**3GPP TSG-RAN WG1 Meeting #102-e *R1-200xxx***

**E-meeting, August 17th – 28th, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.212** | **CR** |  | **rev** | **-** | **Current version:** | **16.2.0** |  |
|  | | | | | | | | |
| *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 | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Corrections in TS 38.212 for NR MIMO after RAN1#102-e | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei | | | | | | | | | |
| ***Source to TSG:*** | R1 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_eMIMO-Core | | | | |  | ***Date:*** | | | 2020-08-31 |
|  |  | | | |  | |  | | |  |
| ***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 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. [102-e-NR-eMIMO-03]: The reporting on L1-SINR for PUSCH is not clear. 2. [102-e-NR-eMIMO-08]: RRC name is not aligned between RAN1 and RAN2, while the RRC name should be *ul-FullPowerTransmission-r16* according to RAN2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Clarified the L1-SINR reporting for PUSCH according to the agreed TP in R1-2007288 2. Updated the RRC name *ul-FullPowerTransmission* to *ul-FullPowerTransmission-r16* according to the agreed TP in R1-2007345. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | 1. L1-SINR reporting on PUSCH is not clear. 2. Misalignment between RAN1 and RAN2 for the RRC parameter name *ul-FullPowerTransmission-r16.* | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.3.2.1.2, 7.3.1.1.2, 7.3.1.1.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

##### 6.3.2.1.2 CSI

The bitwidth for PMI of *codebookType=typeI-SinglePanel* and *codebookType=typeI-MultiPanel* is specified in Clause 6.3.1.1.2.

The bitwidth for RI/LI/CQI/CRI of *codebookType=typeI-SinglePanel* and *codebookType=typeI-MultiPanel* is specified in Clause 6.3.1.1.2.

The bitwidth for PMI of *codebookType=typeII* is provided in Tables 6.3.2.1.2-1, where the values of , , , , , , and  are given by Clause 5.2.2.2.3 in [6, TS 38.214].

<Unchanged parts are ommited>

For CSI on PUSCH, two UCI bit sequences are generated,  and . The CSI fields of all CSI reports, in the order from upper part to lower part in Table 6.3.2.1.2-6, are mapped to the UCI bit sequence  starting with . The CSI fields of all CSI reports, in the order from upper part to lower part in Table 6.3.2.1.2-7, are mapped to the UCI bit sequence  starting with .

The mapping order of CSI fields of one report for CRI/RSRP or SSBRI/RSRP reporting is provided in Table 6.3.1.1.2-8. The mapping order of CSI fields of one report for CRI/SINR or SSBRI/SINR reporting is provided in Table 6.3.1.1.2-8A. The procedure in clause 6.3.2 described for CSI part 1 is also applicable for one report for CRI/RSRP, SSBRI/RSRP, CRI/SINR, or SSBRI/SINR reporting.

Table 6.3.2.1.2-3: Mapping order of CSI fields of one CSI report, CSI part 1

|  |  |
| --- | --- |
| CSI report number | CSI fields |
| CSI report #n  CSI part 1 | CRI as in Tables 6.3.1.1.2-3/4/6, if reported |
| Rank Indicator as in Tables 6.3.1.1.2-3/4/5 or 6.3.2.1.2-8, if reported |
| Wideband CQI for the first TB as in Tables 6.3.1.1.2-3/4/5 or 6.3.2.1.2-8, if reported |
| Subband differential CQI for the first TB with increasing order of subband number as in Tables 6.3.1.1.2-3/4/5 or 6.3.2.1.2-8, if reported |
| Indicator of the number of non-zero wideband amplitude coefficients for layer 0 as in Table 6.3.1.1.2-5, if reported |
| Indicator of the number of non-zero wideband amplitude coefficients for layer 1 as in Table 6.3.1.1.2-5 (if the rank according to the reported RI is equal to one, this field is set to all zeros), if 2-layer PMI reporting is allowed according to the rank restriction in Clauses 5.2.2.2.3 and 5.2.2.2.4 [6, TS 38.214] and if reported |
| Indicator of the total number of non-zero coefficients summed across all layers as in Table 6.3.2.1.2-8, if reported |
|  |
|  |
| Note: Subbands for given CSI report *n* indicated by the higher layer parameter *csi-ReportingBand* are numbered continuously in the increasing order with the lowest subband of *csi-ReportingBand* as subband 0. | |

<Unchanged parts are omitted>

Table 6.3.2.1.2-6: Mapping order of CSI reports to UCI bit sequence ,   
with two-part CSI report(s)

|  |  |
| --- | --- |
| UCI bit sequence | CSI report number |
|  | CSI part 1 of CSI report #1 as in Table 6.3.2.1.2-3 or Table 6.3.1.1.2-8 or Table 6.3.1.1.2-8A |
| CSI part 1 of CSI report #2 as in Table 6.3.2.1.2-3 or Table 6.3.1.1.2-8 or Table 6.3.1.1.2-8A |
| … |
| CSI part 1 of CSI report #n as in Table 6.3.2.1.2-3 or Table 6.3.1.1.2-8 or Table 6.3.1.1.2-8A |

where CSI report #1, CSI report #2, …, CSI report #n in Table 6.3.2.1.2-6 correspond to the CSI reports in increasing order of CSI report priority values according to Clause 5.2.5 of [6, TS38.214].

**<Unchanged parts are omitted>**

##### 7.3.1.1.2 Format 0\_1

DCI format 0\_1 is used for the scheduling of one or multiple PUSCH in one cell, or indicating CG downlink feedback information (CG-DFI) to a UE.

The following information is transmitted by means of the DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI or SP-CSI-RNTI or MCS-C-RNTI:

- Identifier for DCI formats – 1 bit

- The value of this bit field is always set to 0, indicating an UL DCI format

- Carrier indicator – 0 or 3 bits, as defined in Clause 10.1 of [5, TS38.213].

- DFI flag – 0 or 1 bit

- 1 bit if the UE is configured to monitor DCI format 0\_1 with CRC scrambled by CS-RNTI and for operation in a cell with shared spectrum channel access. For a DCI format 0\_1 with CRC scrambled by CS-RNTI, the bit value of 0 indicates activating type 2 CG transmission and the bit value of 1 indicates CG-DFI. For a DCI format 0\_1 with CRC scrambled by C-RNTI/SP-CSI-RNTI/MCS-C-RNTI and for operation in a cell with shared specrum channel access, the bit is reserved.

