**3GPP TSG- Meeting #1 *7111***

**, , 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** | **0579** | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *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 further coverage enhancements requirements for TS38.141-2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | China Telecom | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_cov\_enh2-Perf | | | | |  | ***Date:*** | | | 2024-05-28 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | RAN4 has agreed to introduce BS performance requirements for further NR coverage enhacenment, i.e., PRACH repetition. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Big draft CR to include changes from the following endorsed draft CRs:   1. R4-2409899 [NR\_cov\_enh2-Perf] draftCR for 38.141-2, update to PRACH Preambles, Nokia. 2. R4-2409897 Draft CR on manufacturer declarations and applicability for Multiple PRACH transmission (TS38.141-2, Rel-18), 3. R4-2409898 Draft CR on test requirements for multiple PRACH transmission in TS 38.141-2, Samsung | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | There will be no requirements for further NR coverage enhacenment, i.e., PRACH repetition. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.6 8.1.2.11(New) 8.4.1.8(New) A.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | There are additional editorial changes with change track ‘Editorial’. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**<Start of change R4-2409897>**

4.6 Manufacturer's declarations

The following BS manufacturer's declarations listed in table 4.6-1, when applicable to the BS under test, are required to be provided by the manufacturer for radiated requirements testing for *BS type 1-H,* *BS type 1-O* and *BS type 2-O*.

For the *BS type 1-H* declarations required for the conducted requirements testing, refer to TS 38.141-1 [3], clause 4.6.

**Table 4.6-1 Manufacturers declarations for *BS type 1-H, BS type 1-O* and *BS type 2-O* radiated test requirements**

| **Declaration identifier** | **Declaration** | **Description** | **Applicability**  **(Note 1)** | | |
| --- | --- | --- | --- | --- | --- |
|  |  |  | **BS type 1-H**  **(Note 2)** | **BS type 1-O** | **BS type 2-O** |
| D.1 | Coordinate system reference point | Location of coordinated system reference point in reference to an identifiable physical feature of the BS enclosure. | x | x | x |
| D.2 | Coordinate system orientation | Orientation of the coordinate system in reference to an identifiable physical feature of the BS enclosure. | x | x | x |
| … | … | … | … | … | … |
| D.122 | Supported FDD PUSCH DM-RS bundling and and PUCCH DM-RS bundling and | Declaration of supporting FDD PUSCH DM-RS bundling and PUCCH DM-RS bundling | c | x | x |
| D.123 | MCS index table 3 | Declaration of support MCS index table 3 as specified in TS 38.214 [18]. | c | x | n/a |
| D.124 | PUSCH repetition type A | Declaration of support PUSCH repetition type A | c | x | x |
| D.125 | Air-to-ground scenario | Declaration of air-to-ground scenario support, i.e. ATG support or no ATG support | c | x | n/a |
| D.126 | PRACH format and SCS for Multiple PRACH transmission | Declaration of the supported PRACH format(s) as specified in TS 38.211 [20] for Multiple PRACH transmission, i.e., format: A2, B4, C2.  Declaration of the supported SCS(s) per supported PRACH format with short sequence for Multiple PRACH transmission, as specified in TS 38.211 [20], i.e.:  - For BS type 2-O: 120 kHz. | c | x | x |
| NOTE 1: Manufacturer declarations applicable per BS *requirement set* were marked as "x". Manufacturer declarations not applicable per BS *requirement set* were marked as "n/a".  NOTE 2: For *BS type 1-H*, the only radiated declarations are related to EIRP and EIS requirements. For *BS type 1-H* declarations required for the conducted requirements testing, refer to TS 38.141-1 [3]. For declarations marked as 'c', related conducted declarations in TS 38.141-1 [3] apply. When separately declared, they shall still use the same declaration identifier.  NOTE 3: Depending on the capability of the system some of these beams may be the same. For those same beams, testing is not repeated.  NOTE 4: These *operating bands* are related to their respective single‑band RIBs.  NOTE 5: As each identified OSDD has a declared minimum EIS value (D.27), multiple operating band can only be declared if they have the same minimum EIS declaration.  NOTE 6: If the *BS type 1-H* or *BS type 1-O* is not capable of redirecting the receiver target related to the OSDD then there is only one RoAoA applicable to the OSDD.  NOTE 7: Although EISREFSENS\_50M level is based on a reference measurement channel with BWChannel = 50 MHz, it does not imply that BS has to support 50 MHz channel bandwidth.  NOTE 8: Not applicable for *BS type 2-O*.  NOTE 9: For an OSDD without receiver target redirection range, this is a direction inside the sensitivity RoAoA.  NOTE 10: *OTA coverage range* is used for conformance testing of such TX OTA requirements as occupied bandwidth, frequency error, TAE or EVM.  NOTE 11: The *OTA coverage reference* direction may be the same as the Reference beam direction pair (D.8) but does not have to be.  NOTE 12: If a *BS type 2-O* is capable of 64QAM DL operation but not capable of 256QAM DL operation, then up to two rated output power declarations may be made. One declaration is applicable when configured for 64QAM transmissions and the other declaration is applicable when not configured for 64QAM transmissions.  NOTE 13: If D.57 and D.58 are declared for certain frequency range (D.56), there shall be no "Rated beam EIRP" declaration (D.11) for the *operating band* containing that particular frequency range.  NOTE 14: If a BS is capable of 1024QAM DL operation then up to three rated output power declarations may be made. One declaration is applicable when configured for 1024QAM transmissions, a different declaration is applicable when configured 256QAM transmissions and the other declaration is applicable when configured neither for 256QAM nor 1024QAM transmissions.  NOTE 15: Parameters for contiguous or non-contiguous spectrum operation in the operating band are assumed to be the same unless they are separately declared.  NOTE 16: If BS is declared to support Band n20 (D.4), the manufacturer shall declare if the BS may operate in geographical areas allocated to broadcasting (DTT). Additionally, related declarations of the emission levels and maximum output power shall be declared.  NOTE 17: In case of BS type 1-H, this declaration applies per *TAB connector*.  NOTE 18: If a *BS type 2-O* is capable of 256QAM DL operation, then up to three rated output power declarations may be made. One declaration is applicable when configured for 256QAM transmissions, a different declaration is applicable when configured for 64QAM transmissions and the other declaration is applicable when not configured neither for 256QAM nor 64QAM transmissions.  NOTE 19: If BS is declared to support Band n24 (D.4), the manufacturer shall declare if the BS may operate in geographical areas where FCC regulations apply. Additionally, related declarations of the emission levels and maximum output power shall be declared.  NOTE 20: If a BS is capable of 256QAM DL operation but not capable of 1024QAM DL operation then up to two rated output power declarations may be made. One declaration is applicable when configured for 256QAM transmissions, and the other declaration is applicable when not configured for 256QAM transmissions | | | | | |

