**3GPP TSG-RAN WG4 Meeting #99-e *R4-2108734***

**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 36.104: In-band blocking for multi-band Base Stations | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Core, TEI15 | | | | |  | ***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 Note 2 to Tables 7.6.1.1-1, 7.6.1.1-1a and 7.6.1.1-1c, where the 1.4 dB desensitization 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:*** | | 7.6.1.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 36.141 | | |
| ***(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. | | | | | | | | |

### 7.6.1 General blocking requirement

The blocking characteristics is a measure of the receiver ability to receive a wanted signal at its assigned channel in the presence of an unwanted interferer, which are either a 1.4MHz, 3MHz or 5MHz E-UTRA signal for in-band blocking or a CW signal for out-of-band blocking. The interfering signal shall be an E-UTRA signal as specified in Annex C.

#### 7.6.1.1 Minimum requirement

For E-UTRA, the throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel, with a wanted and an interfering signal coupled to BS antenna input using the parameters in Tables 7.6.1.1-1, 7.6.1.1-1a, 7.6.1.1-1b, 7.6.1.1-1c and 7.6.1.1-2. The reference measurement channel for the wanted signal is identified in Table 7.2.1-1, 7.2.1-2, 7.2.1-3 and 7.2.1-4 for each channel bandwidth and further specified in Annex A.

The blocking 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.

For a BS operating in non-contiguous spectrum within any operating band, the blocking requirement applies in addition inside any sub-block gap, in case the sub-block gap size is at least as wide as twice the interfering signal minimum offset in Table 7.6.1.1-2. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

For a BS capable of multi-band operation, the requirement in the in-band blocking frequency ranges applies for each supported operating band. The requirement applies in addition inside any Inter RF Bandwidth gap, in case the Inter RF Bandwidth gap size is at least as wide as twice the interfering signal minimum offset in Table 7.6.1.1-2.

For a BS capable of multi-band operation, the requirement in the out-of-band blocking frequency ranges apply for each operating band, with the exception that the in-band blocking frequency ranges of all supported operating bands according to Tables 7.6.1.1-1, 7.6.1.1-1a and 7.6.1.1-1c shall be excluded from the out-of-band blocking requirement.

Table 7.6.1.1-1: Blocking performance requirement for Wide Area BS for E-UTRA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap [MHz] | Type of Interfering Signal |
| 1-7, 9-11, 13, 14, 18,19, 21-23, 24, 27, 30, 33-45, 48, 50, 52, 65, 66, 68, 70 | (FUL\_low -20) | to | (FUL\_high +20) | -43 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +20) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 8, 26, 28 | (FUL\_low -20) | to | (FUL\_high +10) | -43 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +10) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 12 | (FUL\_low -20) | to | (FUL\_high +13) | -43 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +13) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 17 | (FUL\_low -20) | to | (FUL\_high +18) | -43 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +18) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 20, 71 | (FUL\_low -11) | to | (FUL\_high +20) | -43 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +20) | to  to | (FUL\_low -11)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 25 | (FUL\_low -20) | to | (FUL\_high +15) | -43 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +15) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 31, 72, 73, 74 | (FUL\_low -20) | to | (FUL\_high +5) | -43 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +5) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 85 | (FUL\_low -20) | to | (FUL\_high +12) | -43 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +12) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| Note 1: PREFSENS depends on the channel bandwidth as specified in Table 7.2.1-1.  Note 2: For a BS capable of multiband operation, 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 PREFSENS + 1.4 dB. | | | | | | | |

NOTE: Table 7.6.1.1-1 assumes that two operating bands, where the downlink operating band (see Table 5.5-1) of one band would be within the in-band blocking region of the other band, are not deployed in the same geographical area.

Table 7.6.1.1-1a: Blocking performance requirement for Local Area BS for E-UTRA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap [MHz] | Type of Interfering Signal |
| 1-7, 9-11, 13-14, 18,19, 21-23, 24, 27, 30, 33-45, 48-52, 65, 66, 68, 70 | (FUL\_low -20) | to | (FUL\_high +20) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +20) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 8, 26, 28 | (FUL\_low -20) | to | (FUL\_high +10) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +10) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 12 | (FUL\_low -20) | to | (FUL\_high +13) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +13) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 17 | (FUL\_low -20) | to | (FUL\_high +18) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1. 1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +18) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 20, 71 | (FUL\_low -11) | to | (FUL\_high +20) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1. 1-2 | See table 7.6.1.1-2 |
| 1 | to | (FUL\_low -11)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| (FUL\_high +20) | to |
| 25 | (FUL\_low -20) | to | (FUL\_high +15) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1. 1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +15) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 31, 72, 73, 74 | (FUL\_low -20) | to | (FUL\_high +5) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +5) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 46 | (FUL\_low -20) | to | (FUL\_high +20) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| (FUL\_low -500)  (FUL\_high +20) | to  to | (FUL\_low -20)  (FUL\_high +500) | -35 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 1  (FUL\_high +500) | to  to | (FUL\_low -500)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 85 | (FUL\_low -20) | to | (FUL\_high +12) | -35 | PREFSENS +6dB (Note 1) | See table 7.6.1. 1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +12) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| Note 1: PREFSENS depends on the channel bandwidth as specified in Table 7.2.1-2  Note 2: For a BS capable of multiband operation, 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 PREFSENS + 1.4 dB. | | | | | | | |

NOTE: Table 7.6.1.1-1a assumes that two operating bands, where the downlink operating band (see Table 5.5-1) of one band would be within the in-band blocking region of the other band, are not deployed in the same geographical area.

