**3GPP TSG-RAN WG4 Meeting #94-e *R4-2002839***

**Electronic meeting, 24 February – 6 March 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.141-2** | **CR** | **0141** | **rev** | **1** | **Current version:** | **16.2.0** |  |
|  | | | | | | | | |
| *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 TS 38.141-2: BS RF requirement for band n259 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_n259-Core | | | | |  | ***Date:*** | | | 2020-02-24 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Band n259 is a new band. The BS RF requirements should be introduced in technical specifications. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The upper limit value of “FDL,high – FDL,low“ and “FUL,high – FUL,low” for FR2 is increased to 4000MHz  Band n259 is added to the table with step frequencies for both Tx an Rx spurious emissions requirements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | BS RF requirements for Band n259 cannot be referred. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.7.1, 6.7.5.2.5.2.3, 7.5.2.5.3, 7.7.5.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.104 | | |
| ***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 changes >---------------------------------------------------------------*

### 6.2.5 Test requirement

For each declared conformance *beam direction pair*, the EIRP measurement results in subclause 6.2.4.2 shall remain within the values provided in table 6.2.5-1, relative to the manufacturer's declared rated beam EIRP (D.11) value:

Table 6.2.5-1: Test requirement for radiated transmit power

|  |  |  |
| --- | --- | --- |
|  | Normal test environment | Extreme test environment |
| *BS type 1-H* | f ≤ 3 GHz: ± 3.3 dB | N/A |
| 3 GHz < f ≤ 6 GHz: ± 3.5 dB |
| *BS type 1-O* | f  ≤ 3 GHz: ± 3.3 dB | f  ≤ 3 GHz: ± 5.2 dB |
| 3 GHz < f ≤ 6 GHz: ± 3.5 dB | 3 GHz < f ≤ 4.2 GHz: ± 5.3 dB |
| 4.2 GHz < f ≤ 6 GHz: ± 5.3 dB |
| *BS type 2-O* | 24.15 GHz < f ≤ 29.5 GHz: ± 5.1 dB  37 GHz < f ≤ 43.5 GHz: ± 5.4 dB  … | 24.15 GHz < f ≤ 29.5 GHz: ± 7.6 dB  37 GHz < f ≤ 43.5 GHz: ± 7.8 dB |

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#### 6.3.5.2 *BS type 2-O*

The final TRP measurement result in subclause 6.3.4.2 shall remain:

- within +5.1 dB and -5.1 dB of the manufacturer's declared *rated carrier TRP* Prated,c,TRP carrier frequency 24.25 GHz < f ≤ 29.5 GHz.

- within +5.4 dB and –5.4 dB of the manufacturer's declared *rated carrier TRP* Prated,c,TRP for carrier frequency 37 GHz < f ≤ 43.5 GHz.

*Editor’s note: more frequency divisions for the measuring accuracy may be introduced.*

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##### 6.5.2.5.2 *BS type 2-O*

The measured mean EIRP spectral density according to subclause 6.5.2.4.2 shall be less than -33.1 + Prated,c,EIRP- Prated,c,TRP dBm/MHz for carrier frequency 24.15 GHz < f ≤ 29.5 GHz, where Prated,c,EIRP is the value declared for the *reference beam direction pair* (D.8) for the beam identifier (D.3) which provides the highest intended EIRP.

The measured mean EIRP spectral density according to subclause 6.5.2.4.2 shall be less than -32.7 + Prated,c,EIRP- Prated,c,TRP dBm/MHz for carrier frequency 37 GHz < f ≤ 43.5 GHz, where Prated,c,EIRP is the value declared for the *reference beam direction pair* (D.8) for the beam identifier (D.3) which provides the highest intended EIRP.

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### 6.7.1 General

OTA unwanted emissions consist of so-called out-of-band emissions and spurious emissions according to ITU definitions ITU-R SM.329 [5]. In ITU terminology, out of band emissions are unwanted emissions immediately outside the *BS channel bandwidth* resulting from the modulation process and non-linearity in the transmitter but excluding spurious emissions. Spurious emissions are emissions which are caused by unwanted transmitter effects such as harmonics emission, parasitic emission, intermodulation products and frequency conversion products, but exclude out of band emissions.

