**3GPP TSG-RAN WG4 Meeting #94-e *R4-2001473***

**Electronic meeting, 24th Feb - 6th Mar, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.104** | **CR** | **0156** | **rev** | **--** | **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 for TS 38.104: Introduction of PRACH demodulation requirements for NR HST | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | RAN4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST-Perf | | | | |  | ***Date:*** | | | 2020-02-10 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | This CR introduces PRACH performance requirements of high speed train scenario including UE velocity of up to 350km/h. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add new tables for introducing PRACH performance requirements of high speed train scenario of UE velocity of up to 350km/h. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The performance requirement part of PRACH under high speed train condition is missing | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.4.2, A.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS 38.141-1, TS 38.141-2 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**<Start of first change>**

### 8.4.2 PRACH detection requirements

#### 8.4.2.1 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 TDLC300-100, 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 8.4.2.1-1.

The performance requirements for high speed train (table 8.4.2.2-4 and 8.4.2.2-5) are optional.

Table 8.4.2.1-1: Time error tolerance for AWGN and TDLC300-100

|  |  |  |  |
| --- | --- | --- | --- |
| PRACH preamble | PRACH SCS (kHz) | Time error tolerance | |
| AWGN | TDLC300-100 |
| 0 | 1.25 | 1.04 us | 2.55 us |
| A1, A2, A3, B4, C0, C2 | 15 | 0.52 us | 2.03 us |
| 30 | 0.26 us | 1.77 us |

The test preambles for normal mode are listed in table A.6-1 and the test parameter *msg1-FrequencyStart* is set to 0. The test preambles for high speed mode restricted set type A are listed in A.6-3 and the test preambles for high speed mode restricted set type B are listed in A.6-4. The test parameter *msg1-FrequencyStart* for high speed mode is set to 0.

#### 8.4.2.2 Minimum requirements

The probability of detection shall be equal to or exceed 99% for the SNR levels listed in Tables 8.4.2.2-1 to 8.4.2.2-5.

Table 8.4.2.2-1: PRACH missed detection requirements for Normal Mode, 1.25 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Frequency offset | SNR (dB) |
| Burst format 0 |
| 1 | 2 | AWGN | 0 | [-14.5] |
| TDLC300-100 Low | 400 Hz | [-6.6] |
| 4 | AWGN | 0 | [-16.7] |
| TDLC300-100 Low | 400 Hz | [-11.9] |
| 8 | AWGN | 0 | [-18.9] |
| TDLC300-100 Low | 400 Hz | [-15.8] |

Table 8.4.2.2-2: PRACH missed detection requirements for Normal Mode, 15 kHz SCS

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Frequency offset | SNR (dB) | | | | | |
| Burst format A1 | Burst format A2 | Burst format A3 | Burst format B4 | Burst format C0 | Burst format C2 |
| 1 | 2 | AWGN | 0 | [-9.3] | [-12.6] | [-14.2] | [-16.8] | [-6.3] | [-12.5] |
| TDLC300-100 Low | 400 Hz | [-2.1] | [-4.8] | [-6.6] | [-8.8] | [0.8] | [-4.9] |
| 4 | AWGN | 0 | [-11.6] | [-14.3] | [-16.0] | [-19.0] | [-8.7] | [-14.1] |
| TDLC300-100 Low | 400 Hz | [-7.3] | [-10.3] | [-11.7] | [-13.8] | [-4.3] | [-10.2] |
| 8 | AWGN | 0 | [-13.8] | [-16.7] | [-18.2] | [-21.2] | [-11.1] | [-16.6] |
| TDLC300-100 Low | 400 Hz | [-11.0] | [-13.9] | [-15.2] | [-17.3] | [-8.1] | [-13.9] |

Table 8.4.2.2-3: PRACH missed detection requirements for Normal Mode, 30 kHz SCS

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Frequency offset | SNR (dB) | | | | | |
| Burst format A1 | Burst format A2 | Burst format A3 | Burst format B4 | Burst format C0 | Burst format C2 |
| 1 | 2 | AWGN | 0 | -9.1 | -12.0 | -13.8 | -16.5 | -6.1 | -11.9 |
| TDLC300-100 Low | 400 Hz | -2.8 | -5.7 | -7.4 | -9.9 | 0.1 | -5.6 |
| 4 | AWGN | 0 | -11.4 | -14.2 | -15.9 | -19.0 | -8.6 | -14.1 |
| TDLC300-100 Low | 400 Hz | -7.2 | -10.4 | -12.0 | -14.5 | -4.5 | -10.4 |
| 8 | AWGN | 0 | -13.7 | -16.6 | -18.1 | -21.1 | -11.0 | -16.5 |
| TDLC300-100 Low | 400 Hz | -10.7 | -13.7 | -15.1 | -17.6 | -7.8 | -13.7 |

Table 8.4.2.2-4: PRACH missed detection requirements for High speed train burst format 0, restricted set type A, 1.25 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Frequency offset | SNR (dB) |
| 1 | 2 | TDLC300-100 Low | 400 Hz | TBD |
| AWGN | 625 Hz | TBD |
| AWGN | 1340 Hz | TBD |
| 4 | TDLC300-100 Low | 400 Hz | TBD |
| AWGN | 625 Hz | TBD |
| AWGN | 1340 Hz | TBD |
| 8 | TDLC300-100 Low | 400 Hz | TBD |
| AWGN | 625 Hz | TBD |
| AWGN | 1340 Hz | TBD |

Table 8.4.2.2-5: PRACH missed detection requirements for High speed train burst format 0, restricted set type B, 1.25 kHz SCS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Propagation conditions and correlation matrix (Annex G) | Frequency offset | SNR (dB) |
| 1 | 2 | TDLC300-100 Low | 400 Hz | TBD |
| AWGN | 625 Hz | TBD |
| AWGN | 2334 Hz | TBD |
| 4 | TDLC300-100 Low | 400 Hz | TBD |
| AWGN | 625 Hz | TBD |
| AWGN | 2334 Hz | TBD |
| 8 | TDLC300-100 Low | 400 Hz | TBD |
| AWGN | 625 Hz | TBD |
| AWGN | 2334 Hz | TBD |

**<END of first change>**

**<Start of second change>**

# 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, B4, C0, C2 | 15 | 23 | 0 | 0 |
| 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, B4, C0, C2 | 60 | 69 | 0 | 0 |
| 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 |

**<End of second change>**