the Base Station RF Bandwidth edges on each side of the Inter-RF Bandwidth gap. The minimum requirement for Base Station RF Bandwidth edge is specified in Table 6.6.2.2-1 to 6.6.2.2-8 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 is no carrier 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 minimum requirement specified for the adjacent sub blocks on each side of the sub block gap. The minimum requirement for each sub block is specified in Tables 6.6.2.2-1 to 6.6.2.2-8 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 6.6.2.2-1, 6.6.2.2-2a and 6.6.2.2-2b is specified in Table 6.6.2.2-0.

Table 6.6.2.2-0: 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 | UTRA or GSM supported (NOTE 1) | Applicable requirement table |
| None | Y/N | Y/N | 6.6.2.2-1 |
| In certain regions (NOTE 2), bands 3, 8 | N | N | 6.6.2.2-1 |
| Any | Y | N | 6.6.2.2-1 |
| Any below 1GHz except for, in certain regions (NOTE 2), band 8 | N | N | 6.6.2.2-2a |
| Any above 1GHz except for, in certain regions (NOTE 2), band 3 | N | N | 6.6.2.2-2b |
| NOTE 1: NR operation with UTRA or GSM is not supported in this specification.NOTE 2: Applicable only for operation in regions where Category B limits as defined in ITU-R Recommendation SM.329 [6] are used for which category B option 2 operating band unwanted emissions requirements as defined in TS 36.104 [4] and TS 38.104 [17] are applied. |

Table 6.6.2.2-1: WA BS OBUE in BC2 bands applicable for: BS not supporting NR; BS operating NR in Band 3 or 8 in Europe; or BS with standalone NB-IoT at the BS RF bandwidth edge (irrespective of NR support)

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 2, 3) | Measurement bandwidth (Note 7) |
| 0 MHz ≤ Δf < 0.2 MHz(Note 1) | 0.015 MHz ≤ f\_offset < 0.215 MHz  | -14 dBm | 30 kHz  |
| 0.2 MHz ≤ Δf < 1 MHz | 0.215 MHz ≤ f\_offset < 1.015 MHz |  (Note 4) | 30 kHz  |
| (Note 6) | 1.015 MHz ≤ f\_offset < 1.5 MHz  | -26 dBm (Note 4) | 30 kHz  |
| 1 MHz ≤ Δf ≤ min(Δfmax, 10 MHz)  | 1.5 MHz ≤ f\_offset < min(f\_offsetmax, 10.5 MHz) | -13 dBm (Note 4) | 1 MHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax  | -15 dBm (Note 4, 8) | 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 6.6.2.2-2 apply for 0 MHz ≤ Δf < 0.15 MHz.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, 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/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).NOTE 3: For MSR BS supporting multi-band operation with Inter RF Bandwidth gap < 2×ΔfOBUE operation 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 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 6.6.2.2-2: WA BS OBUE in BC2 bands applicable for: BS with GSM/EDGE or standalone NB-IoT or E-UTRA 1.4 or 3 MHz carriers adjacent to the Base Station RF Bandwidth edge

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 1, 2, 3,4, 5) | Measurement bandwidth (Note 7) |
| 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 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 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 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 5: 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 6.6.2.2-2a: WA BS OBUE in BC2 bands ≤ 1 GHz applicable for: BS supporting NR, not operating NR in Band 8 in Europe, not supporting UTRA, not supporting GSM, and with no standalone NB-IoT carrier at the BS 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) | Measurement bandwidth (Note 7) |
| 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) | -14 dBm | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax  | -16 dBm (Note 8) | 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 6.6.2.2-2 apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.2-2b: WA BS OBUE in BC2 bands > 1 GHz applicable for: BS supporting NR, not operating NR in Band 3 in Europe, not supporting UTRA, not supporting GSM, and with no standalone NB-IoT carrier at the BS 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) | Measurement bandwidth (Note 7) |
| 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) | -14 dBm | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.5 MHz ≤ f\_offset < f\_offsetmax  | -15 dBm (Note 8) | 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 6.6.2.2-2 apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.2-3: MR BS OBUE in BC2 bands applicable for: BS with maximum output power 31 < PRated,c ≤ 38 dBm and not supporting NR