- 0 bit otherwise;

If DCI format 0\_1 is used for indicating CG-DFI, all the remaining fields are set as follows:

- HARQ-ACK bitmap – 16 bits , where the order of the bitmap to HARQ process index mapping is such that HARQ process indices are mapped in ascending order from MSB to LSB of the bitmap. For each bit of the bitmap, value 1 indicates ACK, and value 0 indicates NACK.

- TPC command for scheduled PUSCH – 2 bits as defined in Clause 7.1.1 of [5, TS38.213]

- All the remaining bits in format 0\_1 are set to zero.

Otherwise, all the remaining fields are set as follows:

- UL/SUL indicator – 0 bit for UEs not configured with *supplementaryUplink* in *ServingCellConfig* in the cell or UEs configured with *supplementaryUplink* in *ServingCellConfig* in the cell but only one carrier in the cell is configured for PUSCH transmission; otherwise, 1 bit as defined in Table 7.3.1.1.1-1.

- Bandwidth part indicator – 0, 1 or 2 bits as determined by the number of UL BWPs  configured by higher layers, excluding the initial UL bandwidth part. The bitwidth for this field is determined as bits, where

-  if , in which case the bandwidth part indicator is equivalent to the ascending order of the higher layer parameter *BWP-Id*;

- otherwise , in which case the bandwidth part indicator is defined in Table 7.3.1.1.2-1;

If a UE does not support active BWP change via DCI, the UE ignores this bit field.

- Frequency domain resource assignment – number of bits determined by the following, where  is the size of the active UL bandwidth part:

- If higher layer parameter *useInterlacePUCCH-PUSCH* in *BWP-UplinkDedicated* is not configured

-  bits if only resource allocation type 0 is configured, where  is defined in Clause 6.1.2.2.1 of [6, TS 38.214],

- bits if only resource allocation type 1 is configured, or  bits if both resource allocation type 0 and 1 are configured.

- If both resource allocation type 0 and 1 are configured, the MSB bit is used to indicate resource allocation type 0 or resource allocation type 1, where the bit value of 0 indicates resource allocation type 0 and the bit value of 1 indicates resource allocation type 1.

- For resource allocation type 0, the  LSBs provide the resource allocation as defined in Clause 6.1.2.2.1 of [6, TS 38.214].

- For resource allocation type 1, the  LSBs provide the resource allocation as follows:

- For PUSCH hopping with resource allocation type 1:

-  MSB bits are used to indicate the frequency offset according to Clause 6.3 of [6, TS 38.214], where  if the higher layer parameter *frequencyHoppingOffsetLists* contains two offset values and  if the higher layer parameter *frequencyHoppingOffsetLists* contains four offset values

-  bits provides the frequency domain resource allocation according to Clause 6.1.2.2.2 of [6, TS 38.214]

- For non-PUSCH hopping with resource allocation type 1:

-  bits provides the frequency domain resource allocation according to Clause 6.1.2.2.2 of [6, TS 38.214]

- If the higher layer parameter *useInterlacePUCCH-PUSCH* in *BWP-UplinkDedicated* is configured

- 5 + Y bits provide the frequency domain resource allocation according to Clause 6.1.2.2.3 of [6, TS 38.214] if the subcarrier spacing for the active UL bandwidth part is 30 kHz. The 5 MSBs provide the interlace allocation and the Y LSBs provide the RB set allocation.

- 6 + Y bits provide the frequency domain resource allocation according to Clause 6.1.2.2.3 of [6, TS 38.214] if the subcarrier spacing for the active UL bandwidth part is 15 kHz. The 6 MSBs provide the interlace allocation and the Y LSBs provide the RB set allocation.

The value of Y is determined by where is the number of RB sets contained in the UL BWP as defined in clause 7 of [6, TS38.214].

If "Bandwidth part indicator" field indicates a bandwidth part other than the active bandwidth part and if both resource allocation type 0 and 1 are configured for the indicated bandwidth part, the UE assumes resource allocation type 0 for the indicated bandwidth part if the bitwidth of the "Frequency domain resource assignment" field of the active bandwidth part is smaller than the bitwidth of the "Frequency domain resource assignment" field of the indicated bandwidth part.

- Time domain resource assignment – 0, 1, 2, 3, 4, 5, or 6 bits

- If the higher layer parameter *PUSCH-TimeDomainResourceAllocationList-ForDCIformat0\_1* is not configured and if the higher layer parameter *pusch-TimeDomainAllocationList* is configured, 0, 1, 2, 3, or 4 bits as defined in Clause 6.1.2.1 of [6, TS38.214]. The bitwidth for this field is determined as bits, where *I* is the number of entries in the higher layer parameter *pusch-TimeDomainAllocationList* or *pusch-TimeDomainAllocationList-r16*;

- If the higher layer parameter *PUSCH-TimeDomainResourceAllocationList-ForDCIformat0\_1* is configured, 0, 1, 2, 3, 4, 5 or 6 bits as defined in Clause 6.1.2.1 of [6, TS38.214]. The bitwidth for this field is determined as bits, where *I* is the number of entries in the higher layer parameter *PUSCH-TimeDomainResourceAllocationList-ForDCIformat0\_1*;

- otherwise the bitwidth for this field is determined as bits, where *I* is the number of entries in the default table*.*

- Frequency hopping flag – 0 or 1 bit:

- 0 bit if only resource allocation type 0 is configured, or if the higher layer parameter *frequencyHopping* is not configured and the higher layer parameter pusch-RepTypeIndicatorForDCI-Format0-1 is not configured to *pusch-RepTypeB*, or if the higher layer parameter frequencyHoppingForDCI-Format0-1 is not configured and pusch-RepTypeIndicatorForDCI-Format0-1 is configured to *pusch-RepTypeB*, or if only resource allocation type 2 is configured;

- 1 bit according to Table 7.3.1.1.1-3 otherwise, only applicable to resource allocation type 1, as defined in Clause 6.3 of [6, TS 38.214].

- Modulation and coding scheme – 5 bits as defined in Clause 6.1.4.1 of [6, TS 38.214]

- New data indicator – 1 bit if the number of scheduled PUSCH indicated by the Time domain resource assignment field is 1; otherwise 2, 3, 4, 5, 6, 7 or 8 bits determined based on the maximum number of schedulable PUSCH among all entries in the higher layer parameter *pusch-TimeDomainAllocationList-r16*, where each bit corresponds to one scheduled PUSCH as defined in clause 6.1.4 in [6, TS 38.214].

