**3GPP TSG-RAN4 Meeting #95-e *draftR4-2008823***

**Online, , 25th May 2020 - 5th Jun 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.104** | **CR** | **0165** | **rev** | **1** | **Current version:** | **16.3.0** |  |
|  | | | | | | | | |
| *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 38.104: HST PUSCH demodulation requirements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_HST-Perf | | | | |  | ***Date:*** | | | 2020-05-12 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | - SNR of performance requirements were left as TBD in last meeting. Will be updated based on the results collected in this meeting.  - BS type applicability is missing from HST perfromance requirements.  - Some typos have been spotted.  - 500kph PUSCH requirements to be introduced after March 2020. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | CR implementing endorsed draftCR R4-2005537.  Summary of change from R4-2005537:  - Updated 350kh requirement TBDs to capture values agreed in last meeting. Remains in square brackets [R4-2003270].  - Captured agreement of “The performance requirements for PUSCH for high speed train shall only apply to Wide Area Base Stations and Medium Range Base Stations” [R4 2002405].  - Typo correction “matrics” -> “matrices”.  - Added new section covering 500kph requirements.  Additional changes in RAN4#95e are tracked as “Nokia2” and highlighted.  - “The performance requirements for PUSCH for high speed train only apply to Wide Area Base Stations and Medium Range Base Stations (subject to declaration).”, clarification was raised in the first round and not contested. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | TBD remain in performance requirements. Performance requirements apply to wrong BS types. 500kph requirements not introduced, thus PUSCH performance under high speed train conditions assuming a UE velocity of up to 500km/h is not ensured. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.2.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | Agenda item: 6.17.2.2.1 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R4-2006053 | | | | | | | | |

**<<Start of change>>**

### 8.2.4 Requirements for PUSCH for high speed train

#### 8.2.4.1 General

The performance requirement of PUSCH is determined by a minimum required throughput for a given SNR. The required throughput is expressed as a fraction of maximum throughput for the FRCs listed in annex A. The performance requirements assume HARQ retransmissions. The performance requirements for high speed train are optional.

The performance requirements for PUSCH for high speed train only apply to Wide Area Base Stations and Medium Range Base Stations (subject to declaration).

Table: 8.2.4.1-1 Test parameters for testing high speed train PUSCH

|  |  |  |
| --- | --- | --- |
| Parameter | | Value |
| Transform precoding | | Disabled |
| Default TDD UL-DL pattern (Note 1) | | 15 kHz SCS:  3D1S1U, S=10D:2G:2U  30 kHz SCS:  7D1S2U, S=6D:4G:4U |
| HARQ | Maximum number of HARQ transmissions | 4 |
| RV sequence | 0, 2, 3, 1 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| Additional DM-RS position | pos2 |
| Number of DM-RS CDM group(s) without data | 2 |
| Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
| DM-RS port | 0 |
| DM-RS sequence generation | NID0=0, nSCID =0 |
| Time domain resource assignment | PUSCH mapping type | A |
| Start symbol | 0 |
| Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | Full applicable test bandwidth |
| Frequency hopping | Disabled |
| Code block group based PUSCH transmission | | Disabled |
| Note 1: The same requirements are applicable to FDD and TDD with different UL-DL pattern. | | |

#### 8.2.4.2 Minimum requirements

The throughput shall be equal to or larger than the fraction of maximum throughput for the FRCs stated in tables 8.2.4.2-1 to 8.2.4.2-4 at the given SNR for 1Tx. FRCs are defined in annex A. Unless stated otherwise, the MIMO correlation matrices for the gNB are defined in annex G for low correlation.

Table 8.2.4.2-1: Minimum requirements for PUSCH, Type A, 10 MHz channel bandwidth, 15 kHz SCS, 350km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions  (Annex G) | Fraction of maximum throughput | FRC  (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-33 | pos2 | -3.7 |
| Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-29 | pos2 | 8.4 |
| Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-33 | pos2 | -3.6 |
| Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A4-29 | pos2 | 8.7 |
| 8 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-33 | pos2 | -9.2 |
| Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-29 | pos2 | 2.6 |

Table 8.2.4.2-2: Minimum requirements for PUSCH, Type A, 40 MHz channel bandwidth, 30 kHz SCS, 350km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions  (Annex G) | Fraction of maximum throughput | FRC  (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-34 | pos2 | -3.7 |
| Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-30 | pos2 | 8.5 |
| Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-34 | pos2 | -3.6 |
| Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A4-30 | pos2 | 8.7 |
| 8 | Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A3-34 | pos2 | -9.1 |
| Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-30 | pos2 | 2.7 |

Table 8.2.4.2-3: Minimum requirements for PUSCH, Type A, 10 MHz channel bandwidth, 15 kHz SCS, 500km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions  (Annex G) | Fraction of maximum throughput | FRC  (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-33 | pos2 | -3.9 |
| Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-29 | pos2 | 8.5 |
| Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A3-33 | pos2 | -3.6 |
| Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A4-29 | pos2 | 9.2 |
| 8 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-33 | pos2 | -9.4 |
| Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-29 | pos2 | 2.7 |

Table 8.2.4.2-4: Minimum requirements for PUSCH, Type A, 40 MHz channel bandwidth, 30 kHz SCS, 500km/h

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions  (Annex G) | Fraction of maximum throughput | FRC  (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-34 | pos2 | -3.9 |
| Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-30 | pos2 | 8.7 |
| Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A3-34 | pos2 | -3.6 |
| Normal | HST Scenario 3-NR500 | 70 % | G-FR1-A4-30 | pos2 | 8.0 |
| 8 | Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A3-34 | pos2 | -9.2 |
| Normal | HST Scenario 1-NR500 | 70 % | G-FR1-A4-30 | pos2 | 2.8 |

**<<End of change>>**