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 2, 3) | Measurement bandwidth (Note 7) |
| 0 MHz ≤ Δf < 0.6 MHz(Note 1) | 0.015MHz ≤ f\_offset < 0.615MHz  | PRated,c - 58dB - 5/3(f\_offset/MHz-0.015)dB  | 30 kHz  |
| 0.6 MHz ≤ Δf < 1 MHz | 0.615MHz ≤ f\_offset < 1.015MHz | PRated,c - 53dB - 15(f\_offset/MHz-0.215)dB  | 30 kHz  |
| (Note 6) | 1.015MHz ≤ f\_offset < 1.5 MHz  | PRated,c - 65dB | 30 kHz  |
| 1 MHz ≤ Δf ≤ 2.8 MHz | 1.5 MHz ≤ f\_offset < 3.3 MHz | PRated,c - 52dB | 1 MHz  |
| 2.8 MHz ≤ Δf ≤ 5 MHz | 3.3 MHz ≤ f\_offset < 5.5 MHz | min(PRated,c - 52dB, -15dBm) | 1 MHz  |
| 5 MHz ≤ Δf ≤ Δfmax | 5.5 MHz ≤ f\_offset < f\_offsetmax  | PRated,c - 56dB | 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 6.6.2.2-5 apply for 0 MHz ≤ Δf < 0.15 MHz.NOTE 2: For MSR BS supporting non-contiguous spectrum operation within any operating band the 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 (PRated,c - 56 dB)/MHz. 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, 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 6.6.2.2-3a: MR BS OBUE in BC2 bands applicable for: BS with maximum output power 31 < PRated,c ≤ 38 dBm, supporting NR, not supporting UTRA, and not supporting GSM

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7) |
| 0 MHz ≤ Δf < 5 MHz | 0.05 MHz ≤ f\_offset < 5.05 MHz | PRated,c - 53dB - 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-60dB | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | Min(PRated,c-60dB, -25dBm) (Note 8) | 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 6.6.2.2-5 apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.2-4: MR BS OBUE in BC2 bands applicable for: BS with maximum output power PRated,c ≤ 31 dBm and not supporting NR

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 2, 3) | Measurement bandwidth (Note 7) |
| 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 6) | 1.015MHz ≤ f\_offset < 1.5 MHz  | -34 dBm | 30 kHz  |
| 1 MHz ≤ Δf ≤ 5 MHz | 1.5 MHz ≤ f\_offset < 5.5 MHz | -21 dBm | 1 MHz  |
| 5 MHz ≤ Δf ≤ Δfmax | 5.5 MHz ≤ f\_offset < f\_offsetmax  | -25 dBm | 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 6.6.2.2-6 apply for 0 MHz ≤ Δf < 0.15MHz.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, 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 -25dBm/MHz. 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, 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 6.6.2.2-4a: MR BS OBUE in BC2 bands applicable for: BS with maximum output power PRated,c ≤ 31 dBm, supporting NR, not supporting UTRA, and not supporting GSM

|  |  |  |  |
| --- | --- | --- | --- |
| 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 7) |
| 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) | -29 dBm | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax | -29 dBm (Note 8) | 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 6.6.2.2-6 apply for 0 MHz ≤ Δf < 0.15 MHz. |

Table 6.6.2.2-5: MR BS OBUE in BC2 bands applicable for: BS with maximum output power 31 < PRated,c ≤ 38 dBm and with GSM/EDGE or E-UTRA 1.4 or 3 MHz carriers or standalone NB-IoT adjacent to the Base Station RF Bandwidth edge

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 2, 3) | Measurement bandwidth (Note 7) |
| 0 MHz ≤ Δf < 0.05 MHz(Note 1) | 0.015 MHz ≤ f\_offset < 0.065 MHz  | PRated,c - 38dB - 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 - 41dB - 160(f\_offset/MHz-0.065)dB | 30 kHz  |
| NOTE 1: 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 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 6.6.2.2-6: MR BS OBUE in BC2 bands applicable for: BS with maximum output power PRated,c ≤ 31 dBm and with GSM/EDGE or E-UTRA 1.4 or 3 MHz carriers or standalone NB-IoT adjacent to the Base Station RF Bandwidth edge

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 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 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 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 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 5: 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 6.6.2.2-7: LA BS OBUE in BC2 bands

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 2, 3) | Measurement bandwidth (Note 7) |
| 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) | -37 dBm | 100 kHz  |
| 10 MHz ≤ Δf ≤ Δfmax | 10.05 MHz ≤ f\_offset < f\_offsetmax  | -37 dBm (Note 8) | 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 6.6.2.2-8 apply for 0 MHz ≤ Δf < 0.16 MHz.NOTE 2: For MSR BS supporting non-contiguous spectrum operation within any operating band the minimum requirement within sub-block gaps is calculated as a cumulative sum of contributions from adjacent sub blocks on each side of the sub block gap. Exception is 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 -37dBm/100 kHz.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 6.6.2.2-8: LA BS OBUE in BC2 bands applicable for: BS with GSM/EDGE or E-UTRA 1.4 or 3 MHz carriers or standalone NB-IoT adjacent to the Base Station RF Bandwidth edge

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency offset of measurement filter ‑3dB point, Δf | Frequency offset of measurement filter centre frequency, f\_offset | Minimum requirement (Note 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 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 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 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 5: 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. |

The following notes are common to all subclauses in 6.6.2:

NOTE 6: This frequency range ensures that the range of values of f\_offset is continuous.

NOTE 7: 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 8: The requirement is not applicable when Δfmax < ΔfOBUE.

NOTE 9: All limits in Table 6.6.2.2‑1, Table 6.6.2.2‑3, Table 6.6.2.2‑4 and Table 6.6.2.2‑7 are identical to the corresponding limits for Band Category 1 and 3.