- Redundancy version – – number of bits determined by the following:

- 2 bits as defined in Table 7.3.1.1.1-2 if the number of scheduled PUSCH indicated by the Time domain resource assignment field is 1;

- otherwise 2, 3, 4, 5, 6, 7 or 8 bits determined by the maximum number of schedulable PUSCHs among all entries in the higher layer parameter *pusch-TimeDomainAllocationList-r16*, where each bit corresponds to one scheduled PUSCH as defined in clause 6.1.4 in [6, TS 38.214] and redundancy version is determined according to Table 7.3.1.1.2-34.

- HARQ process number – 4 bits

- 1st downlink assignment index – 1, 2 or 4 bits:

- 1 bit for semi-static HARQ-ACK codebook;

- 2 bits for dynamic HARQ-ACK codebook, or for enhanced dynamic HARQ-ACK codebook without *UL-TotalDAI-Included-r16* configured;

- 4 bits for enhanced dynamic HARQ-ACK codebook and with *UL-TotalDAI-Included-r16 = "enable"*..

When two HARQ-ACK codebooks are configured for the same serving cell and if higher layer parameter *priorityIndicatorForDCI-Format0-1* is configured, if the bit width of the 1st downlink assignment index in DCI format 0\_1 for one HARQ-ACK codebook is not equal to that of the 1st downlink assignment index in DCI format 0\_1 for the other HARQ-ACK codebook, a number of most significant bits with value set to '0' are inserted to smaller 1st downlink assignment index until the bit width of the 1st downlink assignment index in DCI format 0\_1 for the two HARQ-ACK codebooks are the same.

- 2nd downlink assignment index – 0, 2 or 4 bits:

- 2 bits for dynamic HARQ-ACK codebook with two HARQ-ACK sub-codebooks, or for enhanced dynamic HARQ-ACK codebook with two HARQ-ACK sub-codebooks and without *UL-TotalDAI-Included-r16* configured;

- 4 bits for enhanced dynamic HARQ-ACK codebook with two HARQ-ACK sub-codebooks and with *UL-TotalDAI-Included-r16 = "enable"*;

- 0 bit otherwise.

When two HARQ-ACK codebooks are configured for the same serving cell and if higher layer parameter *priorityIndicatorForDCI-Format0-1* is configured, if the bit width of the 2nd downlink assignment index in DCI format 0\_1 for one HARQ-ACK codebook is not equal to that of the 2nd downlink assignment index in DCI format 0\_1 for the other HARQ-ACK codebook, a number of most significant bits with value set to '0' are inserted to smaller 2nd downlink assignment index until the bit width of the 2nd downlink assignment index in DCI format 0\_1 for the two HARQ-ACK codebooks are the same.

- TPC command for scheduled PUSCH – 2 bits as defined in Clause 7.1.1 of [5, TS38.213]

- SRS resource indicator – or  bits, where  is the number of configured SRS resources in the SRS resource set configured by higher layer parameter *srs-ResourceSetToAddModList*, and associated with the higher layer parameter *usage* of value '*codeBook*' or '*nonCodeBook*',

-  bits according to Tables 7.3.1.1.2-28/29/30/31 if the higher layer parameter *txConfig = nonCodebook*, where  is the number of configured SRS resources in the SRS resource set configured by higher layer parameter *srs-ResourceSetToAddModList*, and associated with the higher layer parameter *usage* of value '*nonCodeBook*' and

- if UE supports operation with *maxMIMO-Layers* and the higher layer parameter *maxMIMO-Layers* of *PUSCH-ServingCellConfig* of the serving cell is configured, *Lmax* is given by that parameter

- otherwise, *Lmax* is given by the maximum number of layers for PUSCH supported by the UE for the serving cell for non-codebook based operation.

-  bits according to Tables 7.3.1.1.2-32, 7.3.1.1.2-32A and 7.3.1.1.2-32B if the higher layer parameter *txConfig = codebook*, where  is the number of configured SRS resources in the SRS resource set configured by higher layer parameter *srs-ResourceSetToAddModList*, and associated with the higher layer parameter *usage* of value '*codeBook*'.

- Precoding information and number of layers – number of bits determined by the following:

- 0 bits if the higher layer parameter *txConfig = nonCodeBook*;

- 0 bits for 1 antenna port and if the higher layer parameter *txConfig = codebook*;

- 4, 5, or 6 bits according to Table 7.3.1.1.2-2 for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank*, and *codebookSubset*;

- 4 or 5 bits according to Table 7.3.1.1.2-2A for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16= fullpowerMode1, maxRank=2,* transform precoder is disabled, and according to the values of higher layer parameter *codebookSubset*;

- 4 or 6 bits according to Table 7.3.1.1.2-2B for 4 antenna ports, if *txConfig = codebook, ul-FullPowerTransmission-r16= fullpowerMode1,* *maxRank=3 or 4,* transform precoder is disabled, and according to the values of higher layer parameter *codebookSubset*;

- 2, 4, or 5 bits according to Table 7.3.1.1.2-3 for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank*, and *codebookSubset*;

- 3 or 4 bits according to Table 7.3.1.1.2-3A for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16= fullpowerMode1*, *maxRank=1*, and according to whether transform precoder is enabled or disabled, and the values of higher layer parameter *codebookSubset*;

- 2 or 4 bits according to Table7.3.1.1.2-4 for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank* and *codebookSubset*;

- 2 bits according to Table 7.3.1.1.2-4A for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16= fullpowerMode1*, transform precoder is disabled, *maxRank=2*, and *codebookSubset=nonCoherent*;

- 1 or 3 bits according to Table7.3.1.1.2-5 for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank* and *codebookSubset*;

- 2 bits according to Table 7.3.1.1.2-5A for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16= fullpowerMode1*, *maxRank=1*, and according to whether transform precoder is enabled or disabled, and the values of higher layer parameter *codebookSubset*;

For the higher layer parameter *txConfig=codebook*, if *ul-FullPowerTransmission-r16* is configured to *fullpowerMode2*, maxRank is configured to be larger than 2, and at least one SRS resource with 4 antenna ports is configured in an SRS resource set with usage set to 'codebook' and an SRS resource with 2 antenna ports is indicated via SRI in the same SRS resource set, then Table 7.3.1.1.2-4 is used.

For the higher layer parameter *txConfig = codebook*, if different SRS resources with different number of antenna ports are configured, the bitwidth is determined according to the maximum number of ports in an SRS resource among the configured SRS resources in an SRS resource set with usage set to 'codebook'. If the number of ports for a configured SRS resource in the set is less than the maximum number of ports in an SRS resource among the configured SRS resources, a number of most significant bits with value set to '0' are inserted to the field.

