**3GPP TSG-RAN WG4 Meeting #99-e *R4-2108740***

**Electronic Meeting, 19 – 27 May, 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
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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:*** | CR to 37.145-2: In-band blocking for multi-band Base Stations | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Perf | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***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 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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Multi-band support for MSR and LTE BS was introduced in 3GPP Rel-11 and the work is summarized in TR 37.812.  Many RF requirements were impacted, including in-band blocking, where in order to minimize the impact of blocking between the bands, the in-band blocking is modified for multi-band capable BS to ensure that the blocking probability for each band is kept to a reasonably low level and does not increase proportionally with the added frequency range with multiple bands. For this reason, the allowed degradation for blocking signals in bands other than the band with the wanted signal is set at 1.4 dB instead of the usual 6 dB.  This is clarified in notes to the blocking tables, where the 1.4 dB desensitization (or similar) is defined for blocking signals in “other” supported bands, while 6 dB 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”. Since the in-band blocking is defined in a frequency range that stretches also outside the operating band, it is not clear what is intended by “adjacent or overlapping band” in this context. For near-adjacent bands, the in-band frequency ranges will be a contiguous frequency range in many cases.  It is therefore proposed to clarify that “adjacent and overlapping” refers to the operating bands in question. | | | | | | | | |
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| ***Summary of change:*** | | The NOTE for multi-band operation is updated to clarify that “adjacent and overlapping” refers to the operating bands in question. | | | | | | | | |
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| ***Consequences if not approved:*** | | It would remain unclear what the intention is with “adjacent and overlapping bands” for in-band-blocking in case of multi-band BS. | | | | | | | | |
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| ***Clauses affected:*** | | 7.5.5.1.1, 7.6.2.5.2, 7.6.2.5.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 37.105 | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 37.145-1 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R1: Note text and cover page updated to refer to adjacent operating bands. | | | | | | | | |

#### 7.5.5.1 MSR operation

##### 7.5.5.1.1 General blocking test requirement

For the general blocking requirement, the interfering signal shall be a UTRA FDD signal as specified in clause A.1 in TS 25.141 [10] for a UTRA, E-UTRA 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 20 MHz.

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

For *multi-band RIBs* the requirement applies in addition inside any *Inter RF Bandwidth gap*, in case the gap size is at least 15 MHz. 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 *RIB*, using the parameters in tables 7.5.5.1.1-1 and 7.5.5.1.1-2, 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 clause 7.2.5.4.

- For any measured UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in clause 7.2.5.2.

- For any measured NR carrier, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel defined in clause 7.2 of TS 38.104 [33].

For *multi-band RIBs*, the requirement applies according to table 7.5.5.1.1‑1 for the in-band blocking frequency ranges of each supported operating band.

Table 7.5.5.1.1-1: 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 edge of *sub-block* inside a gap [MHz] |
| --- | --- | --- | --- | --- |
| Wide Area BS | -40 + y - ΔOTAREFSENS  (NOTE 7, 9) | EISREFSENS + x dB  (NOTE 2, 5, 9) |  |  |
|  | -40 + y - ΔminSENS  (NOTE 7, 10) | EISminSENS + xdB (NOTE 2, 5, 10) |  |  |
| Medium Range BS | -35 + y - ΔOTAREFSENS  (NOTE 7, 9) | EISREFSENS + xdB  (NOTE 3, 5, 9) | FUL\_low - ΔfOOB to FUL\_high + ΔfOOB | (±7.5+z) (Note 11) |
|  | -35 + y - ΔminSENS  (NOTE 7, 10) | EISminSENS + xdB (NOTE 3, 5, 10) |  |  |
| Local Area BS | -30 + y - ΔOTAREFSENS  (NOTE 7, 9) | EISREFSENS + xdB (NOTE 4, 5, 9) |  |  |
|  | -30 + y - ΔminSENS  (NOTE 7, 10) | EISminSENS + xdB (NOTE 4, 5, 10) |  |  |
| NOTE 1: EISREFSENS and EISminSENS depend on the RAT, the BS class and on the *channel bandwidth*, see clauses 7.3 and 7.2.  NOTE 2: For WA BS that does not support NR, "x" is equal to 6 in case of E-UTRA or UTRA wanted signals and equal to 3 in case of GSM/EDGE wanted signal.  NOTE 3: For MR BS that does not support NR, "x" is equal to 6 in case of UTRA wanted signals, 9 in case of E-UTRA wanted signal and 3 in case of GSM/EDGE wanted signal.  NOTE 4: For LA BS that does not support NR, "x" is equal to 11 in case of E-UTRA 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 that supports NR but does not support UTRA, x is equal to 6.  NOTE 6: For a BS capable of multi-band operation, "x" in Note 2, 3, 4, 5 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 the in-band blocking frequency range of an adjacent or overlapping operating 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 7: For a BS that not supporting NR, "y" is equal to zero for all BS classes. For a BS that supports NR but does not support UTRA, "y" is equal to -3 for the WA and MR BS class and -5 for the LA BS class.  NOTE 8: The downlink frequency range of an FDD operating band is excluded from the general blocking requirement.  NOTE 9: This test requirement is only applied in the OTA REFSENS conformance test directions.  NOTE 10: This test requirement is only applied in the OTA minSENS receiver target reference direction.  NOTE 11: For NR wanted signal channel bandwidth greater than 20 MHz, z = 22.5 MHz. For all other cases, z = 0 MHz. | | | | |

