**3GPP TSG-RAN WG4 Meeting #104-bis-e *R4-221xxxx***

**Electronic, , 10th - 19th October 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.104** | **CR** | **DRAFT** | **rev** | **1** | **Current version:** | **17.7.0** |  |
|  | | | | | | | | |
| *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 38.104: PRACH requirements for FR2-2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_ext\_to\_71GHz-Perf | | | | |  | ***Date:*** | | | 2022-30-09 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduction of the structure of the PRACH requirements for FR2-2 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Proposal for scheleton of PRACH requirements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No PRACH requirements for FR2-2 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 11.4.2.2.2 and 11.4.2.2.x (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.141-2 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | New clause 11.4.2.2.x to be implemented preferably as 11.4.2.2.3. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Revision of R4-2216576 and R4-2212680 endorsed during RAN4 #104 | | | | | | | | |

### <Start of Change 1>

#### 11.4.2.2 PRACH detection requirements

##### 11.4.2.2.1 General

The probability of detection is the conditional probability of correct detection of the preamble when the signal is present. There are several error cases – detecting different preamble than the one that was sent, not detecting a preamble at all or correct preamble detection but with the wrong timing estimation. For AWGN and TDLA30-300, a timing estimation error occurs if the estimation error of the timing of the strongest path is larger than the time error tolerance given in Table 11.4.2.2-1.

The performance requirements for high speed train (table 11.4.2.2.3-1) are optional and only applicable for FR2-1 below 30GHz.

Table 11.4.2.2-1: Time error tolerance for AWGN, TDLA30-300, and TDLA10-650

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| PRACH | PRACH SCS | Time error tolerance | | |
| preamble | (kHz) | AWGN | TDLA30-300 | TDLA10-650 |
| A1, A2, A3, B4, | 60 | 0.13 us | 0.28 us | N/A |
| C0, C2 | 120 | 0.07 us | 0.22 us | N/A |
|  | 480 | 18 ns | N/A | 68 ns |

The test preambles for normal mode are listed in table A.6-2 and the test parameter *msg1-FrequencyStart* is set to 0. The test preambles for high speed train short formats are listed in table A.6-7 and the test parameter *msg1-FrequencyStart* for high speed train is set to 0.

##### 11.4.2.2.2 Minimum requirements for Normal mode

The probability of detection shall be equal to or exceed 99% for the SNR levels listed in Tables 11.4.2.2.2-1 to 11.4.2.2.2-2.

Table 11.4.2.2.2-1: PRACH missed detection requirements for Normal Mode, 60 kHz SCS in FR2-1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number | Number of | Propagation | Frequency | SNR (dB) | | | | | |
| of TX antennas | demodulation branches | conditions and correlation matrix (Annex G) | offset | Burst format A1 | Burst format A2 | Burst format A3 | Burst format B4 | Burst format C0 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -8.9 | -11.9 | -13.5 | -15.8 | -6.0 | -11.8 |
|  |  | TDLA30-300 Low | 4000 Hz | -1.6 | -3.8 | -4.8 | -6.9 | 1.1 | -3.9 |

Table 11.4.2.2.2-2: PRACH missed detection requirements for Normal Mode, 120 kHz SCS in FR2-1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number | Number of | Propagation | Frequency | SNR (dB) | | | | | |
| of TX antennas | demodulation branches | conditions and correlation matrix (Annex G) | offset | Burst format A1 | Burst format A2 | Burst format A3 | Burst format B4 | Burst format C0 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -8.7 | -11.5 | -13.3 | -15.8 | -5.8 | -11.4 |
|  |  | TDLA30-300 Low | 4000 Hz | -1.7 | -4.4 | -5.8 | -7.5 | 1.2 | -4.2 |

Table 11.4.2.2.2-3: PRACH missed detection test requirements for Normal Mode, 120 kHz SCS in FR2-2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex G) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | FFS | FFS | FFS |
|  |  | TDLA30-650 Low | 7100 Hz | FFS | FFS | FFS |

Table 11.4.2.2.22-4: PRACH missed detection test requirements for Normal Mode, 480 kHz SCS in FR2-2

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

##### 11.4.2.2.3 Minimum requirements for high speed train

The probability of detection shall be equal to or exceed 99% for the SNR levels listed in Table 11.4.2.2.3-1.

Table 11.4.2.2.3-1: PRACH missed detection requirements for high speed train, 120 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of  TX antennas | Number of  RX antennas | Propagation  conditions (Annex G) | Frequency  offset | SNR (dB) |
| Burst format C2 |
| 1 | 2 | AWGN | 19444 Hz | -10.4 |

### <End of Change 1>

### <Start of Change 2>

##### 11.4.2.2.x Minimum requirements for PRACH with LRA=1151 and LRA=571

The probability of detection shall be equal to or exceed 99% for the SNR levels listed in Tables 11.4.2.2.x-1 to 11.4.2.2.x-3.

Table 11.4.2.2.x-1: Missed detection requirements for PRACH with LRA=571, 120 kHz SCS in FR2-2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex G) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | FFS | FFS | FFS |
|  |  | TDLA30-650 Low | 7100 Hz | FFS | FFS | FFS |

Table 11.4.2.2.x-2: Missed detection requirements for PRACH with LRA=1151, 120 kHz SCS in FR2-2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex G) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | FFS | FFS | FFS |
|  |  | TDLA10-650 | 7100 Hz | FFS | FFS | FFS |

Table 11.4.2.2.x-3: Missed detection requirements for PRACH with LRA=571, 480 kHz SCS in FR2-2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of | Number of | Propagation | Frequency | SNR (dB) | | |
| TX antennas | demodulation branches | conditions and correlation matrix (Annex G) | offset | Burst format A2 | Burst format B4 | Burst format C2 |
| 1 | 2 | AWGN | 0 | FFS | FFS | FFS |
|  |  | TDLA10-650 | 7100 Hz | FFS | FFS | FFS |

### <End of Change 2>