**3GPP TSG- Meeting #**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
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| *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:*** |  | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *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:*** | | There is a need to introduce the URLLC requirement for 0.001% BLER, as discussed for the CR split at RAN4#95-e. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * New performance requirements section including methodology * Test requirement section for the 0.001% BLER test introduced * Annex C.3 Updated to include “X” factor * Minor updates to Annex D | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | URLLC requirements incomplete | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.2.6, C.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | R4-2015025 | | | | | | | | |

### 8.2.6 Performance requirements for PUSCH with 0.001% BLER

#### 8.2.6.1 Definition and applicability

The performance requirement of PUSCH is determined by a maximum required transport block error rate (BLER) for a given SNR. The required BLER is defined as the probability of incorrectly decoding the transport block after reaching the maximum number of HARQ transmissions for the FRCs listed in annex A.

#### 8.2.6.2 Minimum Requirement

For *BS type 1-O*, the minimum requirement is in TS 38.104 [2], subclause 11.2.1.6.

For *BS type 2-O*, no requirement and no test are defined.

#### 8.2.6.3 Test Purpose

The test shall verify the receiver's ability to achieve 0.001% BLER under AWGN conditions for a given SNR.

#### 8.2.6.4 Method of test

##### 8.2.6.4.1 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).

##### 8.2.6.4.2 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 8.2.5.4.2-1.

Table 8.2.6.4.2-1: Test parameters for testing PUSCH with 0.001% BLER

|  |  |  |
| --- | --- | --- |
| 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 | 1 |
| RV sequence | 0 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| Additional DM-RS position | Pos1 |
| Number of DM-RS CDM group(s) without data | 1 |
| Ratio of PUSCH EPRE to DM-RS EPRE | -3 dB |
| DM-RS port(s) | {0} |
| DM-RS sequence generation | NID0=0, nSCID =0 |
| Time domain resource assignment | PUSCH mapping type | A, B |
| 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 patterns. | | |

No multipath fading channel is included in the test.

7) Adjust the test signal mean power so the calibrated radiated SNR value at the BS receiver is as specified in subclause 8.2.6.5 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 8.2.6.4.2-2.

Table 8.2.5.4.2-2: 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 BLER. BLER is evaluated based on the test methodology described in Annex I.

#### 8.2.6.5 Test requirement

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

The throughput measured according to subclause 8.2.6.4.2 shall not be below the limits for the SNR levels specified in table 8.2.6.5.1-1 to table 8.2.6.5.1-8 for 0.001% BLER if declared to be supported.

Table 8.2.6.5.1-1: Test requirements for PUSCH with 0.001% BLER, Type A, 5 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions | BLER | FRC (annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | AWGN | 0.001% | G-FR1-A3A-1 | Pos1 | -3.8 |

Table 8.2.6.5.1-2: Test requirements for PUSCH with 0.001% BLER, Type A, 10 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions | BLER | FRC (annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | AWGN | 0.001% | G-FR1-A3A-2 | Pos1 | -4.6 |

Table 8.2.6.5.1-3: Test requirements for PUSCH with 0.001% BLER, Type A, 10 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions | BLER | FRC (annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | AWGN | 0.001% | G-FR1-A3A-3 | Pos1 | -4.1 |

Table 8.2.6.5.1-4: Test requirements for PUSCH with 0.001% BLER, Type A, 40 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions | BLER | FRC (annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | AWGN | 0.001% | G-FR1-A3A-4 | Pos1 | -4.9 |

Table 8.2.6.5.1-5: Test requirements for PUSCH with 0.001% BLER, Type B, 5 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions | BLER | FRC (annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | AWGN | 0.001% | G-FR1-A3A-1 | Pos1 | -3.9 |

Table 8.2.6.5.1-6: Test requirements for PUSCH with 0.001% BLER, Type B, 10 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions | BLER | FRC (annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | AWGN | 0.001% | G-FR1-A3A-2 | Pos1 | -4.6 |

Table 8.2.6.5.1-7: Test requirements for PUSCH with 0.001% BLER, Type B, 10 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions | BLER | FRC (annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | AWGN | 0.001% | G-FR1-A3A-3 | Pos1 | -4.2 |

Table 8.2.6.5.1-8: Test requirements for PUSCH with 0.001% BLER, Type B, 40 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of demodulation branches | Cyclic prefix | Propagation conditions | BLER | FRC (annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | AWGN | 0.001% | G-FR1-A3A-4 | Pos1 | -4.9 |

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 subclause 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 subclause 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 |
| 8.2.6 Performance requirements for PUSCH with 0.001% BLER | SNRs as specified | 0.3 dB | Formula: SNR + TT + 1dB  1dB is added to the test requirement to facilitate early test pass. The BLER delivered by the device during the test will be lower than the test requirement, which enables compliance to the requirement to be demonstrated with a number of observed block errors lower than a certain threshold. |
| 8.3.1 Performance requirements for PUCCH format 0 | See subclause 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 subclause 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 subclause 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 subclause 11.3.1.5 | 0.6 dB | Formula: SNR + TTOTA  UCI BLER limit unchanged |
| 8.3.5 Performance requirements for PUCCH format 4 | See subclause 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 subclause 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 |
| 8.2.5 Performance requirements for UL timing adjustment | See subclause 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. | | | |