- Antenna ports – number of bits determined by the following

- 2 bits as defined by Tables 7.3.1.1.2-6, if transform precoder is enabled, *dmrs-Type*=1, and *maxLength*=1, except that *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured and π/2 BPSK modulation is used;

- 2 bits as defined by Tables 7.3.1.1.2-6A, if transform precoder is enabled and *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured, π/2 BPSK modulation is used, *dmrs-Type*=1, and *maxLength*=1, where nSCID is the scrambling identity for antenna ports defined in [Clause 6.4.1.1.1.2, TS38.211];

- 4 bits as defined by Tables 7.3.1.1.2-7, if transform precoder is enabled, *dmrs-Type*=1, and *maxLength*=2, except that *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured and π/2 BPSK modulation is used;

- 4 bits as defined by Tables 7.3.1.1.2-7A, if transform precoder is enabled and *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured, π/2 BPSK modulation is used, *dmrs-Type*=1, and *maxLength*=2, where nSCID is the scrambling identity for antenna ports defined in [Clause 6.4.1.1.1.2, TS38.211];

- 3 bits as defined by Tables 7.3.1.1.2-8/9/10/11, if transform precoder is disabled, *dmrs-Type*=1, and *maxLength*=1, and the value of rank is determined according to the SRS resource indicator field if the higher layer parameter *txConfig = nonCodebook* and according to the Precoding information and number of layers field if the higher layer parameter *txConfig = codebook*;

- 4 bits as defined by Tables 7.3.1.1.2-12/13/14/15, if transform precoder is disabled, *dmrs-Type*=1, and *maxLength*=2, and the value of rank is determined according to the SRS resource indicator field if the higher layer parameter *txConfig = nonCodebook* and according to the Precoding information and number of layers field if the higher layer parameter *txConfig = codebook*;

- 4 bits as defined by Tables 7.3.1.1.2-16/17/18/19, if transform precoder is disabled, *dmrs-Type*=2, and *maxLength*=1, and the value of rank is determined according to the SRS resource indicator field if the higher layer parameter *txConfig = nonCodebook* and according to the Precoding information and number of layers field if the higher layer parameter *txConfig = codebook*;

- 5 bits as defined by Tables 7.3.1.1.2-20/21/22/23, if transform precoder is disabled, *dmrs-Type*=2, and *maxLength*=2, and the value of rank is determined according to the SRS resource indicator field if the higher layer parameter *txConfig = nonCodebook* and according to the Precoding information and number of layers field if the higher layer parameter *txConfig = codebook*.

where the number of CDM groups without data of values 1, 2, and 3 in Tables 7.3.1.1.2-6 to 7.3.1.1.2-23 refers to CDM groups {0}, {0,1}, and {0, 1,2} respectively.

If a UE is configured with both *dmrs-UplinkForPUSCH-MappingTypeA* and *dmrs-UplinkForPUSCH-MappingTypeB*, the bitwidth of this field equals , where  is the "Antenna ports" bitwidth derived according to *dmrs-UplinkForPUSCH-MappingTypeA* and  is the "Antenna ports" bitwidthderived according to *dmrs-UplinkForPUSCH-MappingTypeB*. A number of  zeros are padded in the MSB of this field, if the mapping type of the PUSCH corresponds to the smaller value of  and .

- SRS request – 2 bits as defined by Table 7.3.1.1.2-24 for UEs not configured with *supplementaryUplink* in *ServingCellConfig* in the cell; 3 bits for UEs configured with *supplementaryUplink* in *ServingCellConfig* in the cell where the first bit is the non-SUL/SUL indicator as defined in Table 7.3.1.1.1-1 and the second and third bits are defined by Table 7.3.1.1.2-24. This bit field may also indicate the associated CSI-RS according to Clause 6.1.1.2 of [6, TS 38.214].

- CSI request – 0, 1, 2, 3, 4, 5, or 6 bits determined by higher layer parameter *reportTriggerSize*.

- CBG transmission information (CBGTI) – 0 bit if higher layer parameter *codeBlockGroupTransmission* for PUSCH is not configured or if the number of scheduled PUSCH indicated by the Time domain resource assignment field is larger than 1; otherwise, 2, 4, 6, or 8 bits determined by higher layer parameter *maxCodeBlockGroupsPerTransportBlock* for PUSCH.

- PTRS-DMRS association – number of bits determined as follows

- 0 bit if *PTRS-UplinkConfi*g is not configured in either *dmrs-UplinkForPUSCH-MappingTypeA* or *dmrs-UplinkForPUSCH-MappingTypeB* and transform precoder is disabled, or if transform precoder is enabled, or if *maxRank=1*;

- 2 bits otherwise, where Table 7.3.1.1.2-25 and 7.3.1.1.2-26 are used to indicate the association between PTRS port(s) and DMRS port(s) for transmission of one PT-RS port and two PT-RS ports respectively, and the DMRS ports are indicated by the Antenna ports field.

If "Bandwidth part indicator" field indicates a bandwidth part other than the active bandwidth part and the "PTRS-DMRS association" field is present for the indicated bandwidth part but not present for the active bandwidth part, the UE assumes the "PTRS-DMRS association" field is not present for the indicated bandwidth part.

- beta\_offset indicator – 0 if the higher layer parameter *betaOffsets = semiStatic*; otherwise 2 bits as defined by Table 9.3-3 in [5, TS 38.213].

When two HARQ-ACK codebooks are configured for the same serving cell and if higher layer parameter *priorityIndicatorForDCI-Format0-1* is configured, if the bit width of the beta\_offset indicator in DCI format 0\_1 for one HARQ-ACK codebook is not equal to that of the beta\_offset indicator in DCI format 0\_1 for the other HARQ-ACK codebook, a number of most significant bits with value set to '0' are inserted to smaller beta\_offset indicator until the bit width of the beta\_offset indicator in DCI format 0\_1 for the two HARQ-ACK codebooks are the same.

- DMRS sequence initialization – 0 bit if transform precoder is enabled; 1 bit if transform precoder is disabled.

- UL-SCH indicator – 0 or 1 bit as follows

- 0 bit if the number of scheduled PUSCH indicated by the Time domain resource assignment field is larger than 1;

- 1 bit otherwise. A value of "1" indicates UL-SCH shall be transmitted on the PUSCH and a value of "0" indicates UL-SCH shall not be transmitted on the PUSCH. Except for DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, a UE is not expected to receive a DCI format 0\_1 with UL-SCH indicator of "0" and CSI request of all zero(s).

