**3GPP TSG-RAN WG4 Meeting #97-e *R4-2017523***

**E-meeting, 2nd – 13th November 2020**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.141-2** | **CR** | **0246** | **rev** | **1** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](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:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Intel Corporation, NTT DOCOMO, INC | | | | | | | | | |
| ***Source to TSG:*** | RAN4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_L1enh\_URLLC-Perf | | | | |  | ***Date:*** | | | 2020-10-23 |
|  |  | | | |  | |  | | |  |
| ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Definition of BS PUSCH demodulation requirements for scenarios with PUSCH mapping Type B with low number of symbols | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Added requirements for scenarios with PUSCH mapping Type B with low number of symbols | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | BS PUSCH demodulation requirements for scenarios with PUSCH mapping Type B with low number of symbols are not completed | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.2, C.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS 38.104 | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.141-1 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**START OF CHANGE**

## 8.2 OTA performance requirements for PUSCH

<SKIP UNCHANGED PART>

8.2.8 Performance requirements for PUSCH mapping Type B with non-slot transmission

#### 8.2.8.1 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.

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

#### 8.2.8.2 Minimum Requirement

For *BS type 1-O*, the minimum requirement is in TS 38.104 [2], clause 11.2.1.8.

For *BS type 2-O*, the minimum requirement is in TS 38.104 [2], clause 11.2.2.5.

#### 8.2.8.3 Test purpose

The test shall verify the receiver's ability to achieve throughput under scenarios with non-slot PUSCH Type B transmission for a given SNR.

#### 8.2.8.4 Method of test

##### 8.2.8.4.1 Initial conditions

Test environment: Normal, see annex B.2.

RF channels to be tested for single carrier: M, see clause 4.9.1.

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

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

##### 8.2.8.4.2 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 8.2.8.4.2-1.

Table 8.2.8.4.2-1: Test parameters for testing PUSCH

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **BS type 1-O** | **BS type 2-O** |
| 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 | 60 kHz and 120kHz SCS:  3D1S1U, S=10D:2G:2U |
| HARQ | Maximum number of HARQ transmissions | 1 | |
|  | RV sequence | 0, 2, 3, 1 | |
| DM-RS | DM-RS configuration type | 1 | |
|  | DM-RS duration | single-symbol DM-RS | |
|  | Additional DM-RS position | pos0 | [pos0, pos1] |
|  | Number of DM-RS CDM group(s) without data | 2 | |
|  | Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB | |
|  | DM-RS port(s) | {0} | |
|  | DM-RS sequence generation | NID0=0, nSCID=0 | |
| Time | PUSCH mapping type | B | B |
| domain | Start symbol | 0 | 0 |
| resource assignment | Allocation length | 2 | [2,4,7] |
| Frequency | RB assignment | Full applicable test bandwidth | |
| domain resource assignment | Frequency hopping | Disabled | |
| TPMI index for 2Tx two layer spatial multiplexing transmission | | 0 | |
| Code block group based PUSCH transmission | | Disabled | |
| PTRS | Frequency density (*KPT-RS*) | N.A. | [2, Disabled] |
| configuration | Time density (*LPT-RS*) | N.A. | [1, Disabled] |
| Note 1: The same requirements are applicable to FDD and TDD with different UL-DL patterns for BS type 1-O, and the same requirements are applicable to TDD with different UL-DL patterns for BS type 2-O. | | | |

6) The multipath fading emulators shall be configured according to the corresponding channel model defined in annex J.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the BS receiver is as specified in clause 8.2.8.5.1 and 8.2.8.5.2 for *BS type 1-O* and *BS type 2-O* respectively, 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 8.2.8.4.2-2.