The OTA out-of-band emissions requirement for the *BS type 1-O* and *BS type 2-O* transmitter is specified both in terms of Adjacent Channel Leakage power Ratio (ACLR) and operating band unwanted emissions (OBUE). The OTA Operating band unwanted emissions define all unwanted emissions in each supported downlink operating band plus the frequency ranges ΔfOBUE above and ΔfOBUE below each band. OTA Unwanted emissions outside of this frequency range are limited by an OTA spurious emissions requirement.

The maximum offset of the operating band unwanted emissions mask from the operating band edge is ΔfOBUE. The value of ΔfOBUE is defined in table 6.7.1-1 for *BS type 1-O* and *BS type 2-O* for the NR operating bands.

Table 6.7.1-1: Maximum offset ΔfOBUE outside the downlink operating band

|  |  |  |
| --- | --- | --- |
| BS type | Operating band characteristics | ΔfOBUE (MHz) |
| *BS type 1-O* | FDL\_high – FDL\_low < 100 MHz | 10 |
| 100 MHz ≤ FDL\_high – FDL\_low ≤ 900 MHz | 40 |
| *BS type 2-O* | FDL\_high – FDL\_low ≤ 4000 MHz | 1500 |

The OTA unwanted emission requirements are applied per cell for all the configurations. Requirements for OTA unwanted emissions are captured using TRP, *directional requirements* or co-location requirements as described per requirement.

There is in addition a requirement for OTA occupied bandwidth.

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###### 6.7.5.2.5.2.3 OTA transmitter spurious emissions (Category B)

The power of any spurious emission shall not exceed the limits in table 6.7.5.2.5.2.3-1.

Table 6.7.5.2.5.2.3-1: BS radiated Tx spurious emission limits in FR2 (Category B)

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency range  (Note 4) | Test limit | Measurement Bandwidth | Note |
| 30 MHz ↔ 1 GHz | -36 dBm | 100 kHz | Note 1 |
| 1 GHz ↔ 18 GHz | -30 dBm | 1 MHz | Note 1 |
| 18 GHz ↔ Fstep,1 | -20 dBm | 10 MHz | Note 2 |
| Fstep,1  ↔ Fstep,2 | -15 dBm | 10 MHz | Note 2 |
| Fstep,2 ↔ Fstep,3 | -10 dBm | 10 MHz | Note 2 |
| Fstep,4  ↔ Fstep,5 | -10 dBm | 10 MHz | Note 2 |
| Fstep,5  ↔ Fstep,6 | -15 dBm | 10 MHz | Note 2 |
| Fstep,6 ↔ min(2nd harmonic of the upper frequency edge of the DL operating band in GHz; 60 GHz) | -20 dBm | 10 MHz | Note 2, Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [5], s4.1  NOTE 2: Limit and bandwidth as in ERC Recommendation 74-01 [26], annex 2.  NOTE 3: Upper frequency as in ITU-R SM.329 [5], s2.5 table 1.  NOTE 4: The step frequencies Fstep,X are defined in table 6.7.5.2.5.2.3-2. | | | |

Table 6.7.5.2.5.2.3-2: Step frequencies for defining the BS radiated Tx spurious emission limits in FR2 (Category B)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating band | Fstep,1 (GHz) | Fstep,2 (GHz) | Fstep,3 (GHz) (Note 2) | Fstep,4 (GHz) (Note 2) | Fstep,5 (GHz) | Fstep,6 (GHz) |
| n258 | 18 | 21 | 22.75 | 29 | 30.75 | 40.5 |
| n259 | 23.5 | 35.5 | 38 | 45 | 47.5 | 59.5 |
| NOTE 1: Fstep,X are based on ERC Recommendation 74-01 [26], annex 2.  NOTE 2: Fstep,3 and Fstep,4 are aligned with the values for ΔfOBUE in table 6.7.1-1. | | | | | | |

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##### 7.5.2.5.3 Test requirements for *BS type 2-O*

The requirement shall apply at the RIB when the AoA of the incident wave of a received signal and the interfering signal are from the same direction and are within the *OTA REFSENS RoAoA.*

The wanted and interfering signals apply to each supported polarization, under the assumption o*f polarization match*.