- ChannelAccess-CPext-CAPC – 0, 1, 2, 3, 4, 5 or 6 bits. The bitwidth for this field is determined as bits, where *I* is the number of entries in the higher layer parameter *ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-r16* for operation in a cell with shared spectrum channel access; otherwise 0 bit. One or more entries from Table 7.3.1.1.2-35 are configured by the higher layer parameter *ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-r16.*

- Open-loop power control parameter set indication – 0 or 1 or 2 bits.

- 0 bit if the higher layer parameter *p0-PUSCH-SetList* is not configured;

- 1 or 2 bits otherwise,

- 1 bit if SRS resource indicator is present in the DCI format 0\_1;

- 1 or 2 bits as determined by higher layer parameter *olpc-ParameterSetForDCI-Format0-1* if SRS resource indicator is not present in the DCI format 0\_1.

- Priority indicator – 0 bit if higher layer parameter *priorityIndicatorForDCI-Format0-1* is not configured; otherwise 1 bit as defined in Clause 9 in [5, TS 38.213].

- Invalid symbol pattern indicator – 0 bit if higher layer parameter *InvalidSymbolPatternIndicator-ForDCIFormat0\_1* is not configured; otherwise 1 bit as defined in Clause 6.1.2.1 in [6, TS 38.214].

- Minimum applicable scheduling offset indicator – 0 or 1 bit

- 0 bit if higher layer parameter *minimumSchedulingOffsetK2* is not configured;

- 1 bit if higher layer parameter *minimumSchedulingOffsetK2* is configured. The 1 bit indication is used to determine the minimum applicable K2 for the active UL BWP and the minimum applicable K0 value for the active DL BWP, if configured respectively, according to Table 7.3.1.1.2-33. If the minimum applicable K0 is indicated, the minimum applicable value of the aperiodic CSI-RS triggering offset for an active DL BWP shall be the same as the minimum applicable K0 value.

- SCell dormancy indication – 0 bit if higher layer parameter *Scell-groups-for-dormancy-within-active-time* is not configured; otherwise 1, 2, 3, 4 or 5 bits bitmap determined according to higher layer parameter *Scell-groups-for-dormancy-within-active-time,* where each bit corresponds to one of the SCell group(s) configured by higher layers parameter *Scell-groups-for-dormancy-within-active-time,* with MSB to LSB of the bitmap corresponding to the first to last configured SCell group. The field is only present when this format is carried by PDCCH on the primary cell within DRX Active Time and the UE is configured with at least two DL BWPs for an SCell.

- Sidelink assignment index – 0, 1 or 2 bits:

- 1 bit if the UE is configured with *pdsch-HARQ-ACK-Codebook* = *semi-static* and, in addition, the UE is configured with a SL configured grant type 1 or to monitor DCI format 3\_0 with CRC scrambled by SL-RNTI or SL-CS-RNTI;

- 2 bits if the UE is configured with *pdsch-HARQ-ACK-Codebook* = *dynamic* and, in addition, the UE is configured with a SL configured grant type 1 or to monitor DCI format 3\_0 with CRC scrambled by SL-RNTI or SL-CS-RNTI;

- 0 bit otherwise.

A UE does not expect that the bit width of a field in DCI format 0\_1 with CRC scrambled by CS-RNTI is larger than corresponding bit width of same field in DCI format 0\_1 with CRC scrambled by C-RNTI for the same serving cell. If the bit width of a field in the DCI format 0\_1 with CRC scrambled by CS-RNTI is not equal to that of the corresponding field in the DCI format 0\_1 with CRC scrambled by C-RNTI for the same serving cell, a number of most significant bits with value set to '0' are inserted to the field in DCI format 0\_1 with CRC scrambled by CS-RNTI until the bit width equals that of the corresponding field in the DCI format 0\_1 with CRC scrambled by C-RNTI for the same serving cell.

If the number of information bits in DCI format 0\_1 scheduling a single PUSCH prior to padding is not equal to the number of information bits in DCI format 0\_1 scheduling multiple PUSCHs for the same serving cell, zeros shall be appended to the DCI format 0\_1 with smaller size until the payload size is the same for scheduling a single PUSCH and multiple PUSCHs.

Table 7.3.1.1.2-1: Bandwidth part indicator

|  |  |
| --- | --- |
| Value of BWP indicator field | Bandwidth part |
| 2 bits |
| 00 | Configured BWP with BWP-Id = 1 |
| 01 | Configured BWP with BWP-Id = 2 |
| 10 | Configured BWP with BWP-Id = 3 |
| 11 | Configured BWP with BWP-Id = 4 |

Table 7.3.1.1.2-2: Precoding information and number of layers, for 4 antenna ports, if transform precoder is disabled, *maxRank* = 2 or 3 or 4, and *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bit field mapped to index | *codebookSubset* = *fullyAndPartialAndNonCoherent* | Bit field mapped to index | *codebookSubset* = *partialAndNonCoherent* | Bit field mapped to index | *codebookSubset*= *nonCoherent* |
| 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 |
| … | … | … | … | … | … |
| 3 | 1 layer: TPMI=3 | 3 | 1 layer: TPMI=3 | 3 | 1 layer: TPMI=3 |
| 4 | 2 layers: TPMI=0 | 4 | 2 layers: TPMI=0 | 4 | 2 layers: TPMI=0 |
| … | … | … | … | … | … |
| 9 | 2 layers: TPMI=5 | 9 | 2 layers: TPMI=5 | 9 | 2 layers: TPMI=5 |
| 10 | 3 layers: TPMI=0 | 10 | 3 layers: TPMI=0 | 10 | 3 layers: TPMI=0 |
| 11 | 4 layers: TPMI=0 | 11 | 4 layers: TPMI=0 | 11 | 4 layers: TPMI=0 |
| 12 | 1 layer: TPMI=4 | 12 | 1 layer: TPMI=4 | 12-15 | reserved |
| … | … | … | … |  |  |
| 19 | 1 layer: TPMI=11 | 19 | 1 layer: TPMI=11 |  |  |
| 20 | 2 layers: TPMI=6 | 20 | 2 layers: TPMI=6 |  |  |
| … | … | … | … |  |  |
| 27 | 2 layers: TPMI=13 | 27 | 2 layers: TPMI=13 |  |  |
| 28 | 3 layers: TPMI=1 | 28 | 3 layers: TPMI=1 |  |  |
| 29 | 3 layers: TPMI=2 | 29 | 3 layers: TPMI=2 |  |  |
| 30 | 4 layers: TPMI=1 | 30 | 4 layers: TPMI=1 |  |  |
| 31 | 4 layers: TPMI=2 | 31 | 4 layers: TPMI=2 |  |  |
| 32 | 1 layers: TPMI=12 |  |  |  |  |
| … | … |  |  |  |  |
| 47 | 1 layers: TPMI=27 |  |  |  |  |
| 48 | 2 layers: TPMI=14 |  |  |  |  |
| … | … |  |  |  |  |
| 55 | 2 layers: TPMI=21 |  |  |  |  |
| 56 | 3 layers: TPMI=3 |  |  |  |  |
| … | … |  |  |  |  |
| 59 | 3 layers: TPMI=6 |  |  |  |  |
| 60 | 4 layers: TPMI=3 |  |  |  |  |
| 61 | 4 layers: TPMI=4 |  |  |  |  |
| 62-63 | reserved |  |  |  |  |

