**3GPP TSG-RAN4 Meeting #94-e *R4-2002415***

**e-meeting, 24th February – 6th March 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **38.141-2** | **CR** | **0121** | **rev** | **1** | **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:***  |  Introducting of conformance tests for 350km/h HST |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_HST-Perf  |  | ***Date:*** | 2020-02-24 |
|  |  |  |  |  |
| ***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 canbe 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:*** | There is a need to introduce OTA conformance tests corresponding to the 350km/h HST performance requirements introduced into 38.104. |
|  |  |
| ***Summary of change:*** | New section 8.2.4 introduced with 350km/h conformance test and requirements. |
|  |  |
| ***Consequences if not approved:*** | No HST conformance test and requirements corresponding to 38.104 performance requirements. |
|  |  |
| ***Clauses affected:*** | 8.2.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS/TR 38.104 CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS/TR 38.141-1 CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

### 8.2.4 Performance requirements for PUSCH for high speed train

#### 8.2.4.1 Definition and applicability

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 re-transmissions. The performance requirements for High Speed Train conditions are optional.

Which specific test(s) are applicable to BS is based on the test applicability rules defined in subclause 8.1.2.1.

#### 8.2.4.2 Minimum Requirement

The minimum requirement is in TS 38.104 [2] subclause 11.2.1.4.

#### 8.2.4.3 Test Purpose

The test shall verify the receiver’s ability to achieve throughput under multipath fading propagation conditions for a given SNR.

#### 8.2.4.4 Method of test

##### 8.2.4.4.1 Initial Conditions

Test environment: Normal, see annex B.2.

RF channels to be tested: M; see subclause 4.9.1.

RF channels to be tested for carrier aggregation: MBW Channel CA; see subclause 4.9.1.

Direction to be tested: OTA REFSENS *receiver target reference direction* (see D.54 in table 4.6-1).

##### 8.2.4.4.2 Procedure

1) Place the BS with its manufacturer declared coordinate system reference point in the same place as calibrated point in the test system, as shown in annex E.3.

2) Align the manufacturer declared coordinate system orientation of the BS with the test system.

3) Set the BS in the declared direction to be tested.

4) Connect the BS tester generating the wanted signal, multipath fading simulators and AWGN generators to a test antenna via a combining network in OTA test setup, as shown in annex E.3. Each of the demodulation branch signals should be transmitted on one polarization of the test antenna(s).

5) The characteristics of the wanted signal shall be configured according to the corresponding UL reference measurement channel defined in annex A, and according to additional test parameters listed in table 8.2.4.4.2-1.

Table 8.2.4.4.2-1: Test parameters for testing PUSCH under HST conditions

|  |  |
| --- | --- |
| Parameter | Value |
| Transform precoding | Disabled |
| Uplink-downlink allocation for TDD | 15 kHz SCS:3D1S1U, S=10D:2G:2U30 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 |
| First DM-RS position | pos 2 or pos 3 (NOTE 2) |
| 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.Note 2: Either pos2 or pos3 may be selected for conformance testing. |

 The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J. Unless stated otherwise, the MIMO correlation matrics for the gNB are defined in annex G for low correlation.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the BS receiver is as specified in subclause 8.2.4.5 and that the SNR at the BS receiver is not impacted by the noise floor.

The power level for the transmission may be set such that the AWGN level at the RIB is equal to the AWGN level in table 8.2.4.4.2-2.

Table 8.2.4.4.2-2: AWGN power level at the BS input

|  |  |  |  |
| --- | --- | --- | --- |
| BS type | Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| 1-O | 15 | 10 | -83.3 - ΔOTAREFSENS dBm / 9.36 MHz |
| 30 | 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and subclause 7.1. |

8) For reference channels applicable to the BS, measure the throughput.

#### 8.2.4.5 Test Requirement

The throughput measured according to subclause 8.2.4.4.2 shall not be below the limits for the SNR levels specified in table 8.2.4.5-1 to 8.2.4.5-2.

Table 8.2.4.5-1: Test requirements for PUSCH, Type A, 10 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions and correlation matrix (Annex J) | 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 | [TBD] |
| Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-29 | pos2 | [TBD] |
| Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-33 | pos2 | [TBD] |
| Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A4-29 | pos2 | [TBD] |

Table 8.2.4.5-2: Test requirements for PUSCH, Type A, 40 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions and correlation matrix (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 | [TBD] |
| Normal | HST Scenario 1-NR350 | 70 % | G-FR1-A4-30 | pos2 | [TBD] |
| Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A3-34 | pos2 | [TBD] |
| Normal | HST Scenario 3-NR350 | 70 % | G-FR1-A4-30 | pos2 | [TBD] |