**3GPP TSG-RAN Meeting #109eR1-22xxxxx**

**e-meeting, May 9 – 20, 2022**

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| *CR-Form-v12.2* |
| **DRAFT CHANGE REQUEST** |
|  |
|  | **38.211** | **CR** | **xxx** | **rev** | **-** | **Current version:** | **16.9.0** |  |
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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 | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Clarification of PUSCH DM-RS generation |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core |  | ***Date:*** | 2022-05-20 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***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 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:*** | Unclear definition of symbol number for PUSCH DM-RS sequence generation when transform preoding is used. |
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| ***Summary of change:*** | Clarifired the definition of symbol number |
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| ***Consequences if not approved:*** | Ambiguous specificaation |
|  |  |
| ***Clauses affected:*** | 6.4.1.1.1.2 |
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|  | **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 ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

6.4.1.1.1.2 Sequence generation when transform precoding is enabled

If transform precoding for PUSCH is enabled, the reference-signal sequence  shall be generated according to



where $r\_{u,v}^{\left(α,δ\right)}(n)$ with $δ=1$ depends on the configuration:

- if the higher-layer parameter *dmrs-UplinkTransformPrecoding* is configured, π/2-BPSK modulation is used for PUSCH, and the PUSCH transmission is not a msg3 transmission, and the transmission is not scheduled using DCI format 0\_0 in a common search space, $r\_{u,v}^{\left(α,δ\right)}(n)$ is given by clause 5.2.3 with $c\_{init}$ given by

$$c\_{init}=\left(2^{17}\left(N\_{symb}^{slot}n\_{s,f}^{μ}+l+1\right)\left(2N\_{ID}^{n\_{SCID}}+1\right)+2N\_{ID}^{n\_{SCID}}+n\_{SCID}\right)mod 2^{31}$$

 where $n\_{SCID}=0$ unless given by the DCI according to clause 7.3.1.1.2 in [4, TS38.212] for a transmission scheduled by DCI format 0\_1, or given by the DCI according to clause 7.3.1.1.3 in [4, TS38.212] for a transmission scheduled by DCI format 0\_2 if the antenna ports field in the DCI format 0\_2 is not 0 bit, or given by the higher-layer parameter *antennaPort* for a PUSCH transmission scheduled by a type-1 configured grant; and

- $N\_{ID}^{0},N\_{ID}^{1}\in \left\{0,1,…,65535\right\}$ are given by the higher-layer parameters *pi2BPSK-ScramblingID0* and *pi2BPSK-ScramblingID1*, respectively, in the *DMRS-UplinkConfig* IE if provided and the PUSCH is scheduled by DCI format 0\_1, or by DCI format 0\_2 if the antenna ports field in the DCI format 0\_2 is not 0 bit, or by a PUSCH transmission with a configured grant;

- $N\_{ID}^{0}\in \left\{0,1,…,65535\right\}$ is given by the higher-layer parameter *pi2BPSK-ScramblingID0* in the *DMRS-UplinkConfig* IE if provided and the PUSCH is scheduled by DCI format 0\_0 with the CRC scrambled by C-RNTI, MCS-C-RNTI, or CS-RNTI, or by DCI format 0\_2 if the antenna ports field in the DCI format 0\_2 is 0 bit;

- $N\_{ID}^{n\_{SCID}}=N\_{ID}^{cell}$ otherwise;

- otherwise, $r\_{u,v}^{\left(α,δ\right)}(n)$ is given by clause 5.2.2 with $α=0$.

The sequence group $u=\left(f\_{gh}+n\_{ID}^{RS}\right) mod 30$, where $n\_{ID}^{RS}$ is given by

- $n\_{ID}^{RS}=n\_{ID}^{PUSCH}$ if $n\_{ID}^{PUSCH}$ is configured by the higher-layer parameter *nPUSCH-Identity* in the *DMRS-UplinkConfig* IE, and

- the higher-layer parameter *dmrs-UplinkTransformPrecoding* is not configured or the higher-layer parameter *dmrs-UplinkTransformPrecoding* is configured and π/2-BPSK modulation is not used for PUSCH, and

- the PUSCH is neither scheduled by RAR UL grant nor scheduled by DCI format 0\_0 with CRC scrambled by TC-RNTI according to clause 8.3 in [5, TS 38.213];

- $n\_{ID}^{RS}=N\_{ID}^{n\_{SCID}}$ if the higher-layer parameter *dmrs-UplinkTransformPrecoding* is configured, π/2-BPSK modulation is used for PUSCH, the PUSCH transmission is not a msg3 transmission, and the transmission is not scheduled using DCI format 0\_0 in a common search space;

- $n\_{ID}^{RS}=N\_{ID}^{cell}$ otherwise

where  and the sequence number $v$ are given by:

- if neither group, nor sequence hopping is enabled

 

- if group hopping is enabled and sequence hopping is disabled

 

 where the pseudo-random sequence  is defined by clause 5.2.1 and shall be initialized with  at the beginning of each radio frame

- if sequence hopping is enabled and group hopping is disabled

 

 where the pseudo-random sequence  is defined by clause 5.2.1 and shall be initialized with  at the beginning of each radio frame.

The hopping mode is controlled by higher-layer parameters:

- for PUSCH transmission scheduled by RAR UL grant or by DCI format 0\_0 with CRC scrambled by TC-RNTI, sequence hopping is disabled and group hopping is enabled or disabled by the higher-layer parameter *groupHoppingEnabledTransformPrecoding;*

- for all other transmissions, sequence hopping and group hopping are enabled or disabled by the respective higher-layer parameters *sequenceHopping* and *sequenceGroupHopping* if these parameters are provided, otherwise, the same hopping mode as for Msg3 shall be used.

The UE is not expected to handle the case of combined sequence hopping and group hopping.

The quantity $l$ above is the OFDM symbol number in the slot except for the case of double-symbol DMRS in which case $l$ is the OFDM symbol number in the slot of the first symbol of the double-symbol DMRS.