Table 7.3.1.1.2-2A: Precoding information and number of layers for 4 antenna ports, if transform precoder is disabled, *maxRank* = 2, and *ul-FullPowerTransmission-r16 = fullpowerMode1*

|  |  |  |  |
| --- | --- | --- | --- |
| Bit field mapped to index | *codebookSubset* = *partialAndNonCoherent* | Bit field mapped to index | *codebookSubset*= *nonCoherent* |
| 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 |
| … | … | … | … |
| 3 | 1 layer: TPMI=3 | 3 | 1 layer: TPMI=3 |
| 4 | 2 layers: TPMI=0 | 4 | 2 layers: TPMI=0 |
| … | … | … | … |
| 9 | 2 layers: TPMI=5 | 9 | 2 layers: TPMI=5 |
| 10 | 1 layer: TPMI=13 | 10 | 1 layer: TPMI=13 |
| 11 | 2 layer: TPMI=6 | 11 | 2 layer: TPMI=6 |
| 12 | 1 layer: TPMI=4 | 12-15 | Reserved |
| … | … |  |  |
| 20 | 1 layer: TPMI=12 |  |  |
| 21 | 1 layer: TPMI=14 |  |  |
| 22 | 1 layer: TPMI=15 |  |  |
| 23 | 2 layers: TPMI=7 |  |  |
| … | … |  |  |
| 29 | 2 layers: TPMI=13 |  |  |
| 30-31 | Reserved |  |  |

Table 7.3.1.1.2-2B: Precoding information and number of layers for 4 antenna ports, if transform precoder is disabled, *maxRank* = 3 or 4, and *ul-FullPowerTransmission-r16 = fullpowerMode1*

|  |  |  |  |
| --- | --- | --- | --- |
| Bit field mapped to index | *codebookSubset* = *partialAndNonCoherent* | Bit field mapped to index | *codebookSubset*= *nonCoherent* |
| 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 |
| … | … | … | … |
| 3 | 1 layer: TPMI=3 | 3 | 1 layer: TPMI=3 |
| 4 | 2 layers: TPMI=0 | 4 | 2 layers: TPMI=0 |
| … | … | … | … |
| 9 | 2 layers: TPMI=5 | 9 | 2 layers: TPMI=5 |
| 10 | 3 layers: TPMI=0 | 10 | 3 layers: TPMI=0 |
| 11 | 4 layers: TPMI=0 | 11 | 4 layers: TPMI=0 |
| 12 | 1 layer: TPMI=13 | 12 | 1 layer: TPMI=13 |
| 13 | 2 layer: TPMI=6 | 13 | 2 layer: TPMI=6 |
| 14 | 3 layer: TPMI=1 | 14 | 3 layer: TPMI=1 |
| 15 | 1 layer: TPMI=4 | 15 | Reserved |
| … | … |  |  |
| 23 | 1 layer: TPMI=12 |  |  |
| 24 | 1 layer: TPMI=14 |  |  |
| 25 | 1 layer: TPMI=15 |  |  |
| 26 | 2 layers: TPMI=7 |  |  |
| … | … |  |  |
| 32 | 2 layers: TPMI=13 |  |  |
| 33 | 3 layers: TPMI=2 |  |  |
| 34 | 4 layers: TPMI=1 |  |  |
| 35 | 4 layers: TPMI=2 |  |  |
| 36-63 | Reserved |  |  |

Table 7.3.1.1.2-3: Precoding information and number of layers for 4 antenna ports, if transform precoder is enabled and *ul-FullPowerTransmission-r16* is either not configured or configured to *fullpowerMode2*, or if transform precoder is disabled, *maxRank* = 1, and *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bit field mapped to index | *codebookSubset* = *fullyAndPartialAndNonCoherent* | Bit field mapped to index | *codebookSubset*= *partialAndNonCoherent* | Bit field mapped to index | *codebookSubset*= *nonCoherent* |
| 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 |
| … | … | … | … | … | … |
| 3 | 1 layer: TPMI=3 | 3 | 1 layer: TPMI=3 | 3 | 1 layer: TPMI=3 |
| 4 | 1 layer: TPMI=4 | 4 | 1 layer: TPMI=4 |  |  |
| … | … | … | … |  |  |
| 11 | 1 layer: TPMI=11 | 11 | 1 layer: TPMI=11 |  |  |
| 12 | 1 layers: TPMI=12 | 12-15 | reserved |  |  |
| … | … |  |  |  |  |
| 27 | 1 layers: TPMI=27 |  |  |  |  |
| 28-31 | reserved |  |  |  |  |

Table 7.3.1.1.2-3A: Precoding information and number of layers for 4 antenna ports, if transform precoder is enabled and *ul-FullPowerTransmission-r16 = fullpowerMode1*, or if transform precoder is disabled, *maxRank* = 1, and *ul-FullPowerTransmission-r16 = fullpowerMode1*

|  |  |  |  |
| --- | --- | --- | --- |
| Bit field mapped to index | *codebookSubset*= *partialAndNonCoherent* | Bit field mapped to index | *codebookSubset*= *nonCoherent* |
| 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 |
| … | … | … | … |
| 3 | 1 layer: TPMI=3 | 3 | 1 layer: TPMI=3 |
| 4 | 1 layer: TPMI=13 | 4 | 1 layer: TPMI=13 |
| 5 | 1 layer: TPMI=4 | 5-7 | Reserved |
| … | … |  |  |
| 13 | 1 layer: TPMI=12 |  |  |
| 14 | 1 layer: TPMI=14 |  |  |
| 15 | 1 layer: TPMI=15 |  |  |

