**3GPP TSG-RAN4 Meeting # 104-e *R4-221XXXX***

**Electronic meeting, August 15 – August 26, 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.141-1** | **CR** | XXXX | **rev** | **-** | **Current version:** | **17.6.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  | Big CR for TS 38.141-1 Maintenance RF part (Rel-17, CAT F) |
|  |  |
| ***Source to WG:*** | MCC, Nokia |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Perf |  | ***Date:*** | 2022-08-10 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-17 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | R4-2212505 Draft CR to 38.141-1: Clarification on RMS detection mode:RMS detection mode is defined for ACLR while the required measurement duration is not clarified. The corresponding changes for other requirements using RMS detection were agreed in RAN4#102-e meetingR4-2214748 Draft CR to TS 38.141-1 on clarifications of ACLR/CACLR requirements for band n46 and n96:It is not clear that the ACLR/CACLR limits specified for other bands are not applicable to band n46 and n96, and the clause heading 6.6.3.5.4 mixes up with the text of clause 6.6.3.5.3. |
|  |  |
| ***Summary of change:*** | R4-2212505 Draft CR to 38.141-1: Clarification on RMS detection mode:Clarification on required average time for ACLR is addedR4-2214748 Draft CR to TS 38.141-1 on clarifications of ACLR/CACLR requirements for band n46 and n96:Clarify that the ACLR/CACLR limits specified for other bands are not applicable to band n46 and n96, and separate the clause heading 6.6.3.5.4 mixes up from the text of clause 6.6.3.5.3. |
|  |  |
| ***Consequences if not approved:*** | R4-2212505 Draft CR to 38.141-1: Clarification on RMS detection mode:The clarification on ACLR RMS measurement is missing.R4-2214748 Draft CR to TS 38.141-1 on clarifications of ACLR/CACLR requirements for band n46 and n96:Ambiguities remain and would lead to different interpretations. |
|  |  |
| ***Clauses affected:*** | 6.6.3.1, 6.6.3.4.2, 6.6.3.5.2, 6.6.3.5.3, 6.6.3.5.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ... |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

##### <Start of change 1, R4-2214748>

6.6.3.1 Definition and applicability

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

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

The requirements shall also apply if the BS supports NB-IoT operation in NR in-band.

For a BS operating in non-contiguous spectrum, the ACLR requirement in clause 6.6.3.2 shall apply in *sub block gaps*, while the CACLR requirement in clause 6.6.3.2 shall apply in *sub block gaps*.

For a *multi-band connector*, the ACLR requirement in clause 6.6.3.2 shall apply in *Inter RF Bandwidth gaps*, while the CACLR requirement in clause 6.6.3.2 shall apply in *Inter RF Bandwidth gaps*.

The requirement applies during the *transmitter ON period*.

##### <End of change 1, R4-2214748>

##### <Start of change 2, R4-2212505>

##### 6.6.3.4.2 Procedure

For *BS type 1-H* where there may be multiple *TAB connectors*, they may be tested one at a time or multiple *TAB connectors* may be tested in parallel as shown in annex D.1.1 for *BS type 1-C* or in annex D.3.1 for *BS type 1-H*. Whichever method is used the procedure is repeated until all *TAB connectors* necessary to demonstrate conformance have been tested.

1) Connect the *single-band connector* or *multi-band connector* under test to measurement equipment as shown in annex D.1.1 for *BS type 1-C* and in annex D.3.1 for *BS type 1-H*. All connectors not under test shall be terminated.

 The measurement device characteristics shall be:

- Measurement filter bandwidth: defined in clause 6.6.3.5.

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

The emission power should be averaged over an appropriate time duration to ensure the measurement is within the measurement uncertainty in Table 4.1.2.2-1.

2) For a connectors declared to be capable of single carrier operation only (D.16), set the representative connectors under test to transmit according to the applicable test configuration in clause 4.8 using the corresponding test models NR-FR1‑TM 1.1 in clause 4.9.2 at *rated carrier output power* Prated,c,AC for *BS type 1-C* and Prated,c,TABC for *BS type 1-H* (D.21).

 For a connector under test declared to be capable of multi-carrier and/or CA operation (D.15-D.16) set the connector under test to transmit on all carriers configured using the applicable test configuration and corresponding power setting specified in clauses 4.7 and 4.8 using the corresponding test models or set of physical channels in clause 4.9.2.