Table 7.6.1.1-1b: Blocking performance requirement for Home BS for E-UTRA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 channel edge of the wanted signal [MHz] | Type of Interfering Signal |
| 1-7, 9-11, 13, 14, 18, 19, 21-23, 24, 27, 30, 33-44, 48, 50-52, 65, 66, 68, 70 | (FUL\_low -20) | to | (FUL\_high +20) | -27 | PREFSENS +14dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +20) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +14dB (Note 1) | ⎯ | CW carrier |
| 8, 26, 28 | (FUL\_low -20) | to | (FUL\_high +10) | -27 | PREFSENS +14dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +10) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +14dB (Note 1) | ⎯ | CW carrier |
| 12 | (FUL\_low -20) | to | (FUL\_high +13) | -27 | PREFSENS +14dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +13) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +14dB (Note 1) | ⎯ | CW carrier |
| 17 | (FUL\_low -20) | to | (FUL\_high +18) | -27 | PREFSENS +14dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +18) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +14dB (Note 1) | ⎯ | CW carrier |
| 20, 71 | (FUL\_low -11) | to | (FUL\_high +20) | -27 | PREFSENS +14dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +20) | to  to | (FUL\_low -11)  12750 | -15 | PREFSENS +14dB (Note 1) | ⎯ | CW carrier |
| 25 | (FUL\_low -20) | to | (FUL\_high +15) | -27 | PREFSENS +14dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +15) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +14dB (Note 1) | ⎯ | CW carrier |
| 74 | (FUL\_low -20) | to | (FUL\_high +5) | -27 | PREFSENS +14dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +5) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +14dB (Note 1) | ⎯ | CW carrier |
| 85 | (FUL\_low -20) | to | (FUL\_high +12) | -27 | PREFSENS +14dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +12) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +14dB (Note 1) | ⎯ | CW carrier |
| Note 1: PREFSENS depends on the channel bandwidth as specified in Table 7.2.1-3. | | | | | | | |

NOTE: Table 7.6.1.1-1b assumes that two operating bands, where the downlink operating band (see Table 5.5-1) of one band would be within the in-band blocking region of the other band, are not deployed in the same geographical area.

Table 7.6.1.1-1c: Blocking performance requirement for Medium Range BS for E-UTRA

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 to the lower/higher Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap [MHz] | Type of Interfering Signal |
| 1-7, 9-11, 13, 14, 18,19, 21-23, 24, 27, 30, 33-45, 48, 50, 52, 65, 66, 68, 70 | (FUL\_low -20) | to | (FUL\_high +20) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +20) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 8, 26, 28 | (FUL\_low -20) | to | (FUL\_high +10) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +10) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 12 | (FUL\_low -20) | to | (FUL\_high +13) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +13) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 17 | (FUL\_low -20) | to | (FUL\_high +18) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +18) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 20, 71 | (FUL\_low -11) | to | (FUL\_high +20) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +20) | to  to | (FUL\_low -11)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 25 | (FUL\_low -20) | to | (FUL\_high +15) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +15) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 31, 72, 73, 74 | (FUL\_low -20) | to | (FUL\_high +5) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +5) | to  to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 46 | (FUL\_low -20) | to | (FUL\_high +20) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| (FUL\_low -500)  (FUL\_high +20) | to  to | (FUL\_low -20)  (FUL\_high +500) | -35 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 1  (FUL\_high +500) | to  to | (FUL\_low -500)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| 85 | (FUL\_low -20) | to | (FUL\_high +12) | -38 | PREFSENS +6dB (Note 1) | See table 7.6.1.1-2 | See table 7.6.1.1-2 |
| 1  (FUL\_high +12) | to | (FUL\_low -20)  12750 | -15 | PREFSENS +6dB (Note 1) | ⎯ | CW carrier |
| Note 1: PREFSENS depends on the channel bandwidth as specified in Table 7.2.1-4.  Note 2: For a BS capable of multiband operation, 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 PREFSENS + 1.4 dB. | | | | | | | |

NOTE: Table 7.6.1.1-1c assumes that two operating bands, where the downlink operating band (see Table 5.5-1) of one band would be within the in-band blocking region of the other band, are not deployed in the same geographical area.

Table 7.6.1.1-2: Interfering signals for 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 (Note 1) |
| 20 | ±30 | 20 MHz E-UTRA signal (Note 2) |
| Note 1: This type of interfering signal is not applied for Band 46.  Note 2: This type of interfering signal is only applied for Band 46. | | |