**3GPP TSG-RAN4 Meeting #109 *R4-2321133***

**Chicago, USA, –**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.141-2** | **CR** | **0563** | **rev** | **-** | **Current version:** | **18.3.0** |  |
|  |
| *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:***  | Big CR for TS 38.141-2 on 4Tx demodulation requirements |
|  |  |
| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** |  NR\_ENDC\_RF\_FR1\_enh2-Perf  |  | ***Date:*** | 2023-11-21 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | This big draft CR merges endorsed draft CRs to 38.141-2 in RAN4#108-bis. The reason for change in endorsed draft CR is copied below* R4-2315586

The 4Tx PUSCH demodulation requirements were discussed in previous RAN4 meeting. The simulation assumptions and test cases are agreed. So it is reasonable to add corresponding FRC tables. The draft CR R4-2312068 was endorsed in RAN4#108 |
|  |  |
| ***Summary of change:*** | The summary of change in endorsed draft CR is copied as below:* R4-2315586

Adding note in A.3, A.7Create new Annex A.11 with note that this chpter is not used |
|  |  |
| ***Consequences if not approved:*** | The consequences if not approved for endorsed draft CR are coppied as below.* R4-2315586

The FRC table for 4Tx PUSCH demodulation requirments are not available |
|  |  |
| ***Clauses affected:*** | A3, A7, A11 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<Start Of Change R4-2315586>

# A.3 Fixed Reference Channels for performance requirements (QPSK, R=193/1024)

The parameters for the reference measurement channels are specified in table A.3-2, table A.3-2A, table A.3-4 and table A.3-6 for FR1 PUSCH performance requirements:

- FRC parameters are specified in table A.3-2 for FR1 PUSCH with transform precoding disabled, additional DM-RS position = pos1 and 1 transmission layer.

 FRC parameters are specified in table A.3-2A for FR1 PUSCH with transform precoding disabled, additional DM-RS position = pos2 and 1 transmission layer.

- FRC parameters are specified in table A.3-4 for FR1 PUSCH with transform precoding disabled, additional DM-RS position = pos1 and 2 transmission layers.

- FRC parameters are specified in table A.3-6 for FR1 PUSCH with transform precoding enabled, additional DM-RS position = pos1 and 1 transmission layer.

The parameters for the reference measurement channels are specified in table A.3-14 for FR1 PUSCH performance requirements for TBoMS:

- FRC parameters are specified in table A.3-14 for FR1 PUSCH with transform precoding disabled, *Additional DM-RS position = pos1* and 1 transmission layer.

The parameters for the reference measurement channels are specified in table A.3-7 to table A.3-12 for FR2 PUSCH performance requirements:

- FRC parameters are specified in table A.3-7 for FR2 PUSCH with transform precoding disabled, additional DM-RS position = pos0 and 1 transmission layer.

- FRC parameters are specified in table A.3-8 for FR2 PUSCH with transform precoding disabled, additional DM-RS position = pos0 and 2 transmission layer.

- FRC parameters are specified in table A.3-9 for FR2 PUSCH with transform precoding enabled, additional DM-RS position = pos0 and 1 transmission layer.

- FRC parameters are specified in table A.3-10 for FR2 PUSCH with transform precoding disabled, additional DM-RS position = pos1 and 1 transmission layer.

- FRC parameters are specified in table A.3-11 for FR2 PUSCH with transform precoding disabled, additional DM-RS position = pos1 and 2 transmission layer.

- FRC parameters are specified in table A.3-12 for FR2 PUSCH with transform precoding enabled, additional DM-RS position = pos1 and 1 transmission layer.

The parameters for the reference measurement channels are specified in table A.3-13 for FR2 PUSCH performance requirements for 2-step RA type:

- FRC parameters are specified in table A.3-13 for FR2 PUSCH with transform precoding disabled, *Additional DM-RS position = pos1* and 1 transmission layer.

The parameters for the reference measurement channels are specified in table A.3-15 for FR2 PUSCH performance requirements for TBoMS:

- FRC parameters are specified in table A.3-15 for FR2 PUSCH with transform precoding disabled, *Additional DM-RS position = pos1* and 1 transmission layer.

Note: The FRC table A.3-16 defined in TS38.104 [2] and TS38.141-1 [3] is not used in this specification.

