**3GPP TSG-RAN WG4 Meeting #104-e *R4-221xxxx***

**Electronic, , 15th - 26th August 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.141-2** | **CR** | **Draft** | **rev** | **-** | **Current version:** | **17.6.0** |  |
|  |
| *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:***  | draftCR to TS 38.141-2 on HST FR2 FRCs |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, Intel |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_HST\_FR2-Perf |  | ***Date:*** | 2022-08-22 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *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)* |
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| ***Reason for change:*** | PUSCH FRCs for HST FR2 were not completely defined in the previous version of the specification.FRCs for HST FR2 UL timing adjustment requirements are not defined. |
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| ***Summary of change:*** | Corrections and completions of PUSCH FRCs.Addition of new FRCs for UL timing adjustment requirements. |
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| ***Consequences if not approved:*** | HST FR2 BS demodulation performance requirements are not complete and cannot be used. |
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| ***Clauses affected:*** | A.10 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **N** |  Other core specifications  |  |
| ***affected:*** |  | **N** |  Test specifications |  |
| ***(show related CRs)*** |  | **N** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | This is the revision of R4-2213391. |

## Start of Change

# A.10 Fixed Reference Channels for performance requirements (64QAM, R=517/1024)

The parameters for the reference measurement channels are specified in table A.10-1, A.10-2 and A.10-3 for FR2 PUSCH performance requirements:

- FRC parameters are specified in table A.10-1 for FR2 PUSCH with transform precoding disabled, *Additional DM-RS position = pos0* and 1 transmission layer.

- FRC parameters are specified in table A.10-2 for FR2 PUSCH with transform precoding disabled, *Additional DM-RS position = pos1* and 1 transmission layer.

- FRC parameters are specified in table A.10-3 for FR2 PUSCH with transform precoding disabled, *Additional DM-RS position = pos2* and 1 transmission layer.

The parameters for the reference measurement channels are specified in table A.10-4, table A.10-5 and table A.10-6 for FR2 PUSCH UL timing adjustment perfromance requirements:

* FRC parameters are specified in table A.10-4 for FR2 UL timing adjustment requirements, PUSCH with transform precoding disabled, *Additional DM-RS position = pos0* and 1 transmission layer.
* FRC parameters are specified in table A.10-5 for FR2 UL timing adjustment requirements, PUSCH with transform precoding disabled, *Additional DM-RS position = pos1* and 1 transmission layer.
* FRC parameters are specified in table A.10-6 for FR2 UL timing adjustment requirements, PUSCH with transform precoding disabled, *Additional DM-RS position = pos2* and 1 transmission layer.

Table A.10-1: FRC parameters for FR2 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos0 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-1 | G-FR2-A10-2 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 32 | 132 |
| Data bearing CP-OFDM Symbols per slot (Note 1) | 9 | 9 |
| Modulation | 64QAM | 64QAM |
| Code rate (Note 2) | 517/1024 | 517/1024 |
| Payload size (bits) | 10504 | 43032 |
| Transport block CRC (bits) | 24 | 24 |
| Code block CRC size (bits) | 24 | 24 |
| Number of code blocks - C | 2 | 6 |
| Code block size including CRC (bits) (Note 2) | 5288 | 7200 |
| Total number of bits per slot without PT-RS | 20736 | 85536 |
| Total number of bits per slot with PT-RS (Note 3) | 19872 | 81972 |
| Total resource elements per slot without PT-RS | 3456 | 14256 |
| Total resource elements per slot with PT-RS (Note 3) | 3312 | 13662 |
| 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 [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*. |

Table A.10-2: FRC parameters for FR2 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos1 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-3 | G-FR2-A10-4 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 32 | 132 |
| Data bearing CP-OFDM Symbols per slot (Note 1) | 8 | 8 |
| Modulation | 64QAM | 64QAM |
| Code rate (Note 2) | 517/1024 | 517/1024 |
| Payload size (bits) | 9224 | 37896 |
| Transport block CRC (bits) | 24 | 24 |
| Code block CRC size (bits) | 24 | 24 |
| Number of code blocks - C | 2 | 5 |
| Code block size including CRC (bits) (Note 2) | 4648 | 7608 |
| Total number of bits per slot without PT-RS | 18432 | 76032 |
| Total number of bits per slot with PT-RS (Note 3) | 17664 | 72864 |
| Total resource elements per slot without PT-RS | 3072 | 12672 |
| Total resource elements per slot with PT-RS (Note 3) | 2944 | 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: PT-RS configuration *KPT-RS =2, LPT-RS =1*. |

Table A.10-3: FRC parameters for FR2 PUSCH performance requirements, transform precoding disabled, Additional DM-RS position = pos2 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-5 | G-FR2-A10-6 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 32 | 132 |
| 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) | 8064 | 33816 |
| Transport block CRC (bits) | 24 | 24 |
| Code block CRC size (bits) | - | 24 |
| Number of code blocks - C | 1 | 5 |
| Code block size including CRC (bits) (Note 2) | 8088 | 6792 |
| Total number of bits per slot without PT-RS | 16128 | 66528 |
| Total number of bits per slot with PT-RS (Note 3) | 15456 | 63756 |
| Total resource elements per slot without PT-RS | 2688 | 11088 |
| Total resource elements per slot with PT-RS (Note 3) | 2576 | 10626 |
| 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*. |

Table A.10-4: FRC parameters for FR2 UL timing adjustment requirements, PUSCH with transform precoding disabled, Additional DM-RS position = pos0 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-7 | G-FR2-A10-8 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 16 | 66 |
| Data bearing CP-OFDM Symbols per slot (Note 1) | 9 | 9 |
| Modulation | 64QAM | 64QAM |
| Code rate (Note 2) | 517/1024 | 517/1024 |
| Payload size (bits) | 5248 | 21504 |
| 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) | 5272 | 7200 |
| Total number of bits per slot without PT-RS | 10368 | 42768 |
| Total number of bits per slot with PT-RS (Note 3) | 9936 | 40986 |
| Total resource elements per slot without PT-RS | 1728 | 7128 |
| Total resource elements per slot with PT-RS (Note 3) | 1656 | 6831 |
| 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 [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*. |

Table A.10-5: FRC parameters for FR2 UL timing adjustment requirements, PUSCH with transform precoding disabled, Additional DM-RS position = pos1 and 1 transmission layer (64QAM, R=517/1024)

|  |  |  |
| --- | --- | --- |
| Reference channel | G-FR2-A10-9 | G-FR2-A10-10 |
| Subcarrier spacing [kHz] | 120 | 120 |
| Allocated resource blocks | 16 | 66 |
| Data bearing CP-OFDM Symbols per slot (Note 1) | 8 | 8 |
| Modulation | 64QAM | 64QAM |
| Code rate (Note 2) | 517/1024 | 517/1024 |
| Payload size (bits) | 4608 | 18960 |
| 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) | 4632 | 6352 |
| Total number of bits per slot without PT-RS | 9216 | 38016 |
| Total number of bits per slot with PT-RS (Note 3) | 8832 | 36432 |
| Total resource elements per slot without PT-RS | 1536 | 6336 |
| Total resource elements per slot with PT-RS (Note 3) | 1472 | 6072 |
| 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: PT-RS configuration *KPT-RS =2, LPT-RS =1*. |

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*. |

## End of Change