The throughput shall be ≥ 95% of the maximum throughput of the reference measurement channel.

For *BS type 2-O*, the OTA wanted and OTA interfering signals are provided at RIB using the parameters in table 7.5.2.5.3-1 for general OTA blocking requirements. The reference measurement channel for the OTA wanted signal is identified in subclause 7.3.5.3 and is further specified in annex A.1. The characteristics of the interfering signal is further specified in TS 38.104 [2] annex D.

The OTA blocking requirements are applicable outside the *Base Station RF Bandwidth*. The interfering signal offset is defined relative to the *Base Station RF Bandwidth edges*.

For *BS type 2-O* the OTA blocking requirement shall apply in the in-band blocking frequency range, which is defined within frequency range from FUL\_low - ΔfOOB to FUL\_high + ΔfOOB,where theΔfOOB for *BS type 2-O* is defined in table 7.5.2.5.3-0.

Table 7.5.2.5.3-0: ΔfOOB offset for NR *operating bands* in FR2

|  |  |  |
| --- | --- | --- |
| BS type | *Operating band* characteristics | ΔfOOB (MHz) |
| *BS type 2-O* | FUL\_high – FUL\_low ≤ 4000 MHz | 1500 |

For a RIBs supporting operation in *non-contiguous spectrum* within any *operating band*, the OTA blocking requirements apply 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 7.5.2.5.3-1. The interfering signal offset is defined relative to the sub-block edges inside the sub-block gap.

Table 7.5.2.5.3-1: General OTA blocking requirement for *BS type 2-O*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| *BS channel bandwidth* of the lowest/highest carrier received (MHz) | OTA wanted signal mean power (dBm) | | OTA interfering signal mean power (dBm) | OTA interfering signal centre frequency offset  from the lower/upper Base Station RF Bandwidth edge or sub-block edge inside a sub-block gap (MHz) | Type of OTA interfering signal |
| 24.24 GHz < f ≤ 33.4 GHz | 37 GHz < f ≤ 52.6 GHz |
| 50, 100, 200, 400 | EISREFSENS + 6 dB | EISREFSENS + 6 dB | EISREFSENS\_50M + 33 + ΔFR2\_REFSENS dB | ±75 | 50 MHz DFT-s-OFDM NR signal, 60 kHz SCS, 64 RBs |
| NOTE: EISREFSENS and EISREFSENS\_50M are given in TS 38.104 [2], subclause 10.3.3. | | | | | |

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#### 7.7.5.2 Test requirement for *BS type 2-O*

The power of any receiver spurious emission shall not exceed the limits in table 7.7.5.2-1.

Table 7.7.5.2-1: Radiated Rx spurious emission limits for *BS type 2-O*

|  |  |  |  |
| --- | --- | --- | --- |
| Spurious  frequency range  (Note 4) | Limit (Note 5) | Measurement Bandwidth | Note |
| 30 MHz ↔ 1 GHz | -36 dBm | 100 kHz | Note 1 |
| 1 GHz ↔ 18 GHz | -30 dBm | 1 MHz | Note 1 |
| 18 GHz ↔ Fstep,1 | -20 dBm | 10 MHz | Note 2 |
| Fstep,1  ↔ Fstep,2 | -15 dBm | 10 MHz | Note 2 |
| Fstep,2 ↔ Fstep,3 | -10 dBm | 10 MHz | Note 2 |
| Fstep,4  ↔ Fstep,5 | -10 dBm | 10 MHz | Note 2 |
| Fstep,5  ↔ Fstep,6 | -15 dBm | 10 MHz | Note 2 |
| Fstep,6 ↔ min(2nd harmonic of the upper frequency edge of the UL operating band in GHz; 60 GHz) | -20 dBm | 10 MHz | Note 2, Note 3 |
| NOTE 1: Bandwidth as in ITU-R SM.329 [2], s4.1.  NOTE 2: Limit and bandwidth as in ERC Recommendation 74-01 [19], Annex 2.  NOTE 3: Upper frequency as in ITU-R SM.329 [2], s2.5 table 1.  NOTE 4: The step frequencies Fstep,X are defined in table 7.7.5.2-2.  NOTE 5: Additional limits may apply regionally. | | | |