3) Measure ACLR for the frequency offsets both side of channel frequency as specified in table 6.6.3.5.2‑1. In multiple carrier case only offset frequencies below the lowest and above the highest carrier frequency used shall be measured.

4) For the ACLR requirement applied inside sub-block gap for non-contiguous spectrum operation, or inside *Inter RF Bandwidth gap* for multi-band operation:

a) Measure ACLR inside sub-block gap or *Inter RF Bandwidth gap* as specified in clause 6.6.3.5.2, if applicable.

b) Measure CACLR inside sub-block gap or *Inter RF Bandwidth gap* as specified in clause 6.6.3.5.2, if applicable.

5) Repeat the test with the channel set-up according to NR-FR1-TM 1.2 in clause 4.9.2.

In addition, for *multi-band connectors*, the following steps shall apply:

6) For a *multi-band connectors* and single band tests, repeat the steps above per involved *operating band* where single band test configurations and test models shall apply with no carrier activated in the other *operating band*.

#### 6.6.3.5 Test requirements

##### <End of change 2, R4-2212505>

##### <Start of change 3, R4-2214748>

6.6.3.5.2 Limits and *basic limits*

The ACLR is defined with a square filter of bandwidth equal to the transmission bandwidth configuration of the transmitted signal (BWConfig) centred on the assigned channel frequency and a filter centred on the adjacent channel frequency according to the tables below.

For operation in paired and unpaired spectrum except for band n46, n96 and n102, the ACLR shall be higher than the value specified in table 6.6.3.5.2‑1.

**Table 6.6.3.5.2-1: Base station ACLR limit**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)**  | **BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted** | **Assumed adjacent channel carrier (informative)** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **ACLR limit** |
| 5, 10, 15, 20 | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 44.2 dB |
|  | 2 x BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 44.2 dB |
|  | BWChannel /2 + 2.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 44.2 dB (NOTE 3) |
|  | BWChannel /2 + 7.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 44.2 dB (NOTE 3) |
| 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 43.8 dB |
|  | 2 x BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 43.8 dB |
|  | BWChannel /2 + 2.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 43.8 dB (NOTE 3) |
|  | BWChannel /2 + 7.5 MHz | 5 MHz E-UTRA | Square (4.5 MHz) | 43.8 dB (NOTE 3) |
| Note 1: BWChannel and BWConfig are the *BS channel bandwidth* and transmission bandwidth configuration of the lowest/highest NR carrier transmitted on the assigned channel frequency.Note 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).Note 3: The requirements are applicable when the band is also defined for E-UTRA or UTRA. |

For band n46, n96 and n102, the ACLR shall be higher than the value specified in Table 6.6.3.5.2-1a.

**Table 6.6.3.5.2-1a: Base station ACLR limit for band n46, n96 and n102**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)**  | **BS adjacent channel centre frequency offset below the lowest or above the highest carrier centre frequency transmitted** | **Assumed adjacent channel carrier (informative)** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **ACLR limit** |
| 10, 20, 40, 60, 80  | BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 35 dB |
| 2 x BWChannel | NR of same BW (Note 2) | Square (BWConfig) | 40 dB |
| Note 1: BWChannel and BWConfig are the *BS channel bandwidth* and transmission bandwidth configuration of the lowest/highest NR carrier transmitted on the assigned channel frequency.Note 2: With SCS that provides largest transmission bandwidth configuration (BWConfig). |

The ACLR absolute *basic limit* is specified in table 6.6.3.5.2‑2.

**Table 6.6.3.5.2-2: Base station ACLR absolute *basic limit***

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

For operation in non-contiguous spectrum or multiple bands except for band n46, n96 and n102, the ACLR shall be higher than the value specified in table 6.6.3.5.2-3.