Table 8.2.8.4.2-2: AWGN power level at the BS input

|  |  |  |  |
| --- | --- | --- | --- |
| BS type | Sub-carrier spacing (kHz) | Channel bandwidth (MHz) | AWGN power level |
| BS type 1-O | 15 | 5 | -86.5 - ΔOTAREFSENS dBm / 4.5 MHz |
|  |  | 10 | -83.3 - ΔOTAREFSENS dBm / 9.36 MHz |
|  | 30 | 20 | -80.4 - ΔOTAREFSENS dBm / 18.36 MHz |
|  |  | 40 | -77.2 - ΔOTAREFSENS dBm / 38.16 MHz |
| BS type 2-O | 60 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 47.52 MHz |
|  | 120 | 50 | EISREFSENS\_50M + ΔFR2\_REFSENS + 15 dBm / 46.08 MHz |
| NOTE 1: ΔOTAREFSENS as declared in D.53 in table 4.6-1 and clause 7.1.  NOTE 2: ΔFR2\_REFSENS = -3 dB as described in clause 7.1, since the OTA REFSENS reference direction (as declared in D.54 in table 4.6-1) is used for testing.  NOTE 3: EISREFSENS\_50M as declared in D.28 in table 4.6-1. | | | |

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

#### 8.2.8.5 Test Requirement

##### 8.2.8.5.1 Test requirement for *BS type 1-O*

The throughput measured according to subclause 8.2.8.4.2 shall not be below the limits for the SNR levels specified in table 8.2.8.5.1-1 to table 8.2.8.5.1-4 for 1Tx.

Table 8.2.8.5.1-1: Test requirements for PUSCH, Type B, 5 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 | TDLC300-100 Low | 70% | G-FR1-A3B-1 | pos0 | TBD |

Table 8.2.8.5.1-2: Test requirements for PUSCH, Type B, 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 | TDLC300-100 Low | 70% | G-FR1-A3B-2 | pos0 | TBD |

Table 8.2.8.5.1-3: Test requirements for PUSCH, Type B, 10 MHz channel bandwidth, 30 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 | TDLC300-100 Low | 70% | G-FR1-A3B-3 | pos0 | TBD |

Table 8.2.8.5.1-4: Test requirements for PUSCH, Type B, 40 MHz channel bandwidth, 30 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 | TDLC300-100 Low | 70% | G-FR1-A3B-4 | pos0 | TBD |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex C.

##### 8.2.8.5.2 Test requirement for *BS type 2-O*

The throughput measured according to clause 8.2.8.4.2 shall not be below the limits for the SNR levels specified in table 8.2.8.5.2-1 to 8.2.8.5.2-2 for 1Tx.

Table 8.2.8.5.2-1: Test requirements for PUSCH with 70% of maximum throughput, 50 MHz Channel Bandwidth, 60 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 | PT-RS | SNR  (dB) |
| 1 | 2 | Normal | TDLA30-300 Low | 70 % | TBD | TBD | TBD | TBD |

Table 8.2.8.5.2-2: Test requirements for PUSCH with 70% of maximum throughput, 50 MHz Channel Bandwidth, 120 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 | PT-RS | SNR  (dB) |
| 1 | 2 | Normal | TDLA30-300 Low | 70 % | TBD | TBD | TBD | TBD |

NOTE: If the above Test Requirement differs from the Minimum Requirement then the Test Tolerance applied for this test is non-zero. The Test Tolerance for this test and the explanation of how the Minimum Requirement has been relaxed by the Test Tolerance is given in annex C.