Table 7.7.5.2-2: Step frequencies for defining the the radiated Rx spurious emission limits   
for *BS type 2-O*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Operating band | Fstep,1 (GHz) | Fstep,2 (GHz) | Fstep,3 (GHz) | Fstep,4 (GHz) | Fstep,5 (GHz) | Fstep,6 (GHz) |
| n257 | 18 | 23.5 | 25 | 31 | 32.5 | 41.5 |
| n258 | 18 | 21 | 22.75 | 29 | 30.75 | 40.5 |
| n259 | 23.5 | 35.5 | 38 | 45 | 47.5 | 59.5 |
| n260 | 25 | 34 | 35.5 | 41.5 | 43 | 52 |
| n261 | 18 | 25.5 | 26.0 | 29.85 | 30.35 | 38.35 |

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Table C.1-2: Derivation of test requirements (FR2 OTA transmitter tests)

|  |  |  |  |
| --- | --- | --- | --- |
| Test | Minimum requirement in TS 38.104 [2] | Test Tolerance (TTOTA) | Test requirement in the present document |
| 6.2 Radiated transmit power | See TS 38.104 [2], subclause 9.2 | Normal conditions:  1.7 dB, 24.25GHz < f ≦ 29.5GHz  2.0 dB, 37GHz < f ≦ 43.5GHz  Extreme conditions:  3.1 dB, 24.25GHz < f ≦ 29.5GHz  3.3 dB, 37GHz < f ≦ 43.5GHz | Formula:  Upper limit + TT, Lower limit – TT |
| 6.3 OTA base station output power | See TS 38.104 [2], subclause 9.3 | 2.1 dB, 24.25GHz < f ≦ 29.5GHz  2.4 dB, 37GHz < f ≦ 43,5GHz | Formula:  Upper limit + TT, Lower limit – TT |
| 6.4 OTA output power dynamics | See TS 38.104 [2], subclause 9.4 | 0.4 dB | Formula:  Total power dynamic range – TT |
| 6.5.1 OTA transmitter OFF power | See TS 38.104 [2], subclause 9.5.2 | 2.9 dB, 24.25GHz < f ≦ 29.5GHz  3.3 dB, 37GHz < f ≦ 43.5GHz | Formula:  Minimum Requirement + TT |
| 6.6.2 OTA frequency Error | See TS 38.104 [2], subclause 9.6.1 | 12 Hz | Formula:  Frequency Error limit + TT |
| 6.6.3 OTA Modulation quality (EVM) | See TS 38.104 [2], subclause 9.6.2 | 1 % | Formula:  EVM limit + TT |
| 6.6.4 OTA time alignment error | See TS 38.104 [2], subclause 9.6.3 | 25 ns |  |
| 6.7.2 OTA occupied bandwidth | See TS 38.104 [2], subclause 9.7.2 | 0 Hz | Formula:  Minimum Requirement + TT |
| 6.7.3 OTA Adjacent Channel Leakage Power Ratio (ACLR) | See TS 38.104 [2], subclause 9.7.3 | Relative:  2.3 dB, 24.25GHz < f ≦ 29.5GHz  2.6 dB, 37GHz < f ≦ 52.6GHz  Absolute:  2.7 dB, 24.25GHz < f ≦ 29.5GHz  2.7 dB, 37GHz < f ≦ 52.6GHz | Formula:  Relative limit - TT  Absolute limit +TT |
| 6.7.4 OTA operating band unwanted emissions | See TS 38.104 [2], subclause 9.7.4 | 0 MHz ≤ Δf < 0.1\*BWcontiguous  2.7 dB, 24.25GHz < f ≦ 29.5GHz  2.7 dB, 37GHz < f ≦ 52.6GHz  0.1\*BWcontiguous ≤ Δf < Δfmax  0 dB | Formula:  Minimum Requirement + TT |
| 6.7.5.2 General transmitter spurious emissions requirements  Category A | See TS 38.104 [2], subclause 9.7.5.3.2 | 0 dB | Formula:  Minimum Requirement + TT |
| 6.7.5.2 General transmitter spurious emissions requirements  Category B | See TS 38.104 [2], subclause 9.7.5.3.2 | 0 dB | Formula:  Minimum Requirement + TT |

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