Table 7.3.1.1.2-4: Precoding information and number of layers, for 2 antenna ports, if transform precoder is disabled, *maxRank* = 2, and *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower*

|  |  |  |  |
| --- | --- | --- | --- |
| Bit field mapped to index | *codebookSubset* = *fullyAndPartialAndNonCoherent* | Bit field mapped to index | *codebookSubset* = *nonCoherent* |
| 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 |
| 2 | 2 layers: TPMI=0 | 2 | 2 layers: TPMI=0 |
| 3 | 1 layer: TPMI=2 | 3 | reserved |
| 4 | 1 layer: TPMI=3 |  |  |
| 5 | 1 layer: TPMI=4 |  |  |
| 6 | 1 layer: TPMI=5 |  |  |
| 7 | 2 layers: TPMI=1 |  |  |
| 8 | 2 layers: TPMI=2 |  |  |
| 9-15 | reserved |  |  |

Table 7.3.1.1.2-4A: Precoding information and number of layers, for 2 antenna ports, if transform precoder is disabled*, maxRank* = 2, and *ul-FullPowerTransmission-r16 = fullpowerMode1*

|  |  |
| --- | --- |
| Bit field mapped to index | *codebookSubset*= *nonCoherent* |
| 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 |
| 2 | 2 layers: TPMI=0 |
| 3 | 1 layer: TPMI=2 |

Table 7.3.1.1.2-5: Precoding information and number of layers, for 2 antenna ports, if transform precoder is enabled and *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower*, or if transform precoder is disabled, *maxRank* = 1, and and *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower*

|  |  |  |  |
| --- | --- | --- | --- |
| Bit field mapped to index | *codebookSubset* = *fullyAndPartialAndNonCoherent* | Bit field mapped to index | *codebookSubset* = *nonCoherent* |
| 0 | 1 layer: TPMI=0 | 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 | 1 | 1 layer: TPMI=1 |
| 2 | 1 layer: TPMI=2 |  |  |
| 3 | 1 layer: TPMI=3 |  |  |
| 4 | 1 layer: TPMI=4 |  |  |
| 5 | 1 layer: TPMI=5 |  |  |
| 6-7 | reserved |  |  |

Table 7.3.1.1.2-5A: Precoding information and number of layers, for 2 antenna ports, if transform precoder is enabled and *ul-FullPowerTransmission-r16 = fullpowerMode1*, or if transform precoder is disabled*, maxRank* = 1, and *ul-FullPowerTransmission-r16 = fullpowerMode1*

|  |  |
| --- | --- |
| Bit field mapped to index | *codebookSubset*= *nonCoherent* |
| 0 | 1 layer: TPMI=0 |
| 1 | 1 layer: TPMI=1 |
| 2 | 1 layer: TPMI=2 |
| 3 | Reserved |

Table 7.3.1.1.2-6: Antenna port(s), transform precoder is enabled, *dmrs-Type*=1, *maxLength*=1, except that *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured and π/2-BPSK modulation is used

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 2 | 0 |
| 1 | 2 | 1 |
| 2 | 2 | 2 |
| 3 | 2 | 3 |

Table 7.3.1.1.2-6A: Antenna port(s), transform precoder is enabled, *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured, π/2-BPSK modulation is used, *dmrs-Type*=1, *maxLength*=1

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 2 | 0, nSCID= 0 |
| 1 | 2 | 0, nSCID= 1 |
| 2 | 2 | 2, nSCID= 0 |
| 3 | 2 | 2, nSCID= 1 |

Table 7.3.1.1.2-7: Antenna port(s), transform precoder is enabled, *dmrs-Type*=1, *maxLength*=2, except that *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured and π/2-BPSK modulation is used

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 2 | 0 | 1 |
| 1 | 2 | 1 | 1 |
| 2 | 2 | 2 | 1 |
| 3 | 2 | 3 | 1 |
| 4 | 2 | 0 | 2 |
| 5 | 2 | 1 | 2 |
| 6 | 2 | 2 | 2 |
| 7 | 2 | 3 | 2 |
| 8 | 2 | 4 | 2 |
| 9 | 2 | 5 | 2 |
| 10 | 2 | 6 | 2 |
| 11 | 2 | 7 | 2 |
| 12-15 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-7A: Antenna port(s), transform precoder is enabled, *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured, π/2-BPSK modulation is used, *dmrs-Type=1, maxLength=2*

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 2 | 0, nSCID= 0 | 1 |
| 1 | 2 | 0, nSCID= 1 | 1 |
| 2 | 2 | 2, nSCID= 0 | 1 |
| 3 | 2 | 2, nSCID= 1 | 1 |
| 4 | 2 | 0, nSCID= 0 | 2 |
| 5 | 2 | 0, nSCID= 1 | 2 |
| 6 | 2 | 2, nSCID= 0 | 2 |
| 7 | 2 | 2, nSCID= 1 | 2 |
| 8 | 2 | 4, nSCID= 0 | 2 |
| 9 | 2 | 4, nSCID= 1 | 2 |
| 10 | 2 | 6, nSCID= 0 | 2 |
| 11 | 2 | 6, nSCID= 1 | 2 |
| 12-15 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-8: Antenna port(s), transform precoder is disabled, *dmrs-Type*=1, *maxLength*=1, rank = 1

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 1 | 0 |
| 1 | 1 | 1 |
| 2 | 2 | 0 |
| 3 | 2 | 1 |
| 4 | 2 | 2 |
| 5 | 2 | 3 |
| 6-7 | Reserved | Reserved |

Table 7.3.1.1.2-9: Antenna port(s), transform precoder is disabled, *dmrs-Type*=1, *maxLength*=1, rank = 2

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 1 | 0,1 |
| 1 | 2 | 0,1 |
| 2 | 2 | 2,3 |
| 3 | 2 | 0,2 |
| 4-7 | Reserved | Reserved |

Table 7.3.1.1.2-10: Antenna port(s), transform precoder is disabled, *dmrs-Type*=1, *maxLength*=1, rank = 3

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 2 | 0-2 |
| 2-7 | Reserved | Reserved |

Table 7.3.1.1.2-11: Antenna port(s), transform precoder is disabled, *dmrs-Type*=1, *maxLength*=1, rank = 4

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 2 | 0-3 |
| 2-7 | Reserved | Reserved |

