**3GPP TSG RAN WG1 #120R1-25xxxxx**

**Athens, Greece, February 17 – 21, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.211** | **CR** | **xxx** | **rev** | **-** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *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 |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Alignment of parameter names | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_MIMO\_evo\_DL\_UL-Core | | | | |  | ***Date:*** | | | 2025-02-24 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***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 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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | * Unclear power scalign of PT-RS (R1-2500594) * No need for intermediate DM-RS resource notation for the new DM-RS sequences in the downlink (R1-2500941) | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Correction to definition * Changing to | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | * Ambiguous power scaling for PT-RS * Inconsistent description of DM-RS handling for the new DM-RS sequences. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.4.1.2.2.1, 7.4.1.1.2, 7.4.1.2.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

###### 6.4.1.2.2.1 Precoding and mapping to physical resources if transform precoding is not enabled

The UE shall transmit phase-tracking reference signals only in the resource blocks used for the PUSCH, and only if the procedure in [6, TS 38.214] indicates that phase-tracking reference signals are being used.

The PUSCH PT-RS shall be mapped to resource elements according to

- if the higher-layer parameter *dmrs-TypeEnh* is configured

- otherwise

when all the following conditions are fulfilled

- is within the OFDM symbols allocated for the PUSCH transmission

- resource element  is not used for DM-RS

-  and correspond to

The quantities and are given by Tables 6.4.1.1.3-1 and 6.4.1.1.3-2, the configuration type is given by the higher-layer parameter *dmrs-Type* in the *DMRS-UplinkConfig* IE, and the precoding matrix is given by clause 6.3.1.5*.* The quantity is an amplitude scaling factor to conform with the transmit power specified in clause 6.2.3 of [6, TS 38.214].

The set of time indices  defined relative to the start of the PUSCH allocation is defined by

1. set and

2. if any symbol in the interval overlaps with a symbol used for DM-RS according to clause 6.4.1.1.3

- set

- set to the symbol index of the DM-RS symbol in case of a single-symbol DM-RS or to the symbol index of the second DM-RS symbol in case of a double-symbol DM-RS

- repeat from step 2 as long as is inside the PUSCH allocation

3. add to the set of time indices for PT-RS

4. increment by one

5. repeat from step 2 above as long as is inside the PUSCH allocation

where is defined in Table 6.2.3.1-1 of [6, TS 38.214].

For the purpose of PT-RS mapping, the resource blocks allocated for PUSCH transmission are numbered from 0 to  from the lowest scheduled resource block to the highest. The corresponding subcarriers in this set of resource blocks are numbered in increasing order starting from the lowest frequency from 0 to . The subcarriers to which the PT-RS shall be mapped are given by



where

- 

-  is given by Table 6.4.1.2.2.1-1 for the DM-RS port associated with the PT-RS port according to clause 6.2.3 in [6, TS 38.214]. If the higher-layer parameter *resourceElementOffset* in *PTRS-UplinkConfig* is not configured, the column corresponding to 'offset00' shall be used.

- is the RNTI associated with the DCI scheduling the transmission using C-RNTI, CS-RNTI, MCS-C-RNTI, SP-CSI-RNTI, or is the CS-RNTI in case of configured grant

-  is the number of resource blocks scheduled

- is given by [6, TS 38.214].

Table 6.4.1.2.2.1-1: The parameter  .