**Table 6.6.3.5.2-3: Base Station ACLR limit in non-contiguous spectrum or multiple bands**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)**  | **Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies (MHz)** | **BS adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **ACLR limit** |
| 5, 10, 15, 20 | Wgap ≥ 15 (Note 3)Wgap ≥ 45 (Note 4) | 2.5 MHz | 5 MHz NR(Note 2) | Square (BWConfig) | 44.2 dB |
|  | Wgap ≥ 20 (Note 3)Wgap ≥ 50 (Note 4) | 7.5 MHz | 5 MHz NR(Note 2) |  |  |
| 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | Wgap ≥ 60 (Note 4)Wgap ≥ 30 (Note 3)  | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 43.8 dB |
|  | Wgap ≥ 80 (Note 4)Wgap ≥ 50 (Note 3) | 30 MHz | 20 MHz NR (Note 2) |  |  |
| Note 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.Note 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).Note 3: Applicable in case the *BS channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 5, 10, 15, 20 MHz.Note 4: Applicable in case the *BS channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 MHz. |

For operation in non-contiguous spectrum for band n46, n96 and n102, the ACLR shall be higher than the value specified in Table 6.6.3.2-3a.

**Table 6.6.3.5.2-3a: Base Station ACLR limit in non-contiguous spectrum for band n46, n96 and n102**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)**  | **Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies (MHz)** | **BS adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **ACLR limit** |
| 10, 20, 40, 60, 80 | Wgap ≥ 60 | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 35 dB |
| Wgap ≥ 80 | 30 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 40 dB |
| Note 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.Note 2: With SCS that provides largest transmission bandwidth configuration (BWConfig). |

The Cumulative Adjacent Channel Leakage power Ratio (CACLR) in a sub-block gap or the Inter RF Bandwidth gap is the ratio of:

a) the sum of the filtered mean power centred on the assigned channel frequencies for the two carriers adjacent to each side of the sub-block gap or the Inter RF Bandwidth gap, and

b) the filtered mean power centred on a frequency channel adjacent to one of the respective sub-block edges or Base Station RF Bandwidth edges.

The assumed filter for the adjacent channel frequency is defined in table 6.6.3.5.2-4 and the filters on the assigned channels are defined in table 6.6.3.5.2-6.

For operation in non-contiguous spectrum or multiple bands except for band n46, n96 and n102, the CACLR for NR carriers located on either side of the sub-block gap or the Inter RF Bandwidth gap shall be higher than the value specified in table 6.6.3.5.2-4.

**Table 6.6.3.5.2-4: Base station CACLR limit**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)**  | **Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies (MHz)** | **BS adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **CACLR limit** |
| 5, 10, 15, 20 | 5 ≤ Wgap < 15 (Note 3)5 ≤ Wgap < 45 (Note 4) | 2.5 MHz | 5 MHz NR(Note 2) | Square (BWConfig) | 44.2 dB |
|  | 10 < Wgap < 20 (Note 3)10 ≤ Wgap < 50 (Note 4) | 7.5 MHz | 5 MHz NR(Note 2) |  |  |
| 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 | 20 ≤ Wgap < 60 (Note 4)20 ≤ Wgap < 30 (Note 3) | 10 MHz | 20 MHz NR(Note 2) | Square (BWConfig) | 43.8 dB |
|  | 40 < Wgap < 80 (Note 4)40 ≤ Wgap < 50 (Note 3) | 30 MHz | 20 MHz NR(Note 2) |  |  |
| Note 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.Note 2: With SCS that provides largest transmission bandwidth configuration (BWConfig).Note 3: Applicable in case the *BS channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 5, 10, 15, 20 MHz.Note 4: Applicable in case the *BS channel bandwidth* of the NR carrier transmitted at the other edge of the gap is 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, 100 MHz. |

For operation in non-contiguous spectrum for band n46, n96 and n102, the CACLR for NR carriers located on either side of the sub-block gap shall be higher than the value specified in Table 6.6.3.5.2-4a.

**Table 6.6.3.5.2-4a: Base Station CACLR limit for band n46, n96 and n102**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***BS channel bandwidth* of lowest/highest NR carrier transmitted BWChannel (MHz)**  | **Sub-block or Inter RF Bandwidth gap size (Wgap) where the limit applies (MHz)** | **BS adjacent channel centre frequency offset below or above the sub-block or Base Station RF Bandwidth edge (inside the gap)** | **Assumed adjacent channel carrier** | **Filter on the adjacent channel frequency and corresponding filter bandwidth** | **CACLR limit** |
| 10, 20, 40, 60, 80 | 20 ≤Wgap< 60 | 10 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 35 dB |
| 40 < Wgap< 80 | 30 MHz | 20 MHz NR (Note 2) | Square (BWConfig) | 40 dB |
| Note 1: BWConfig is the transmission bandwidth configuration of the assumed adjacent channel carrier.Note 2: With SCS that provides largest transmission bandwidth configuration (BWConfig). |

The CACLR absolute *basic limit* is specified in table 6.6.3.5.2-5.

