**3GPP TSG RAN WG1 #118bisR1-xxxxx**

**Hefei, China, October 14 – 18, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.211** | **CR** |  | **rev** | **-** | **Current version:** | **18.4.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
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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:*** | | | 2024-10-18 |
|  |  | | | |  | |  | | |  |
| ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | * Ambiguous description of intermediate resources for antenna port mapping. (R1-2407789) * Enhanced DM-RS pattern for PDSCH should, according to RAN1 agreements, not be supported for DCI formats 1\_0, 4\_0, and 4\_1 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Clarification of the intermediate resoruce. * Clarificatio of the DM-RS pattern generation | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | * Ambiguous specification. * Specifications not in line with the RAN1 agreements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.4.1.1.3. 7.4.1.1.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

##### 6.4.1.1.3 Precoding and mapping to physical resources

The sequence  shall be mapped to the intermediate quantity according to

- if transform precoding is not enabled,

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

- otherwise

- if transform precoding is enabled

where , , and are given by Tables 6.4.1.1.3-1 and 6.4.1.1.3-2 and the configuration type is given by the higher-layer parameter *DMRS-UplinkConfig*, and both and correspond to . The intermediate quantity if Δ corresponds to any other antenna ports than*.*

The intermediate quantity shall be precoded, multiplied with the amplitude scaling factor in order to conform to the transmit power specified in [6, TS 38.214], and mapped to physical resources according to

where

- the precoding matrix is given by clause 6.3.1.5,

- the set of antenna ports is given by clause 6.3.1.5, and

- the set of antenna ports is given by [6, TS 38.214];

and the following conditions are fulfilled:

- the resource elements are within the common resource blocks allocated for PUSCH transmission.

The reference point for is

- subcarrier 0 in common resource block 0 if transform precoding is not enabled, and

- subcarrier 0 of the lowest-numbered resource block of the scheduled PUSCH allocation if transform precoding is enabled.

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

- for PUSCH mapping type A:

-  is defined relative to the start of the slot if frequency hopping is disabled and relative to the start of each hop in case frequency hopping is enabled

-  is given by the higher-layer parameter *dmrs-TypeA-Position*

- for PUSCH mapping type B:

-  is defined relative to the start of the scheduled PUSCH resources if frequency hopping is disabled and relative to the start of each hop in case frequency hopping is enabled

- 

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

- is the duration between the first OFDM symbol of the slot and the last OFDM symbol of the scheduled PUSCH resources in the slot for PUSCH mapping type A according to Tables 6.4.1.1.3-3 and 6.4.1.1.3-4 if intra-slot frequency hopping is not used, or

- is the duration of scheduled PUSCH resources for PUSCH mapping type B according to Tables 6.4.1.1.3-3 and 6.4.1.1.3-4 if intra-slot frequency hopping is not used, or

- is the duration per hop according to Table 6.4.1.1.3-6 if intra-slot frequency hopping is used.

- if the higher-layer parameter *maxLength* in *DMRS-UplinkConfig* is not configured, or for a msgA transmission *msgA-MaxLength* in *msgA-DMRS-Config* is not configured, the tables shall be used according to single-symbol DM-RS

- if the higher-layer parameter *maxLength* in *DMRS-UplinkConfig* is equal to 'len2', the associated DCI or configured grant configuration determines whether single-symbol or double-symbol DM-RS shall be used

- if the higher-layer parameter *msgA-MaxLength* in *msgA-DMRS-Config* is equal to 'len2', double-symbol DM-RS shall be used

- if the higher-layer parameter *dmrs-AdditionalPosition* is not set to 'pos0' and intra-slot frequency hopping is enabled according to clause 7.3.1.1.2 in [4, TS 38.212] and by higher layer, Tables 6.4.1.1.3-6 shall be used assuming *dmrs-AdditionalPosition* is equal to 'pos1' for each hop.

For PUSCH mapping type A,

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

- symbols in Table 6.4.1.1.3-4 is only applicable when *dmrs-TypeA-Position* is equal to 'pos2'.

For msgA transmitted using PUSCH mapping type A,

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

- *'dmrs-AdditionalPosition*' in Tables 6.4.1.1.3-3 to 6.4.1.1.3-6 shall be replaced by *msgA-DMRS-AdditionalPosition;*

- only PUSCH DM-RS configuration type 1 is supported;

- only basic DM-RS multiplexing in Table 6.4.1.1.3-5 is supported.

For msgA transmitted using PUSCH mapping type B,

- '*dmrs-AdditionalPosition*' in Tables 6.4.1.1.3-3 to 6.4.1.1.3-6 shall be replaced by *msgA-DMRS-AdditionalPosition*;

- only PUSCH DM-RS configuration type 1 is supported;

- only basic DM-RS multiplexing in Table 6.4.1.1.3-5 is supported.

