**3GPP TSG-RAN WG4 Meeting #96-e *R4-2012706***

**Electronic Meeting, 17th - 28th Aug, 2020**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.104** | **CR** | - | **rev** | **-** | **Current version:** | **16.4.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Draft CR to TS 38.104 BS demodulation requirements for 2-step RACH | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_2step\_RACH-Perf | | | | |  | ***Date:*** | | | 2020-08-01 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | BS demodulation requirements for 2-step RACH are missing in TS 38.104 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | This draftCR add BS demodulation requirements for 2-step RACH   1. Add section 8.2.6 2. Add section 11.2.1.6 3. Add section 11.2.2.4 4. Add Annex A.8 5. Add Annex A.9 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No BS demodulation performance requirements for 2-step RACH | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.2, 11.2, Annex A | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | | **X** |  | Test specifications | | | | 38.141-1, 38.141-2 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**<<Start of change 1/5>>**

### 8.2.6 Requirements of PUSCH for 2-step RACH

#### 8.2.6.1 General

The performance requirement of PUSCH for 2-step RACH is determined by a minimum required block error rate of MsgA received by BS at given SNR for the FRCs listed in Annex A. The performance requirements assume that the precedent preamble of MsgA is correctly detected in a 2-step RACH procedure, and no HARQ retransmissions.

Table 8.2.6-1 Test parameters for testing PUSCH for 2-step RACH

|  |  |  |
| --- | --- | --- |
| Parameter | | Value |
| Transform precoding | | Disabled |
| Channel bandwidth | | 15 kHz SCS: 10 MHz  30 kHz SCS: 40 MHz |
| MCS | | 0 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| DM-RS position (*l0*) | 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 | Both A and B |
| Allocation length | 14 |
| Frequency domain resource assignment | RB assignment | 2 PRBs |
| Starting PRB index | 0 |
| Frequency hopping | Disabled |
| Time offset (TO) Cycling (µs) | Medium level | 15k SCS: 0:0.4:2  30k SCS: 0:0.2:1 |
| High level | [15k SCS: 0:0.1:3.8  30k SCS: 0:0.05:1.9] |
|  | | |

#### 8.2.6.2 Minimum requirements

The block error rate of MsgA for the reference measurement channel as specified in Annex A at the SNR given shall not exceed 1% in table 8.2.6.1-1 for mapping type A and table 8.2.6.1-2 for mapping type B respectively.

Table 8.2.6.1-1 Minimum requirements of PUSCH for 2-step RACH with mapping type A

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | TO cycling Level | Channel Bandwidth [MHz] | SCS [kHz] | Propagation conditions and correlation matrix (Annex G) | FRC (Annex A) | SNR  [dB] |
| 1 | 2 | Normal | Medium | 10 | 15 | TDLC300-100 low | G-FR1-A8-1 | [TBD] |
| 40 | 30 | TDLC300-100 low | G-FR1-A8-1 | [TBD] |
| High | 10 | 15 | TDLC300-100 low | G-FR1-A8-1 | [TBD] |
| 40 | 30 | TDLC300-100 low | G-FR1-A8-1 | [TBD] |

Table 8.2.6.1-2 Minimum requirements of PUSCH for 2-step RACH with mappying type B

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | TO cycling Level | Channel Bandwidth [MHz] | SCS [kHz] | Propagation conditions and correlation matrix (Annex G) | FRC (Annex A) | SNR  [dB] |
| 1 | 2 | Normal | Medium | 10 | 15 | TDLC300-100 low | G-FR1-A8-1 | [TBD] |
| 40 | 30 | TDLC300-100 low | G-FR1-A8-1 | [TBD] |
| High | 10 | 15 | TDLC300-100 low | G-FR1-A8-1 | [TBD] |
| 40 | 30 | TDLC300-100 low | G-FR1-A8-1 | [TBD] |

**<<End of change 1/5>>**

**<<Start of change 2/5>>**

#### 11.2.1.6 Requirements of PUSCH for 2-step RACH

Apply the requirements defined in clause 8.2.6 for 2Rx.

**<<End of change 2/5>>**

**<<Start of change 3/5>>**

#### 11.2.2.4 Requirements of PUSCH for 2-step RACH

##### 11.2.2.4.1 General

The performance requirement of PUSCH for 2-step RACH is determined by a minimum required block error rate of MsgA received by BS at given SNR for the FRCs listed in Annex A. The performance requirements assume that the precedent preamble of MsgA is correctly detected in a 2-step RACH procedure, and no HARQ retransmissions.