Table A.3-1: Void

<End of Change R4-2315586>

#### **<< Unchanged sections omitted >>**

<Start Of Change R4-2315586>

# A.7 Fixed Reference Channels for performance requirements (16QAM, R=434/1024)

The parameters for the reference measurement channels are specified in table A.7-1 for FR2-1 PUSCH performance requirements with transform precoding disabled, additional DM-RS position = pos0 and 2 transmission layers.

The parameters for the reference measurement channels are specified in table A.7-2 for FR2-1 PUSCH performance requirements with transform precoding disabled, additional DM-RS position = pos1 and 2 transmission layers.

The parameters for the reference measurement channels are specified in table A.7-3 for FR2-2 PUSCH performance requirements with transform precoding disabled, additional DM-RS position = pos1 and 2 transmission layers.

Note: The FRC table A.7-4 defined in TS38.104 [2] is not used in this specification.

Table A.7-1: FRC parameters for FR2-1 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos0 and 2 transmission layers (16QAM, R=434/1024)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference channel | G-FR2-A7-1 | G-FR2-A7-2 | G-FR2-A7-3 | G-FR2-A7-4 | G-FR2-A7-5 |
| Subcarrier spacing [kHz] | 60 | 60 | 120 | 120 | 120 |
| Allocated resource blocks | 66 | 132 | 32 | 66 | 132 |
| CP-OFDM Symbols per slot (Note 1) | 9 | 9 | 9 | 9 | 9 |
| Modulation | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Code rate (Note 2) | 434/1024 | 434/1024 | 434/1024 | 434/1024 | 434/1024 |
| Payload size (bits) | 24072 | 48168 | 11784 | 24072 | 48168 |
| Transport block CRC (bits) | 24 | 24 | 24 | 24 | 24 |
| Code block CRC size (bits) | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks - C | 3 | 6 | 2 | 3 | 6 |
| Code block size including CRC (bits) (Note 2) | 8056 | 8056 | 5928 | 8056 | 8056 |
| Total number of bits per slot without PT-RS | 57024 | 114048 | 27648 | 57024 | 114048 |
| Total number of bits per slot with PT-RS (Note 3) | 54648 | 109296 | 26496 | 54648 | 109296 |
| Total symbols per slot without PT-RS | 14256 | 28512 | 6912 | 14256 | 28512 |
| Total symbols per slot with PT-RS (Note 3) | 13662 | 27324 | 6624 | 13662 | 27324 |
| 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 = pos0* with *l0*= 0 as per Table 6.4.1.1.3-3 of TS 38.211 [20].NOTE 2: Code block size including CRC (bits) equals to *K'* in clause 5.2.2 of TS 38.212 [19].NOTE 3: PT-RS configuration *KPT-RS =2, LPT-RS =1*. |

Table A.7-2: FRC parameters for FR2-1 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos1 and 2 transmission layers (16QAM, R=434/1024)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Reference channel | G-FR2-A7-6 | G-FR2-A7-7 | G-FR2-A7-8 | G-FR2-A7-9 | G-FR2-A7-10 |
| Subcarrier spacing [kHz] | 60 | 60 | 120 | 120 | 120 |
| Allocated resource blocks | 66 | 132 | 32 | 66 | 132 |
| CP-OFDM Symbols per slot (Note 1) | 8 | 8 | 8 | 8 | 8 |
| Modulation | 16QAM | 16QAM | 16QAM | 16QAM | 16QAM |
| Code rate (Note 2) | 434/1024 | 434/1024 | 434/1024 | 434/1024 | 434/1024 |
| Payload size (bits) | 21504 | 43032 | 10504 | 21504 | 43032 |
| Transport block CRC (bits) | 24 | 24 | 24 | 24 | 24 |
| Code block CRC size (bits) | 24 | 24 | 24 | 24 | 24 |
| Number of code blocks - C | 3 | 6 | 2 | 3 | 6 |
| Code block size including CRC (bits) (Note 2) | 7200 | 7200 | 5288 | 7200 | 7200 |
| Total number of bits per slot without PT-RS | 50688 | 101376 | 24576 | 50688 | 101376 |
| Total number of bits per slot with PT-RS (Note 3) | 48576 | 97152 | 23552 | 48576 | 97152 |
| Total symbols per slot without PT-RS | 12672 | 25344 | 6144 | 12672 | 25344 |
| Total symbols per slot with PT-RS (Note 3) | 12144 | 24288 | 5888 | 12144 | 24288 |
| 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* with *l0* = 0 and *l*= 8 as per Table 6.4.1.1.3-3 of TS 38.211 [20].NOTE 2: Code block size including CRC (bits) equals to *K'* in clause 5.2.2 of TS 38.212 [19].NOTE 3: PT-RS configuration *KPT-RS =2, LPT-RS =1*. |

