**3GPP TSG-RAN WG4 Meeting #97-e R4-2017527**

**Electronic Meeting, 2nd – 13th Nov, 2020**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.104** | **CR** | **0249** | **rev** | **1** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *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 to TS 38.104: Addition of BS performance requirements for URLLC PUSCH repetition Type A | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_L1enh\_URLLC-Perf | | | | |  | ***Date:*** | | | 2020-10-20 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | PUSCH repetition Type A was agreed to be introduced as the new feature for URLLC to improve the high reliability for PUSCH performance. In order to verify the demodulation performance for PUSCH repetition Type A, the new demodulation requirements are defined. | | | | | | | | |
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| ***Summary of change:*** | | New PUSCH performance requirements are introduced in section 8.2.7 and section 11.2.1 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | New requirement for PUSCH with aggregation factor configured cannot be verified. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.2.7 11.2.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS 38.141-1 and TS 38.141-2 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Resubmittion of endorsed draftCR R4-2012655 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R4-2015623 | | | | | | | | |

*<Start of the change 1>*

### 8.2.7 Requirements for PUSCH repetition Type A

#### 8.2.7.1 General

The performance requirement of PUSCH is determined by a maximum block error probability (BLER) for a given SNR. The BLER is defined as the probability of incorrectly decoding the PUSCH information when the PUSCH information is sent. The performance requirements assume HARQ re-transmissions.

Table: 8.2.7.1-1 Test parameters for testing PUSCH repetition Type A

|  |  |  |
| --- | --- | --- |
| 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, 3, 0, 3 [Note 2] |
| 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 | 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, B |
| Start symbol | 0 |
| Allocation length | 14 |
| PUSCH aggregation factor | 30 kHz SCS: n2  15 kHz SCS: n2 for FDD and n8 for TDD [Note 3] |
| 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: The effective RV sequence is {0, 2, 3, 1} with slot aggregation.  Note 3: The intention of this configuration is to have two effective transmissions of the transport block. To achieve this for the standard TDD pattern captured in this table, a value of n8 is necessary, while for FDD a value of n2 is necessary. | | |

#### 8.2.7.2 Minimum requirements

The BLER shall be equal to or smaller than the required target BLER for the FRCs stated in tables 8.2.7.2-1 to 8.2.7.2-8 at the given SNR for 1Tx. FRCs are defined in annex A.

Table 8.2.7.2-1: Minimum requirements for PUSCH, Type A, 5 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Target BLER | FRC (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | TDLB100-400 Low | 1% (Note 1) | G-FR1-A3A-1 | pos1 | [-8.5] |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | |

Table 8.2.7.2-2: Minimum requirements for PUSCH, Type A, 10 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Target BLER | FRC (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | TDLB100-400 Low | 1% (Note 1) | G-FR1- A3A -2 | pos1 | [-9.3] |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | |

Table 8.2.7.2-3: Minimum requirements for PUSCH, Type A, 10 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Target BLER | FRC (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | TDLB100-400 Low | 1% (Note 1) | G-FR1- A3A -3 | pos1 | [-8.2] |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | |

Table 8.2.7.2-4: Minimum requirements for PUSCH, Type A, 40 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Target BLER | FRC (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | TDLB100-400 Low | 1% (Note 1) | G-FR1- A3A -4 | pos1 | [-10.3] |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | |

Table 8.2.7.2-5: Minimum requirements for PUSCH, Type B, 5 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Target BLER | FRC (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | TDLB100-400 Low | 1% (Note 1) | G-FR1- A3A -1 | pos1 | [-8.2] |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | |

Table 8.2.7.2-6: Minimum requirements for PUSCH, Type B, 10 MHz channel bandwidth, 15 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Target BLER | FRC (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | TDLB100-400 Low | 1% (Note 1) | G-FR1- A3A -2 | pos1 | [-9.8] |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | |

Table 8.2.7.2-7: Minimum requirements for PUSCH, Type B, 10 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Target BLER | FRC (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | TDLB100-400 Low | 1% (Note 1) | G-FR1- A3A -3 | pos1 | [-8.2] |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | |

Table 8.2.7.2-8: Minimum requirements for PUSCH, Type B, 40 MHz channel bandwidth, 30 kHz SCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | Propagation conditions and correlation matrix (Annex G) | Target BLER | FRC (Annex A) | Additional DM-RS position | SNR  (dB) |
| 1 | 2 | Normal | TDLB100-400 Low | 1% (Note 1) | G-FR1- A3A -4 | pos1 | [-10.2] |
| Note 1: BLER is defined as residual BLER; i.e. ratio of incorrectly received transport blocks / sent transport blocks, independently of the number HARQ transmission(s) for each transport block. | | | | | | | |

*<End of the change 1>*

*<Start of the change 2>*

## 11.2 Performance requirements for PUSCH

### 11.2.1 Requirements for *BS type 1-O*

#### 11.2.1.1 Requirements for PUSCH with transform precoding disabled

Apply the requirements defined in clause 8.2.1 for 2Rx.

#### 11.2.1.2 Requirements for PUSCH with transform precoding enabled

Apply the requirements defined in clause 8.2.2 for 2Rx.

#### 11.2.1.3 Requirements for UCI multiplexed on PUSCH

Apply the requirements defined in clause 8.2.3 for 2Rx.

#### 11.2.1.4 Requirements for PUSCH for high speed train

Apply the requirements defined in clause 8.2.4 for 2Rx.

#### 11.2.1.5 Requirements for UL timing adjustment

Apply the requirements defined in clause 8.2.5 for 2Rx.

#### 11.2.1.7 Requirements for PUSCH repetition Type A

Apply the requirements defined in clause 8.2.7 for 2Rx.

*<End of the change 2>*