Table 11.2.2.4.1-1 Test parameters for testing PUSCH for 2-step RACH

|  |  |  |
| --- | --- | --- |
| Parameter | | Value |
| Transform precoding | | Disabled |
| Channel bandwidth | | 60 kHz SCS: 50 MHz  120 kHz SCS: 100 MHz |
| MCS | | 1 |
| DM-RS | DM-RS configuration type | 1 |
| DM-RS duration | single-symbol DM-RS |
| DM-RS position (*l0*) | 2 |
| 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 | Both A and B |
| Allocation length | 10 |
| Frequency domain resource assignment | RB assignment | 2 PRBs |
| Starting PRB index | 0 |
| Frequency hopping | Disabled |
| Time Offset (TO) cycling level (µs) | Medium | SCS 60k: 0:0.1:0.5  SCS 120k: 0:0.05:0.25 |
| High | [SCS 60k: 0:0.1:0.6  SCS 120k: 0:0.05:0.3] |
|  | | |

##### 11.2.2.4.2 Minimum requirements

The block error rate of MsgA for the reference measurement channel as specified in Annex A at the SNR given shall not exceed 1% in table 11.2.2.4.2-1 for mapping type B.

Table 11.2.2.4.2-1 Minimum requirements of PUSCH for 2-step RACH with mappying type B

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of TX antennas | Number of RX antennas | Cyclic prefix | TO cycling Level | Channel Bandwidth [MHz] | SCS [kHz] | Propagation conditions and correlation matrix (Annex G) | FRC (Annex A) | SNR  [dB] |
| 1 | 2 | Normal | Medium | 50 | 60 | TDLA30-300 low | G-FR2-A9-1 | [TBD] |
| 100 | 120 | TDLA30-300 low | G-FR2-A9-1 | [TBD] |
| High | 50 | 60 | TDLA30-300 low | G-FR2-A9-1 | [TBD] |
| 100 | 120 | TDLA30-300 low | G-FR2-A9-1 | [TBD] |

**<<End of change 3/5>>**

**<<Start of change 4/5>>**

# A.8 Fixed Reference Channels for performance requirements (QPSK, R=120/1024)

The parameters for the reference measurement channels are specified in table A.8-1 for FR1 PUSCH performance requirements for 2-step RACH.

Table A.8-1: FRC parameters for FR1 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos2 (QPSK, R=120/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR1-A8-1 | G-FR1-A8-2 |
| Subcarrier spacing [kHz] | 15 | 30 |
| Allocated resource blocks | 2 | 2 |
| CP-OFDM Symbols per slot (Note 1) | 14 | 14 |
| Modulation | QPSK | QPSK |
| Code rate (Note 2) | 120/1024 | 120/1024 |
| Payload size (bits) | 56 | 56 |
| Transport block CRC (bits) | 16 | 16 |
| Code block CRC size (bits) | 0 | 0 |
| Number of code blocks - C | 1 | 1 |
| Code block size including CRC (bits) (Note 2) | 72 | 72 |
| Total number of bits per slot | 528 | 528 |
| Total symbols per slot | 264 | 264 |
| NOTE 1: *DM-RS configuration type* = 1 with *DM-RS duration* = *single-symbol DM-RS* and the number of DM-RS CDM groups without data is 2, *Additional DM-RS position = pos2* with *l0= 2* as per Table 6.4.1.1.3-3 of TS 38.211 [5].  NOTE 2: Code block size including CRC (bits) equals to *K'* in sub-clause 5.2.2 of TS 38.212 [15]. | | |

**<<End of change 4/5>>**

**<<Start of change 5/5>>**

# A.9 Fixed Reference Channels for performance requirements (QPSK, R=157/1024)

The parameters for the reference measurement channels are specified in table A.9-1 for FR2 PUSCH performance requirements for 2-step RACH.

Table A.9-1: FRC parameters for FR1 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos1 (QPSK, R=157/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A9-1 | G-FR2-A9-2 |
| Subcarrier spacing [kHz] | 60 | 120 |
| Allocated resource blocks | 2 | 2 |
| CP-OFDM Symbols per slot (Note 1) | 10 | 10 |
| Modulation | QPSK | QPSK |
| Code rate (Note 2) | 157/1024 | 157/1024 |
| Payload size (bits) | 56 | 56 |
| Transport block CRC (bits) | 16 | 16 |
| Code block CRC size (bits) | 0 | 0 |
| Number of code blocks - C | 1 | 1 |
| Code block size including CRC (bits) (Note 2) | 72 | 72 |
| Total number of bits per slot | 192 | 192 |
| Total symbols per slot | 384 | 384 |
| NOTE 1: *DM-RS configuration type* = 1 with *DM-RS duration* = *single-symbol DM-RS* and the number of DM-RS CDM groups without data is 2, *Additional DM-RS position = pos1* as per Table 6.4.1.1.3-3 of TS 38.211 [5].  NOTE 2: Code block size including CRC (bits) equals to *K'* in sub-clause 5.2.2 of TS 38.212 [15]. | | |

**<<End of change 5/5>>**