Table A.7-3: FRC parameters for FR2-2 PUSCH performance requirements, transform precoding disabled, *Additional DM-RS position = pos1* and 2 transmission layers (16QAM, R=434/1024)

|  |  |  |  |
| --- | --- | --- | --- |
| Reference channel | G-FR2-A7-11 | G-FR2-A7-12 | G-FR2-A7-13 |
| Subcarrier spacing [kHz] | 120 | 120 | 480 |
| Allocated resource blocks | 66 | 264 | 66 |
| CP-OFDM Symbols per slot (Note 1) | 8 | 8 | 8 |
| Modulation | 16QAM | 16QAM | 16QAM |
| Code rate (Note 2) | 434/1024 | 434/1024 | 434/1024 |
| Payload size (bits) | 21504 | 86040 | 21504 |
| Transport block CRC (bits) | 24 | 24 | 24 |
| Code block CRC size (bits) | 24 | 24 | 24 |
| Number of code blocks - C | 3 | 11 | 3 |
| Code block size including CRC (bits) (Note 2) | 7200　 | 7848 | 7200　 |
| Total number of bits per slot without PT-RS | 50688 | 202752 | 50688 |
| Total number of bits per slot with PT-RS (Note 4) | 48576 | 194304 | 48576 |
| Total symbols per slot without PT-RS | 12672 | 50688 | 12672 |
| Total symbols per slot with PT-RS (Note 4) | 12144 | 48576 | 12144 |
| 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* with *l0*= 0 and *l* =8 as per Table 6.4.1.1.3-3 of TS 38.211 [9].NOTE 2: Code block size including CRC (bits) equals to *K'* in sub-clause 5.2.2 of TS 38.212 [15].NOTE 3: The calculation of the “Total number of bits per slot” and “Total symbols per slot” fields include the REs taken up by CSI part 1 and CSI part 2, if present.NOTE 4: PT-RS configuration *KPT-RS =2, LPT-RS =1*. |

# A.8 Fixed Reference Channels for performance requirements (QPSK, R=157/1024)

<End of Change R4-2315586>

#### **<< Unchanged sections omitted >>**

<Start Of Change R4-2315586>

Table A.10-6: FRC parameters for FR2 UL timing adjustment requirements, PUSCH with transform precoding disabled, Additional DM-RS position = pos2 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-11 | G-FR2-A10-12 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 16 | 66 |
| Data bearing CP-OFDM Symbols per slot (Note 1) | 7 | 7 |
| Modulation | 64QAM | 64QAM |
| Code rate (Note 2) | 517/1024 | 517/1024 |
| Payload size (bits) | 4032 | 16896 |
| Transport block CRC (bits) | 24 | 24 |
| Code block CRC size (bits) | - | 24 |
| Number of code blocks - C | 1 | 3 |
| Code block size including CRC (bits) (Note 2) | 4056 | 5664 |
| Total number of bits per slot without PT-RS | 8064 | 33264 |
| Total number of bits per slot with PT-RS (Note 3) | 7728 | 31878 |
| Total resource elements per slot without PT-RS | 1344 | 5544 |
| Total resource elements per slot with PT-RS (Note 3) | 1288 | 5313 |
| 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*= 0 and *l* =4,8 as per Table 6.4.1.1.3-3 of TS 38.211 [9].NOTE 2: Code block size including CRC (bits) equals to *K'* in sub-clause 5.2.2 of TS 38.212 [15].NOTE 3: PT-RS configuration *KPT-RS =2, LPT-RS =1*. |

# A.11 Fixed Reference Channels for performance requirements (64QAM, R=438/1024)

Fixed Reference Channels for performance requirements (64QAM, R=438/1024) are not used in this specification.

Annex B (normative):
Environmental requirements for the BS equipment

<End of Change R4-2315586>