Table 7.5.5.1.1-2: Void

NOTE: The requirement in tables 7.5.5.1.1-1 and 7.5.5.1.1-2 assumes that two operating bands, where the *downlink operating band* (see table 4.4-1 and table 4.4-2 in TS 37.141 [13].) of one band would be within the in-band blocking region of the other band, are not deployed in the same geographical area.

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

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

##### 7.6.2.5.2 Single RAT UTRA FDD operation

In addition to the following in-band and narrowband requirements, the general minimum requirements relating to out of band blocking defined for MSR in clause 7.6.2.5.1-1 shall also be applied for single RAT UTRA operation.

The minimum requirement for in-band blocking and narrowband blocking UTRA operation is defined below:

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

For *RIB* supporting operation in *non-contiguous spectrum*, the requirement applies in addition inside any *sub-block gap*, in case the *sub-block gap* size is at least 15 MHz. The interfering signal offset is defined relative to the *sub-block* edges inside the *sub-block gap* and is equal to -7.5 MHz/+7.5 MHz, respectively.

For a *RIB* supporting operation in *non-contiguous spectrum* the narrowband blocking requirement applies in addition inside any *sub-block gap*, in case the *sub-block gap* size is at least 400 kHz or 600 kHz, depending on the operating band. The interfering signal offset is defined relative to the *sub-block* edges inside the *sub-block gap* and is equal to -200 kHz/+200 kHz or -300 kHz/+300 kHz, respectively.

For *multi-band RIBs* the requirement in the in-band blocking frequency range applies for each supported operating band. The requirement applies in addition inside any *Inter RF Bandwidth gap*, in case *Inter RF Bandwidth gap* size is at least 15 MHz. The interfering signal offset is defined relative to lower/upper *Base Station RF Bandwidth* *edges* inside the *Inter RF Bandwidth gap* and is equal to -7.5 MHz/+7.5 MHz, respectively.

For *multi-band RIBs* the narrowband blocking requirement applies in addition inside any *Inter RF Bandwidth gap*, in case the *Inter RF Bandwidth gap* size is at least 400 kHz or 600 kHz, depending on the operating band. The interfering signal offset is defined relative to lower/upper *Base Station RF Bandwidth* *edges* inside the *Inter RF Bandwidth gap* and is equal to -200 kHz/+200 kHz or -300 kHz/+300 kHz, respectively.

For the wanted and interfering signal at the *RIB*, using the parameters in tables 7.6.2.5.2-1 and 7.6.2.5.2-2, the following requirements shall be met:

- For any UTRA FDD carrier, the BER shall not exceed 0.001 for the reference measurement channel defined in TS 25.104 [2], clause 7.2.1.

The OTA levels are applied referenced to two antenna gain offsets ΔOTAREFSENS and ΔminSENS.

Table 7.6.2.5.2-1: In-band blocking requirement for single RAT UTRA AAS BS

| Base Station Type | Mean power of interfering signal [dBm] | Wanted Signal mean power [dBm] | Minimum Offset of Interfering Signal | Type of Interfering Signal |
| --- | --- | --- | --- | --- |
| Wide Area BS | -40 – ΔOTAREFSENS | EISREFSENS + 6 dB |  |  |
|  | -40 – ΔminSENS | EISminSENS + 6 dB |  |  |
| Medium Range BS | -35 – ΔOTAREFSENS | EISREFSENS + 6 dB | ±10 MHz | WCDMA signal |
|  | -35 – ΔminSENS | EISminSENS + 6 dB |  | (NOTE 1) |
| Local Area BS | -30 – ΔOTAREFSENS | EISREFSENS + 6 dB |  |  |
|  | -30 – ΔminSENS | EISminSENS + 6 dB |  |  |
| NOTE 1: The characteristics of the W-CDMA interference signal are specified in Annex C of TS 25.104 [2].  NOTE 2: For *multi-band RIBs*, in case of interfering signal that is not in the in-band blocking frequency range of the operating band where the wanted signal is present, and not in the in-band blocking frequency range of an adjacent or overlapping operating band, the wanted signal mean power is equal to -119.6 – ΔOTAREFSENS dBm or -119.6 – ΔminSENS dBm as appropriate. | | | | |

NOTE: Table 7.6.2.5.2-1 assumes that two operating bands, where the downlink frequencies (see clause 4.6) of one band would be within the in-band blocking region of the other band, are not deployed in the same geographical area.