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DM-RS antenna port |  | | | | | | | |
| DM-RS Configuration type 1 | | | | DM-RS Configuration type 2 | | | |
| *resourceElementOffset* | | | | *resourceElementOffset* | | | |
| offset00 | offset01 | offset10 | offset11 | offset00 | offset01 | offset10 | offset11 |
| 0 | 0 | 2 | 6 | 8 | 0 | 1 | 6 | 7 |
| 1 | 2 | 4 | 8 | 10 | 1 | 6 | 7 | 0 |
| 2 | 1 | 3 | 7 | 9 | 2 | 3 | 8 | 9 |
| 3 | 3 | 5 | 9 | 11 | 3 | 8 | 9 | 2 |
| 4 | - | - | - | - | 4 | 5 | 10 | 11 |
| 5 | - | - | - | - | 5 | 10 | 11 | 4 |
| 8 | 4 | 6 | 10 | 0 | - | - | - | - |
| 9 | 6 | 8 | 0 | 2 | - | - | - | - |
| 10 | 5 | 7 | 11 | 1 | - | - | - | - |
| 11 | 7 | 9 | 1 | 3 | - | - | - | - |
| 12 | - | - | - | - | 6 | 7 | 0 | 1 |
| 13 | - | - | - | - | 7 | 0 | 1 | 6 |
| 14 | - | - | - | - | 8 | 9 | 2 | 3 |
| 15 | - | - | - | - | 9 | 2 | 3 | 8 |
| 16 | - | - | - | - | 10 | 11 | 4 | 5 |
| 17 | - | - | - | - | 11 | 4 | 5 | 10 |

##### 7.4.1.1.2 Mapping to physical resources

The UE shall assume the PDSCH DM-RS being mapped to physical resources according to configuration type 1 or configuration type 2 as given by the higher-layer parameter *dmrs-Type*.

The UE shall assume the sequence  is scaled by a factor to conform with the transmission power specified in [6, TS 38.214] and mapped to resource elements according to

- if the higher-layer parameter *dmrs-TypeEnh* is configured and the PDSCH is not scheduled by DCI format 1\_0, 4\_0, or 4\_1

- otherwise

where , , and are given by Tables 7.4.1.1.2-1 and 7.4.1.1.2-2 and the following conditions are fulfilled:

- the resource elements are within the common resource blocks allocated for PDSCH transmission

The reference point for is

- subcarrier 0 of the lowest-numbered resource block in CORESET 0 if the corresponding PDCCH is associated with CORESET 0 and Type0-PDCCH common search space and is addressed to SI-RNTI;

- otherwise, subcarrier 0 in common resource block 0

The reference point for  and the position  of the first DM-RS symbol depends on the mapping type:

- for PDSCH mapping type A:

-  is defined relative to the start of the slot

- if the higher-layer parameter *dmrs-TypeA-Position* is equal to 'pos3' and  otherwise

- for PDSCH mapping type B:

-  is defined relative to the start of the scheduled PDSCH resources

- 

The position(s) of the DM-RS symbols is given by  and duration where

- for PDSCH mapping type A, is the duration between the first OFDM symbol of the slot and the last OFDM symbol of the scheduled PDSCH resources in the slot

- for PDSCH mapping type B, is the duration of the scheduled PDSCH resources

and according to Tables 7.4.1.1.2-3 and 7.4.1.1.2-4.

For PDSCH mapping type A

- the case *dmrs-AdditionalPosition* equals to 'pos3' is only supported when *dmrs-TypeA-Position* is equal to 'pos2';

- and symbols in Tables 7.4.1.1.2-3 and 7.4.1.1.2-4 respectively is only applicable when *dmrs-TypeA-Position* is equal to 'pos2';

- single-symbol DM-RS, except if all of the following conditions are fulfilled in which case :

- the higher-layer parameter *lte-CRS-ToMatchAround*, *lte-CRS-PatternList1*, *lte-CRS-PatternList2*, *lte-CRS-PatternList3*, or *lte-CRS-PatternList4* is configured; and

*-* the higher-layer parameter *dmrs-AdditionalPosition* is equal to 'pos1' and ; and

*-* the UE has indicated it is capable of *additionalDMRS-DL-Alt*

For PDSCH mapping type B

- if the PDSCH duration  OFDM symbols for normal cyclic prefix or OFDM symbols for extended cyclic prefix, and the front-loaded DM-RS of the PDSCH allocation collides with resources reserved for a search space set associated with a CORESET,  shall be incremented such that the first DM-RS symbol occurs immediately after the CORESET and until no collision with any CORESET occurs, and

- if the PDSCH duration is 2 symbols, the UE is not expected to receive a DM-RS symbol beyond the second symbol;