**<Unchanged part skipped>**

8.1.2.11 Applicability of performance requirements for Multiple PRACH transmission

8.1.2.11.1 Applicability of requirements for different formats

Unless otherwise stated, Multiple PRACH transmission requirements shall apply only for each PRACH format declared to be supported (see D.126 in table 4.6-1).

8.1.2.11.2 Applicability of requirements for different channel bandwidths

Unless otherwise stated, for the subcarrier spacing to be tested, Multiple PRACH transmission requirements shall apply only for anyone channel bandwidth declared to be supported (see D.7 in table 4.6-1).

**<End of change R4-2409897>**

**<Start of change R4-2409898>**

### 8.4.1 PRACH false alarm probability and missed detection

#### 8.4.1.1 Definition and applicability

The performance requirement of PRACH for preamble detection is determined by the two parameters: total probability of false detection of the preamble (Pfa) and the probability of detection of preamble (Pd). The performance is measured by the required SNR at probability of detection, Pd of 99%. Pfa shall be 0.1% or less.

Pfa is defined as a conditional total probability of erroneous detection of the preamble (i.e. erroneous detection from any detector) when input is only noise.

Pd is defined as conditional probability of detection of the preamble when the signal is present. The erroneous detection consists of several error cases – detecting only different preamble(s) than the one that was sent, not detecting any preamble at all, or detecting the correct preamble but with the out-of-bounds timing estimation value. For AWGN, TDLC300-100, TDLA30-10, TDLA30-300, TDLA30-650, and TDLA10-650, a timing estimation error occurs if the estimation error of the timing of the strongest path is larger than the time error tolerance values given in table 8.4.1.1-1.

Table 8.4.1.1-1: Time error tolerance for AWGN, TDLC300-100, TDLA30-10, TDLA30-300, TDLA30-650 and TDLA10-650

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| PRACH | PRACH SCS |  | Time error tolerance | | | | |
| preamble | (kHz) | AWGN | TDLC300-100 | TDLA30-10 | TDLA30-300 | TDLA30-650 | TDLA10-650 |
| 0 | 1.25 | 1.04 us | 2.55 us | N/A | N/A | N/A | N/A |
| A1, A2, A3, B4, C0, C2 | 15 | 0.52 us | 2.03 us | 0.67 us | N/A | N/A | N/A |
|  | 30 | 0.26 us | 1.77 us | 0.41 us | N/A | N/A | N/A |
|  | 60 (FR2) | 0.13 us | N/A | N/A | 0.28 us | N/A | N/A |
|  | 120 | 0.07 us | N/A | N/A | 0.22 us | 0.22 us | N/A |
|  | 480 | 18 ns | N/A | N/A | N/A | N/A | 68 ns |

The test preambles for normal mode are listed in table A.6-1 and A.6-2. The test preambles for high speed train restricted set type A are listed in table A.6-3 and the test preambles for high speed train restricted set type B are listed in table A.6-4. The test preambles for high speed train short formats are listed in table A.6-5. The test preambles for Multiple PRACH transmission are listed in table A.6-9.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in clause 8.1.2. The performance requirements for high speed train (table 8.4.1.6.1-1 to 8.4.1.6.1-4 and table 8.4.1.6.2-1) are optional. and only applicable for FR2-1 below 30 GHz The test preambles for PRACH with LRA=1151 and LRA=571 are listed in table A.6-6.