**Table 6.6.3.5.2-5: Base station CACLR absolute *basic limit***

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

**Table 6.6.3.5.2-6: Filter parameters for the assigned channel**

|  |  |
| --- | --- |
| **RAT of the carrier adjacent to the sub-block or Inter RF Bandwidth gap**  | **Filter on the assigned channel frequency and corresponding filter bandwidth** |
| NR | NR of same BW with SCS that provides largest transmission bandwidth configuration |

6.6.3.5.3 *BS type 1-C*

The ACLR test requirements for *BS type 1-C* are given in table 6.6.3.5.2-1 or 6.6.3.5.2-3 applies per *antenna connector*. Conformance can be shown by meeting the ACLR limit in table 6.6.3.5.2-1 or 6.6.3.5.2-3, or the absolute *basic limits* in table 6.6.3.5.2-2, whichever is less stringent.

The CACLR test requirements for *BS type 1-C* are given in table 6.6.3.5.2-4 applies per *antenna connector*. Conformance can be shown by meeting the CACLR limit in table 6.6.3.5.2-4 or the absolute *basic limits* in table 6.6.3.5.2-5, whichever is less stringent.

For Band n41 and n90 operation in Japan, absolute ACLR limits shall be applied to the sum of the absolute ACLR power over all *antenna connectors* for *BS type 1-C*.

##### 6.6.3.5.4 *BS type 1-H*

The ACLR absolute *basic limits* in table 6.6.3.5.2-2+ X (where X = 10log10(NTXU,countedpercell)) or the ACLR *limits* in table 6.6.3.5.2-1, or 6.6.3.5.2-3, whichever is less stringent, shall apply for each *TAB connector TX min cell group*.

The CACLR absolute *basic limits* in table 6.6.3.5.2-5 + X, (where X = 10log10(NTXU,countedpercell)) or the CACLR *limits* in table 6.6.3.5.2-4, whichever is less stringent, shall apply for each *TAB connector TX min cell group*.

 Conformance to the *BS type 1-H* ACLR (CACLR) limit can be demonstrated by meeting at least one of the following criteria as determined by the manufacturer

1) The ratio of the sum of the filtered mean power measured on each *TAB connector* in the *TAB connector TX min cell group* at the assigned channel frequency to the sum of the filtered mean power measured on each *TAB connector* in the *TAB connector TX min cell group* at the adjacent channel frequency shall be greater than or equal to the ACLR (CACLR) limit of the BS. This shall apply for each *TAB connector TX min cell group*.

Or

2) The ratio of the filtered mean power at the *TAB connector* centred on the assigned channel frequency to the filtered mean power at this *TAB connector* centred on the adjacent channel frequency shall be greater than or equal to the ACLR (CACLR) limit of the BS for every *TAB connector* in the *TAB connector TX min cell group*, for each *TAB connector TX min cell group*.

 In case the ACLR (CACLR) absolute *basic limit* of *BS type 1-H* are applied, the conformance can be demonstrated by meeting at least one of the following criteria as determined by the manufacturer:

1) The sum of the filtered mean power measured on each *TAB connector* in the *TAB connector TX min cell group* at the adjacent channel frequency shall be less than or equal to the ACLR (CACLR) absolute ba*sic limit* + X (where X = 10log10(NTXU,countedpercell)) of the BS. This shall apply to each *TAB* connector *TX min cell group.*

Or

2) The filtered mean power at each *TAB connector* centred on the adjacent channel frequency shall be less than or equal to the ACLR (CACLR) absolute *basic limit* of the BS scaled by X -10log10(*n*) for every *TAB connector* in the *TAB connector TX min cell group*, for each *TAB connector TX min cell group*, where *n* is the number of *TAB connectors* in the *TAB connector TX min cell group.*

##### <End of change 3, R4-2214748>