- if the PDSCH duration is 5 symbols and if one additional single-symbol DMRS is configured, the UE only expects the additional DM-RS to be transmitted on the 5th symbol when the front-loaded DM-RS symbol is in the 1st symbol of the PDSCH duration, otherwise the UE should expect that the additional DM-RS is not transmitted;

- if the PDSCH duration is 7 symbols for normal cyclic prefix or 6 symbols for extended cyclic prefix:

- if one additional single-symbol DM-RS is configured, the UE only expects the additional DM-RS to be transmitted on the 5th or 6th symbol when the front-loaded DM-RS symbol is in the 1st or 2nd symbol, respectively, of the PDSCH duration, otherwise the UE should expect that the additional DM-RS is not transmitted;

- if the PDSCH duration OFDM symbols, the UE is not expected to receive the front-loaded DM-RS beyond the 4th symbol;

- if the PDSCH duration is 12 or 13 symbols, the UE is not expected to receive DM-RS mapped to symbol 12 or later in the slot;

- for all values of the PDSCH duration other than 2, 5, and 7 symbols, the UE is not expected to receive DM-RS beyond the :th symbol;

- if the PDSCH duration is less than or equal to 4 OFDM symbols, only single-symbol DM-RS is supported.

- if the higher-layer parameter *lte-CRS-ToMatchAround*, *lte-CRS-PatternList1*, *lte-CRS-PatternList2*, *lte-CRS-PatternList3*, or *lte-CRS-PatternList4* is configured, the PDSCH duration symbols for normal cyclic prefix, the subcarrier spacing configuration , single-symbol DM-RS is configured, and at least one PDSCH DM-RS symbol in the PDSCH allocation collides with a symbol containing resource elements as indicated by the higher-layer parameter *lte-CRS-ToMatchAround*, *lte-CRS-PatternList1*, *lte-CRS-PatternList2*, *lte-CRS-PatternList3*, or *lte-CRS-PatternList4*, then shall be incremented by one in all slots.

The time-domain index and the supported antenna ports are given by Table 7.4.1.1.2-5 where

- single-symbol DM-RS is used if the higher-layer parameter *maxLength* in the *DMRS-DownlinkConfig* IE is not configured;

- single-symbol or double-symbol DM-RS is determined by the associated DCI if the higher-layer parameter *maxLength* in the *DMRS-DownlinkConfig* IE is equal to 'len2';

- basic or enhanced DM-RS multiplexing is controlled by the higher-layer parameter *dmrs-TypeEnh.*

In absence of CSI-RS configuration, and unless otherwise configured, the UE may assume PDSCH DM-RS and SS/PBCH block to be quasi co-located with respect to Doppler shift, Doppler spread, average delay, delay spread, and, when applicable, spatial Rx parameters. Unless specified otherwise, the UE may assume that the PDSCH DM-RS within the same CDM group are quasi co-located with respect to Doppler shift, Doppler spread, average delay, delay spread, and spatial Rx (when applicable). The UE may assume that DMRS ports associated with a TCI state as described in clause 5.1.6.2 of [6, TS 38.214] of a PDSCH are QCL with QCL Type A, Type D (when applicable) and average gain.

The UE may assume that no DM-RS collides with the SS/PBCH block.

Table 7.4.1.1.2-1: Parameters for PDSCH DM-RS configuration type 1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **CDM group** |  |  |  |
| 1000 | 0 | 0 |  |  |
| 1001 | 0 | 0 |  |  |
| 1002 | 1 | 1 |  |  |
| 1003 | 1 | 1 |  |  |
| 1004 | 0 | 0 |  |  |
| 1005 | 0 | 0 |  |  |
| 1006 | 1 | 1 |  |  |
| 1007 | 1 | 1 |  |  |
| 1008 | 0 | 0 |  |  |
| 1009 | 0 | 0 |  |  |
| 1010 | 1 | 1 |  |  |
| 1011 | 1 | 1 |  |  |
| 1012 | 0 | 0 |  |  |
| 1013 | 0 | 0 |  |  |
| 1014 | 1 | 1 |  |  |
| 1015 | 1 | 1 |  |  |