**<Unchanged part skipped>**

#### 8.4.1.7 Test requirement for PRACH with LRA=1151 and LRA=571

##### 8.4.1.7.1 Test requirement for *BS type 1-O*

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.4.1.7.1-1 to 8.4.1.7.1-2.

Table 8.4.1.7.1-1: Missed detection requirements for PRACH with LRA=1151, 15 kHz SCS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex J) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -20.8 | -24.8 | -20.8 |
|  |  | TDLA30-10 Low | 400 Hz | -14.5 | -17.7 | -14.6 |

Table 8.4.1.7.1-2: Missed detection requirements for PRACH with LRA=571, 30 kHz SCS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex J) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -17.8 | -21.7 | -17.8 |
|  |  | TDLA30-10 Low | 400 Hz | -11.5 | -15.2 | -11.5 |

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

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.4.1.7.2-1 to 8.4.1.7.2-3.

Table 8.4.1.7.2-1: Missed detection requirements for PRACH with LRA=571, 120 kHz SCS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex J) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -17.6 | -21.8 | -17.6 |
|  |  | TDLA30-650 Low | 7100 | -10.3 | -13.2 | -10.1 |

Table 8.4.1.7.2-2: Missed detection requirements for PRACH with LRA=1151, 120 kHz SCS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex J) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -20.6 | -24.7 | -20.5 |
|  |  | TDLA30-650 Low | 7100 | -13.4 | -16.3 | -13.4 |

Table 8.4.1.7.2-3: Missed detection requirements for PRACH with LRA=571, 480 kHz SCS

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex J) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -17.6 | -21.7 | -17.6 |
|  |  | TDLA10-650 Low | 7100 | -10.5 | -14.4 | -10.5 |

#### 8.4.1.8 Test requirement for PRACH with repetition transmission

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

Pfa shall not exceed 0.1%. Pd shall not be below 99% for the SNRs in tables 8.4.1.8.1-1

Table 8.4.1.8.1-1: PRACH missed detection test requirements with repetition transmission, 120 kHz SCS in FR2-1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | Number of Repetitions | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex J) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | TDLA30-300 Low | 4000 Hz | 2 | TBD | [-11.4] | TBD |
| Note : This requirement has no limitation for PRACH configuration index selection for BS comformance testing | | | | | | | |

**<End of change R4-2409898>**

**<Start of change R4-2409899>**

# A.6 PRACH Test preambles

Table A.6-1 Test preambles for Normal Mode in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 13 | 22 | 32 |
| A1, A2, A3, | 15 | 23 | 0 | 0 |
| B4, C0, C2 | 30 | 46 | 0 | 0 |

Table A.6-2 Test preambles for Normal Mode in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A1, A2, A3 | 60 | 69 | 0 | 0 |
| , B4, C0, C2 | 120 | 69 | 0 | 0 |

Table A.6-3: Test preambles for high speed train restricted set type A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 15 | 384 | 0 |

Table A.6-4: Test preambles for high speed train restricted set type B

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| 0 | 1.25 | 15 | 30 | 30 |

Table A.6-5: Test preambles for high speed train short formats in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A2, B4, C2 | 15 | 23 | 0 | 0 |
|  | 30 | 46 | 0 | 0 |

Table A.6-6: Test preambles for PRACH with LRA=1151 and LRA=571

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A2, B4, C2 | 15 | 164 | 0 | 0 |
|  | 30 | 190 | 0 | 0 |

Table A.6-7: Test preambles for high speed train short formats in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| C2 | 120 | 0 | 0 | 0 |

Table A.6-8 Test preambles for PRACH with LRA=139, LRA=571 and LRA=1151 for 120 KHz and 480 KHz SCS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | LRA | Ncs | Logical sequence index | v |
| A2,  , B4, C2 | 120 | 571 | 285 | 0 | 0 |
|  | 120 | 1151 | 575 | 0 | 0 |
|  | 480 | 139 | 69 | 0 | 0 |
|  | 480 | 571 | 285 | 0 | 0 |

Table A.6-9: Test preambles for normal mode PRACH with repetitions, LRA=139

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Burst format | SCS (kHz) | Ncs | Logical sequence index | v |
| A2, B4, C2 | 120 | 69 | 0 | 0 |

**<End of change R4-2409899>**