C.3 Measurement of performance requirements

**Table C.3-1: Derivation of test requirements (FR1 OTA performance tests)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test** | **Minimum Requirement in TS 38.104 [2]** | **Test Tolerance (TTOTA)** | **Test requirement in the present document** |
| 8.2.1 Performance requirements for PUSCH with transform precoding disabled | See clause 11.2.1.1 | 0.6 dB | Formula: SNR + TTOTA  T-put limit unchanged |
| 8.2.2 Performance requirements for PUSCH with transform precoding enabled | See clause 11.2.1.2 | 0.6 dB | Formula: SNR + TTOTA  T-put limit unchanged |
| 8.2.3 Performance requirements for UCI multiplexed on PUSCH | See clause 11.2.1.3 | 0.6 dB | Formula: SNR + TTOTA  BLER limit unchanged |
| 8.2.4 Performance requirements for PUSCH for high speed train | SNRs as specified | 0.3 dB | Formula: SNR + TT  T-put limit unchanged |
| 8.2.8 Performance requirements for PUSCH mapping type B with non-slot transmission | See clause 11.2.1.8 | 0.6 dB | Formula: SNR + TTOTA  T-put limit unchanged |
| 8.3.1 Performance requirements for PUCCH format 0 | See clause 11.3.1.2 | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  Correct ACK limit unchanged |
| 8.3.2 Performance requirements for PUCCH format 1 | See clause 11.3.1.3 | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  False NACK limit unchanged  Correct ACK limit unchanged |
| 8.3.3 Performance requirements for PUCCH format 2 | See clause 11.3.1.4 | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  Correct ACK limit unchanged  UCI BLER limit unchanged |
| 8.3.4 Performance requirements for PUCCH format 3 | See clause 11.3.1.5 | 0.6 dB | Formula: SNR + TTOTA  UCI BLER limit unchanged |
| 8.3.5 Performance requirements for PUCCH format 4 | See clause 11.3.1.6 | 0.6 dB | Formula: SNR + TTOTA  UCI BLER limit unchanged |
| 8.3.6 Performance requirements for multi-slot PUCCH | See clause 11.3.1.7 | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  False NACK limit unchanged  Correct ACK limit unchanged |
| 8.4.1 PRACH false alarm probability and missed detection | See clause 11.4.1 | 0.6 dB for fading cases  0.3 dB for AWGN cases | Formula: SNR + TTOTA  PRACH False detection limit unchanged  PRACH detection limit unchanged |
| 8.4.2 Performance requirements for PRACH for high speed train | SNRs as specified | 0.6 dB for fading cases  0.3 dB for AWGN cases | Formula: SNR + TT  PRACH False detection limit unchanged  PRACH detection limit unchanged |
| 8.2.5 Performance requirements for UL timing adjustment | See clause 11.2.1.5 | 0.3 dB for AWGN cases | Formula: SNR + TTOTA  T-put limit unchanged |
| NOTE: TT values are applicable for normal condition unless otherwise stated. | | | |

**Table C.3-2: Derivation of test requirements (FR2 OTA performance tests)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test** | **Minimum requirement in TS 38.104 [2]** | **Test Tolerance (TTOTA)** | **Test requirement in the present document** |
| 8.2.1 Performance requirements for PUSCH with transform precoding disabled | See clause 11.2.2.1 | 0.6 dB | Formula: SNR + TTOTA  T-put limit unchanged |
| 8.2.2 Performance requirements for PUSCH with transform precoding enabled | See clause 11.2.2.2 | 0.6 dB | Formula: SNR + TTOTA  T-put limit unchanged |
| 8.2.3 Performance requirements for UCI multiplexed on PUSCH | See clause 11.2.2.3 | 0.6 dB | Formula: SNR + TTOTA  BLER limit unchanged |
| 8.2.8 Performance requirements for PUSCH mapping Type B with non-slot transmission | See clause 11.2.2.5 | 0.6 dB | Formula: SNR + TTOTA  T-put limit unchanged |
| 8.3.1 Performance requirements for PUCCH format 0 | See clause 11.3.2.2 | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  Correct ACK limit unchanged |
| 8.3.2 Performance requirements for PUCCH format 1 | See clause 11.3.2.3 | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  False NACK limit unchanged  Correct ACK limit unchanged |
| 8.3.3 Performance requirements for PUCCH format 2 | See clause 11.3.2.4 | 0.6 dB | Formula: SNR + TTOTA  False ACK limit unchanged  Correct ACK limit unchanged  UCI BLER limit unchanged |
| 8.3.4 Performance requirements for PUCCH format 3 | See clause 11.3.2.5 | 0.6 dB | Formula: SNR + TTOTA  UCI BLER limit unchanged |
| 8.3.5 Performance requirements for PUCCH format 4 | See clause 11.3.2.6 | 0.6 dB | Formula: SNR + TTOTA  UCI BLER limit unchanged |
| 8.4.1 PRACH false alarm probability and missed detection | See clause 11.4.2 | 0.6 dB for fading cases  0.3 dB for AWGN cases | Formula: SNR + TTOTA  PRACH False detection limit unchanged  PRACH detection limit unchanged |
| NOTE: TT values are applicable for normal condition unless otherwise stated. | | | |

**END OF CHANGE**