Table 7.4.1.1.2-2: Parameters for PDSCH DM-RS configuration type 2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **CDM group** |  |  |  |
| 1000 | 0 | 0 |  |  |
| 1001 | 0 | 0 |  |  |
| 1002 | 1 | 2 |  |  |
| 1003 | 1 | 2 |  |  |
| 1004 | 2 | 4 |  |  |
| 1005 | 2 | 4 |  |  |
| 1006 | 0 | 0 |  |  |
| 1007 | 0 | 0 |  |  |
| 1008 | 1 | 2 |  |  |
| 1009 | 1 | 2 |  |  |
| 1010 | 2 | 4 |  |  |
| 1011 | 2 | 4 |  |  |
| 1012 | 0 | 0 |  |  |
| 1013 | 0 | 0 |  |  |
| 1014 | 1 | 2 |  |  |
| 1015 | 1 | 2 |  |  |
| 1016 | 2 | 4 |  |  |
| 1017 | 2 | 4 |  |  |
| 1018 | 0 | 0 |  |  |
| 1019 | 0 | 0 |  |  |
| 1020 | 1 | 2 |  |  |
| 1021 | 1 | 2 |  |  |
| 1022 | 2 | 4 |  |  |
| 1023 | 2 | 4 |  |  |

Table 7.4.1.1.2-3: PDSCH DM-RS positions  for single-symbol DM-RS.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **in symbols** | **DM-RS positions** | | | | | | | |
| **PDSCH mapping type A** | | | | **PDSCH mapping type B** | | | |
| ***dmrs-AdditionalPosition*** | | | | ***dmrs-AdditionalPosition*** | | | |
| ***pos0*** | ***pos1*** | ***pos2*** | ***pos3*** | ***pos0*** | ***pos1*** | ***pos2*** | ***pos3*** |
| 2 | - | - | - | - |  |  |  |  |
| 3 |  |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |  |
| 8 |  | , 7 | , 7 | , 7 |  |  |  |  |
| 9 |  | , 7 | , 7 | , 7 |  |  |  |  |
| 10 |  | , 9 | , 6, 9 | , 6, 9 |  |  |  |  |
| 11 |  | , 9 | , 6, 9 | , 6, 9 |  |  |  |  |
| 12 |  | , 9 | , 6, 9 | , 5, 8, 11 |  |  |  |  |
| 13 |  | , | , 7, 11 | , 5, 8, 11 |  |  |  |  |
| 14 |  | , | , 7, 11 | , 5, 8, 11 | - | - | - | - |

Table 7.4.1.1.2-4: PDSCH DM-RS positions  for double-symbol DM-RS.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **in symbols** | **DM-RS positions** | | | | | |
| **PDSCH mapping type A** | | | **PDSCH mapping type B** | | |
| ***dmrs-AdditionalPosition*** | | | ***dmrs-AdditionalPosition*** | | |
| ***pos0*** | ***pos1*** | ***pos2*** | ***pos0*** | ***pos1*** | ***pos2*** |
| <4 |  |  |  | - | - |  |
| 4 |  |  |  | - | - |  |
| 5 |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |
| 10 |  | , 8 |  |  |  |  |
| 11 |  | , 8 |  |  |  |  |
| 12 |  | , 8 |  |  |  |  |
| 13 |  | , 10 |  |  |  |  |
| 14 |  | , 10 |  | - | - |  |

Table 7.4.1.1.2-5: PDSCH DM-RS time index and antenna ports .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DM-RS multiplexing** | **DM-RS duration** |  | **Supported antenna ports** | |
| **Configuration type 1** | **Configuration type 2** |
| Basic | single-symbol DM-RS | 0 | 1000 – 1003 | 1000 – 1005 |
| double-symbol DM-RS | 0, 1 | 1000 – 1007 | 1000 – 1011 |
| Enhanced | single-symbol DM-RS | 0 | 1000 – 1003, 1008 – 1011 | 1000 – 1005, 1012 – 1017 |
| double-symbol DM-RS | 0, 1 | 1000 – 1015 | 1000 – 1023 |

##### 7.4.1.2.2 Mapping to physical resources

The UE shall assume phase-tracking reference signals being present only in the resource blocks used for the PDSCH, and only if the procedure in [6, TS 38.214] indicates phase-tracking reference signals being used.

