**3GPP TSG-RAN WG4 Meeting #116bisR4-2515153**

**Prague, CZ, 13 - 17 Oct, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.181** | **CR** | **-** | **rev** | **-** | **Current version:** | **19.1.0** |  |
|  | | | | | | | | |
| *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:*** | Draft CR to 38.181 for addition of radiated requirements for NR IoT NTN less than 5MHz | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_IoT\_NTN\_req\_test\_enh-Perf | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | |  |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | PUCCH format 2 radiated requirements for NR IoT NTN less than 5MHz was agreed to be introduced as per WF R4-2508725. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Added the PUCCH format 2 radiated requirements for NR IoT NTN less than 5MHz. | | | | | | | | |
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| ***Consequences if not approved:*** | | There will be inconsist between specification and RAN4 agreements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 11.3.3.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | R4-2513436 | | | | | | | | |

*<START OF THE CHANGE 1>*

11.3.3.2 UCI BLER performance requirements

11.3.3.2.1 Definition and applicability

The UCI block error probability is defined as the probability of incorrectly decoding the UCI information when the UCI information is sent. The UCI information does not contain CSI part 1 and part 2.

Which specific test(s) are applicable to SAN is based on the test applicability rules defined in clause 11.1.3.

The transient period as specified in TS 38.101-5 [12] clause 6.3.3 is not taken into account for performance requirement testing, where the RB hopping is symmetric to the CC center, i.e., intra-slot frequency hopping is enabled.

11.3.3.2.2 Minimum Requirement

For *SAN type 1-O*, the minimum requirement is in TS 38.108 [2] clause 11.3.1.4.

For *SAN type 2-O*, the minimum requirement is in TS 38.108 [2] clause [11.3.2.4].

11.3.3.2.3 Test Purpose

The test shall verify the receiver's ability to detect UCI under multipath fading propagation conditions for a given SNR.

11.3.3.2.4 Method of test

11.3.3.2.4.1 Initial conditions

Test environment: Normal, see Annex B.2.

RF channels to be tested for single carrier: M; see clause 4.9.1

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.44 in table 4.6-1).

11.3.3.2.4.2 Procedure

1) Place the SAN with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex D.7.

2) Align the manufacturer declared coordinate system orientation of the SAN with the test system.

3) Set the SAN in the declared direction to be tested.

4) Connect the SAN tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex D.7. Each of the demodulation branches signals should be transmitted on each polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to TS 38.211 [8], and according to additional test parameters listed in table 11.3.3.2.4.2-1.

**Table 11.3.3.2.4.2-1: Test parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | |
| **SAN type 1-O** | **SAN type 2-O** |
| Modulation order | QPSK | |
| First PRB prior to frequency hopping | 0 | |
| Intra-slot frequency hopping | enabled | |
| First PRB after frequency hopping | The largest PRB index - (Number of PRBs-1) | |
| Number of PRBs | 9 | |
| Number of symbols | 2 | |
| The number of UCI information bits | 22 | |
| First symbol | 12 | |
| DM-RS sequence generation | *NID*0=0 | |
| Note 1: For 3MHz, the first PRB after frequency hopping is 3 | | |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex G.2.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the SAN receiver is as specified in clause 11.3.3.2.5.1 and 11.3.3.2.5.2 for *SAN type 1-O* and *SAN type 2-O* respectively, and that the SNR at the SAN receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 11.3.3.2.4.2-2.

**Table 11.3.3.2.4.2-2: AWGN power level at the SAN input**

|  |  |  |  |
| --- | --- | --- | --- |
| **SAN type** | **Sub-carrier spacing**  **(kHz)** | **Channel bandwidth**  **(MHz)** | **AWGN power level** |
| SAN type 1-O (Note 2) | 15 kHz | 3 | -91.7 - ΔOTAREFSENS dBm /2.7 MHz |
| 5 | -86.5 - ΔOTAREFSENS dBm / 4.5 MHz |
| 30 kHz | 10 | -83.6 - ΔOTAREFSENS dBm / 8.64 MHz |
| SAN type 2-O (Note 5) | 120 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 46.08 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.43 in table 4.6-1 and clause 10.1.  NOTE 2: The AWGN power level contains an AWGN offset of 16dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 16dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level.  NOTE 3: ΔFR2\_REFSENS = -3 dB as described in clause 10.1, since the OTA REFSENS reference direction (as declared in D.54 in table 4.6-1) is used for testing.  NOTE 4: EISREFSENS\_50M as declared in D.xx in table 4.6-1.  NOTE 5: The AWGN power level contains an AWGN offset of 15dB by default. If needed for test purposes, the AWGN level can be reduced from the default by any value in the range 0dB to 15dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. | | | |

8) The signal generator sends a test pattern with the pattern outlined in figure 11.3.3.2.4.2-1. The following statistics are kept: the number of incorrectly decoded UCI.

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**Figure 11.3.3.2.4.2-1: Test signal pattern for PUCCH format 2 demodulation tests**

11.3.3.2.5 Test requirement

11.3.3.2.5.1 Requirements for SAN type 1-O

The fraction of incorrectly decoded UCI shall be less than 1% for the SNR listed in table 11.3.3.2.5.1-1 to table 11.3.3.2.5.1-3.

**Table 11.3.3.2.5.1-1: Required SNR for PUCCH format 2 with 15 kHz SCS 5MHz channel bandwidth**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of**  **TX antennas** | **Number of demodulation branches** | **Cyclic Prefix** | **Propagation conditions and**  **correlation matrix (Annex G)** | **SNR (dB)** |
| 1 | 1 | Normal | NTN-TDLA100-200 Low | 6.9 |
| 2 | Normal | NTN-TDLA100-200 Low | 1.4 |

**Table 11.3.3.2.5.1-2: Required SNR for PUCCH format 2 with 30 kHz SCS 10MHz channel bandwidth**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of**  **TX antennas** | **Number of demodulation branches** | **Cyclis Prefix** | **Propagation conditions and**  **correlation matrix (Annex G)** | **SNR (dB)** |
| 1 | 1 | Normal | NTN-TDLA100-200 Low | 7.0 |
| 2 | Normal | NTN-TDLA100-200 Low | 1.1 |

**Table 11.3.3.2.5.1-3: Required SNR for PUCCH format 2 with 15 kHz SCS 3MHz channel bandwidth**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of**  **TX antennas** | **Number of demodulation branches** | **Cyclic Prefix** | **Propagation conditions and**  **correlation matrix (Annex G)** | **SNR (dB)** |
| 1 | 1 | Normal | NTN-TDLA100-200 Low | [10.2] |
| 2 | Normal | NTN-TDLA100-200 Low | [3.0] |

11.3.3.2.5.2 Requirements for SAN type 2-O

The fraction of incorrectly decoded UCI shall be less than 1% for the SNR listed in table 11.3.3.2.5.2-1.

**Table 11.3.3.2.5.2-1: Required SNR for PUCCH format 2 with 120 kHz SCS 50MHz channel bandwidth**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Number of**  **TX antennas** | **Number of demodulation branches** | **Cyclis Prefix** | **Propagation conditions and**  **correlation matrix (Annex G)** | **SNR (dB)** |
| 1 | 1 | Normal | NTN-TDLC5-1200 Low | 4.8 |
| 2 | Normal | NTN-TDLC5-1200 Low | -1.0 |

*<END OF THE CHANGE 1>*