**3GPP TSG-RAN WG4 Meeting #102-e R4-22xxxxx**

**Electronic Meeting, 21st Feb – 3rd Mar, 2022**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.104** | **CR** | **DRAFT** | **rev** | **-** | **Current version:** | **17.4.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Draft CR on PRACH minimum requirements for high speed train (38.104) | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST\_FR2-Perf | | | | |  | ***Date:*** | | | 2022-02-25 |
|  |  | | | |  | |  | | |  |
| ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Provide initial draft CR for NR HST FR2 PRACH minimum requirements for high speed train as per work split. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | For introducing HST FR2 PRACH minimum requirements for high speed train, update clause 11.4.2.2 and A.6. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | There will be inconsistence between the specification 38.104 and RAN 4 agreements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 11.4.2.2, A.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*<START OF THE 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.

**Table 11.4.2.2-1: Time error tolerance for AWGN and TDLA30-300**

|  |  |  |  |
| --- | --- | --- | --- |
| **PRACH** | **PRACH SCS** | **Time error tolerance** | |
| **preamble** | **(kHz)** | **AWGN** | **TDLA30-300** |
| A1, A2, A3, B4, | 60 | 0.13 us | 0.28 us |
| C0, C2 | 120 | 0.07 us | 0.22 us |

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**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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 |

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 THE CHANGE 1>*

*<START OF THE CHANGE 2>*

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 |

*<END OF THE CHANGE 2>*