If present for a PT-RS port, the UE shall assume the PDSCH PT-RS is scaled by a factor to conform with the transmission power specified in clause 4.1 of [6, TS 38.214] and mapped to resource elements according to

when all the following conditions are fulfilled

- is within the OFDM symbols allocated for the PDSCH transmission

- resource element is not used for DM-RS, non-zero-power CSI-RS (except for those configured for mobility measurements or with *resourceType* in corresponding *CSI-ResourceConfig* configured as 'aperiodic'), zero-power CSI-RS, SS/PBCH block, a detected PDCCH according to clause 5.1.4.1 of [6, TS38.214], or is declared as 'not available' by clause 5.1.4 of [6, TS 38.214]

The set of time indices defined relative to the start of the PDSCH allocation is defined by

1. set and

2. if any symbol in the interval overlaps with a symbol used for DM-RS according to clause 7.4.1.1.2

- set

- set to the symbol index of the DM-RS symbol in case of a single-symbol DM-RS and to the symbol index of the second DM-RS symbol in case of a double-symbol DM-RS

- repeat from step 2 as long as is inside the PDSCH allocation

3. add to the set of time indices for PT-RS

4. increment  by one

5. repeat from step 2 above as long as is inside the PDSCH allocation

Where .

For the purpose of PT-RS mapping, the resource blocks allocated for PDSCH transmission are numbered from 0 to  from the lowest scheduled resource block to the highest. The corresponding subcarriers in this set of resource blocks are numbered in increasing order starting from the lowest frequency from 0 to . The subcarriers to which the UE shall assume the PT-RS is mapped are given by



where

-

-  is given by Table 7.4.1.2.2-1 for the DM-RS port associated with the PT-RS port according to clause 5.1.6.3 in [6, TS 38.214]. If the higher-layer parameter *resourceElementOffset* in the *PTRS-DownlinkConfig* IE is not configured, the column corresponding to 'offset00' shall be used.

-  is the RNTI associated with the DCI scheduling the transmission

-  is the number of resource blocks scheduled

- is given by [6, TS 38.214].

Table 7.4.1.2.2-1: The parameter .

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DM-RS antenna port |  | | | | | | | |
| DM-RS Configuration type 1 | | | | DM-RS Configuration type 2 | | | |
| *resourceElementOffset* | | | | *resourceElementOffset* | | | |
| offset00 | offset01 | offset10 | offset11 | offset00 | offset01 | offset10 | offset11 |
| 1000 | 0 | 2 | 6 | 8 | 0 | 1 | 6 | 7 |
| 1001 | 2 | 4 | 8 | 10 | 1 | 6 | 7 | 0 |
| 1002 | 1 | 3 | 7 | 9 | 2 | 3 | 8 | 9 |
| 1003 | 3 | 5 | 9 | 11 | 3 | 8 | 9 | 2 |
| 1004 | - | - | - | - | 4 | 5 | 10 | 11 |
| 1005 | - | - | - | - | 5 | 10 | 11 | 4 |
| 1008 | 4 | 6 | 10 | 0 | - | - | - | - |
| 1009 | 6 | 8 | 0 | 2 | - | - | - | - |
| 1010 | 5 | 7 | 11 | 1 | - | - | - | - |
| 1011 | 7 | 9 | 1 | 3 | - | - | - | - |
| 1012 | - | - | - | - | 6 | 7 | 0 | 1 |
| 1013 | - | - | - | - | 7 | 0 | 1 | 6 |
| 1014 | - | - | - | - | 8 | 9 | 2 | 3 |
| 1015 | - | - | - | - | 9 | 2 | 3 | 8 |
| 1016 | - | - | - | - | 10 | 11 | 4 | 5 |
| 1017 | - | - | - | - | 11 | 4 | 5 | 10 |