The time-domain index , and the supported antenna ports are given by Table 6.4.1.1.3-5.

Table 6.4.1.1.3-1: Parameters for PUSCH DM-RS configuration type 1.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **CDM group** |  |  |  |
| 0 | 0 | 0 |  |  |
| 1 | 0 | 0 |  |  |
| 2 | 1 | 1 |  |  |
| 3 | 1 | 1 |  |  |
| 4 | 0 | 0 |  |  |
| 5 | 0 | 0 |  |  |
| 6 | 1 | 1 |  |  |
| 7 | 1 | 1 |  |  |
| 8 | 0 | 0 |  |  |
| 9 | 0 | 0 |  |  |
| 10 | 1 | 1 |  |  |
| 11 | 1 | 1 |  |  |
| 12 | 0 | 0 |  |  |
| 13 | 0 | 0 |  |  |
| 14 | 1 | 1 |  |  |
| 15 | 1 | 1 |  |  |

Table 6.4.1.1.3-2: Parameters for PUSCH DM-RS configuration type 2.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **CDM group** |  |  |  |
| 0 | 0 | 0 |  |  |
| 1 | 0 | 0 |  |  |
| 2 | 1 | 2 |  |  |
| 3 | 1 | 2 |  |  |
| 4 | 2 | 4 |  |  |
| 5 | 2 | 4 |  |  |
| 6 | 0 | 0 |  |  |
| 7 | 0 | 0 |  |  |
| 8 | 1 | 2 |  |  |
| 9 | 1 | 2 |  |  |
| 10 | 2 | 4 |  |  |
| 11 | 2 | 4 |  |  |
| 12 | 0 | 0 |  |  |
| 13 | 0 | 0 |  |  |
| 14 | 1 | 2 |  |  |
| 15 | 1 | 2 |  |  |
| 16 | 2 | 4 |  |  |
| 17 | 2 | 4 |  |  |
| 18 | 0 | 0 |  |  |
| 19 | 0 | 0 |  |  |
| 20 | 1 | 2 |  |  |
| 21 | 1 | 2 |  |  |
| 22 | 2 | 4 |  |  |
| 23 | 2 | 4 |  |  |

Table 6.4.1.1.3-3: PUSCH DM-RS positions  within a slot for single-symbol DM-RS and intra-slot frequency hopping disabled.

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

Table 6.4.1.1.3-4: PUSCH DM-RS positions  within a slot for double-symbol DM-RS and intra-slot frequency hopping disabled.

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

Table 6.4.1.1.3-5: PUSCH DM-RS time index .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **DM-RS multiplexing** | **DM-RS duration** |  | **Supported antenna ports** | |
| **Configuration type 1** | **Configuration type 2** |
| Basic | single-symbol DM-RS | 0 | 0 – 3 | 0 – 5 |
| double-symbol DM-RS | 0, 1 | 0 – 7 | 0 – 11 |
| Enhanced | single-symbol DM-RS | 0 | 0 – 3, 8 – 11 | 0 – 5, 12 – 17 |
| double-symbol DM-RS | 0, 1 | 0 – 15 | 0 – 23 |

Table 6.4.1.1.3-6: PUSCH DM-RS positions  within a slot for single-symbol DM-RS and intra-slot frequency hopping enabled.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **in symbols** | **DM-RS positions** | | | | | | | | | | | |
| **PUSCH mapping type A** | | | | | | | | **PUSCH mapping type B** | | | |
|  | | | |  | | | |
| ***dmrs-AdditionalPosition*** | | | | ***dmrs-AdditionalPosition*** | | | | ***dmrs-AdditionalPosition*** | | | |
| ***pos0*** | | ***pos1*** | | ***pos0*** | | ***pos1*** | | ***pos0*** | | ***pos1*** | |
| **1st hop** | **2nd hop** | **1st hop** | **2nd hop** | **1st hop** | **2nd hop** | **1st hop** | **2nd hop** | **1st hop** | **2nd hop** | **1st hop** | **2nd hop** |
| ≤3 | - | - | - | - | - | - | - | - | 0 | 0 |  | 0 |
| 4 | 2 | 0 | 2 | 0 | 3 | 0 | 3 | 0 | 0 | 0 |  | 0 |
| 5, 6 | 2 | 0 | 2 | 0, 4 | 3 | 0 | 3 | 0, 4 | 0 | 0 |  | 0, 4 |
| 7 | 2 | 0 | 2, 6 | 0, 4 | 3 | 0 | 3 | 0, 4 | 0 | 0 |  | 0, 4 |

##### 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 |