Table 7.6.2.5.2-2: Blocking performance requirement (narrowband) for single RAT UTRA AAS BS

| Base Station Type | Mean power of interfering signal [dBm] | Wanted Signal mean power [dBm] | Minimum Offset of Interfering Signal | Type of Interfering Signal |
| --- | --- | --- | --- | --- |
| Wide Area BS | -47 – ΔOTAREFSENS | EISREFSENS + 6 dB |  |  |
|  | -47 – ΔminSENS | EISminSENS + 6 dB |  |  |
| Medium Range BS | -42 – ΔOTAREFSENS | EISREFSENS + 6 dB | ±2.7 MHz (NOTE 2) | GMSK modulated |
|  | -42 – ΔminSENS | EISminSENS + 6 dB | ±2.8 MHz (NOTE 3) | (NOTE 1) |
| Local Area BS | -37 – ΔOTAREFSENS | EISREFSENS + 6 dB |  |  |
|  | -37 – ΔminSENS | EISminSENS + 6 dB |  |  |
| NOTE 1: GMSK modulation as defined in TS 45.004 [32].  NOTE 2: applies for bands II,IV,V,VIII,X,XII,XIV,XXV,XXVI  NOTE 3: applies for bands III,VIII | | | | |

##### 7.6.2.5.3 Single RAT E-UTRA operation

In addition to the following in-band and narrowband requirements, the general minimum requirements relating to out of band blocking defined for MSR in clause 7.6.2.5.1-1 shall also be applied for single RAT E-UTRA operation.

The minimum requirement for in-band blocking E-UTRA operation is defined below:

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

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

For *multi-band RIBs*, the requirement applies in addition inside any *Inter RF Bandwidth gap*, in case the gap size is at least 15 MHz. 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 at the *RIB*, using the parameters in tables 7.6.2.5.3‑1 and 7.6.2.5.3‑2, the following requirements shall be met:

- For any E-UTRA carrier, the throughput shall be ≥ 95 % of the *maximum throughput* of the reference measurement channel defined in TS 36.104 [4], clause 7.2.1.

The OTA levels are applied referenced to two antenna gain offsets ΔOTAREFSENS and ΔminSENS.

For *multi-band RIBs*, the requirement applies according to table 7.6.2.5.3-1 for the in-band blocking frequency ranges of each supported operating band.

Table 7.6.2.5.3-1: In-band blocking requirement for single RAT E-UTRA

| Base Station Type | Mean power of interfering signal [dBm] | Wanted Signal mean power [dBm]  (NOTE 1,2) | Type of Interfering Signal | Interfering signal centre frequency minimum frequency offset from the *Base Station RF Bandwidth edge* or edge of *sub-block* inside a gap [MHz] |
| --- | --- | --- | --- | --- |
| Wide Area BS | -43 – ΔOTAREFSENS | EISREFSENS + 6 dB |  |  |
|  | -43 – ΔminSENS | EISminSENS + 6 dB |  |  |
| Medium Range BS | -38 – ΔOTAREFSENS | EISREFSENS + 6 dB | See | See |
|  | -38 – ΔminSENS | EISminSENS + 6 dB | table 7.6.2.5.3-2 | table 7.6.2.5.3-2 |
| Local Area BS | -35 – ΔOTAREFSENS | EISREFSENS + 6 dB |  |  |
|  | -35 – ΔminSENS | EISminSENS + 6 dB |  |  |
| NOTE 1: EISREFSENS and EISminSENS depend on the RAT, the BS class and on the *channel bandwidth*, see clauses 10.3 and 10.2 in TS 37.105 [6].  NOTE 2: For *multi-band RIBs*, in case of interfering signal that is not in the in-band blocking frequency range of the operating band where the wanted signal is present, and not in the in-band blocking frequency range of an adjacent or overlapping operating band, the wanted signal mean power is equal to EISREFSENS +1.4 dB or EISminSENS +1.4 dB as appropriate. | | | | |

Table 7.6.2.5.3-2: Interfering signals for single RAT E-UTRA in-band blocking performance requirement

|  |  |  |
| --- | --- | --- |
| E-UTRA  channel BW of the lowest/highest carrier received [MHz] | Interfering signal centre frequency minimum offset to the lower/upper *Base Station RF Bandwidth* edge or sub-block edge inside a *sub-block gap* [MHz] | Type of interfering signal |
| 1.4 | ±2.1 | 1.4 MHz E-UTRA signal |
| 3 | ±4.5 | 3 MHz E-UTRA signal |
| 5 | ±7.5 | 5 MHz E-UTRA signal |
| 10 | ±7.5 | 5 MHz E-UTRA signal |
| 15 | ±7.5 | 5 MHz E-UTRA signal |
| 20 | ±7.5 | 5 MHz E-UTRA signal |
| 20 | ±30 | 20 MHz E-UTRA signal |