Table 7.3.1.1.2-12: Antenna port(s), transform precoder is disabled, *dmrs-Type*=1, *maxLength*=2, rank = 1

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |
| 2 | 2 | 0 | 1 |
| 3 | 2 | 1 | 1 |
| 4 | 2 | 2 | 1 |
| 5 | 2 | 3 | 1 |
| 6 | 2 | 0 | 2 |
| 7 | 2 | 1 | 2 |
| 8 | 2 | 2 | 2 |
| 9 | 2 | 3 | 2 |
| 10 | 2 | 4 | 2 |
| 11 | 2 | 5 | 2 |
| 12 | 2 | 6 | 2 |
| 13 | 2 | 7 | 2 |
| 14-15 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-13: Antenna port(s), transform precoder is disabled, *dmrs-Type*=1, *maxLength*=2, rank = 2

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 1 | 0,1 | 1 |
| 1 | 2 | 0,1 | 1 |
| 2 | 2 | 2,3 | 1 |
| 3 | 2 | 0,2 | 1 |
| 4 | 2 | 0,1 | 2 |
| 5 | 2 | 2,3 | 2 |
| 6 | 2 | 4,5 | 2 |
| 7 | 2 | 6,7 | 2 |
| 8 | 2 | 0,4 | 2 |
| 9 | 2 | 2,6 | 2 |
| 10-15 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-14: Antenna port(s), transform precoder is disabled, *dmrs-Type*=1, *maxLength*=2, rank = 3

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 2 | 0-2 | 1 |
| 1 | 2 | 0,1,4 | 2 |
| 2 | 2 | 2,3,6 | 2 |
| 3-15 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-15: Antenna port(s), transform precoder is disabled, *dmrs-Type*=1, *maxLength*=2, rank = 4

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 2 | 0-3 | 1 |
| 1 | 2 | 0,1,4,5 | 2 |
| 2 | 2 | 2,3,6,7 | 2 |
| 3 | 2 | 0,2,4,6 | 2 |
| 4-15 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-16: Antenna port(s), transform precoder is disabled, *dmrs-Type*=2, *maxLength*=1, rank=1

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 1 | 0 |
| 1 | 1 | 1 |
| 2 | 2 | 0 |
| 3 | 2 | 1 |
| 4 | 2 | 2 |
| 5 | 2 | 3 |
| 6 | 3 | 0 |
| 7 | 3 | 1 |
| 8 | 3 | 2 |
| 9 | 3 | 3 |
| 10 | 3 | 4 |
| 11 | 3 | 5 |
| 12-15 | Reserved | Reserved |

Table 7.3.1.1.2-17: Antenna port(s), transform precoder is disabled, *dmrs-Type*=2, *maxLength*=1, rank=2

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 1 | 0,1 |
| 1 | 2 | 0,1 |
| 2 | 2 | 2,3 |
| 3 | 3 | 0,1 |
| 4 | 3 | 2,3 |
| 5 | 3 | 4,5 |
| 6 | 2 | 0,2 |
| 7-15 | Reserved | Reserved |

Table 7.3.1.1.2-18: Antenna port(s), transform precoder is disabled, *dmrs-Type*=2, *maxLength*=1, rank =3

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 2 | 0-2 |
| 1 | 3 | 0-2 |
| 2 | 3 | 3-5 |
| 3-15 | Reserved | Reserved |

Table 7.3.1.1.2-19: Antenna port(s), transform precoder is disabled, *dmrs-Type*=2, *maxLength*=1, rank =4

|  |  |  |
| --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** |
| 0 | 2 | 0-3 |
| 1 | 3 | 0-3 |
| 2-15 | Reserved | Reserved |

Table 7.3.1.1.2-20: Antenna port(s), transform precoder is disabled, *dmrs-Type*=2, *maxLength*=2, rank=1

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 1 | 0 | 1 |
| 1 | 1 | 1 | 1 |
| 2 | 2 | 0 | 1 |
| 3 | 2 | 1 | 1 |
| 4 | 2 | 2 | 1 |
| 5 | 2 | 3 | 1 |
| 6 | 3 | 0 | 1 |
| 7 | 3 | 1 | 1 |
| 8 | 3 | 2 | 1 |
| 9 | 3 | 3 | 1 |
| 10 | 3 | 4 | 1 |
| 11 | 3 | 5 | 1 |
| 12 | 3 | 0 | 2 |
| 13 | 3 | 1 | 2 |
| 14 | 3 | 2 | 2 |
| 15 | 3 | 3 | 2 |
| 16 | 3 | 4 | 2 |
| 17 | 3 | 5 | 2 |
| 18 | 3 | 6 | 2 |
| 19 | 3 | 7 | 2 |
| 20 | 3 | 8 | 2 |
| 21 | 3 | 9 | 2 |
| 22 | 3 | 10 | 2 |
| 23 | 3 | 11 | 2 |
| 24 | 1 | 0 | 2 |
| 25 | 1 | 1 | 2 |
| 26 | 1 | 6 | 2 |
| 27 | 1 | 7 | 2 |
| 28-31 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-21: Antenna port(s), transform precoder is disabled, *dmrs-Type*=2, *maxLength*=2, rank=2

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 1 | 0,1 | 1 |
| 1 | 2 | 0,1 | 1 |
| 2 | 2 | 2,3 | 1 |
| 3 | 3 | 0,1 | 1 |
| 4 | 3 | 2,3 | 1 |
| 5 | 3 | 4,5 | 1 |
| 6 | 2 | 0,2 | 1 |
| 7 | 3 | 0,1 | 2 |
| 8 | 3 | 2,3 | 2 |
| 9 | 3 | 4,5 | 2 |
| 10 | 3 | 6,7 | 2 |
| 11 | 3 | 8,9 | 2 |
| 12 | 3 | 10,11 | 2 |
| 13 | 1 | 0,1 | 2 |
| 14 | 1 | 6,7 | 2 |
| 15 | 2 | 0,1 | 2 |
| 16 | 2 | 2,3 | 2 |
| 17 | 2 | 6,7 | 2 |
| 18 | 2 | 8,9 | 2 |
| 19-31 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-22: Antenna port(s), transform precoder is disabled, *dmrs-Type*=2, *maxLength*=2, rank=3

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 2 | 0-2 | 1 |
| 1 | 3 | 0-2 | 1 |
| 2 | 3 | 3-5 | 1 |
| 3 | 3 | 0,1,6 | 2 |
| 4 | 3 | 2,3,8 | 2 |
| 5 | 3 | 4,5,10 | 2 |
| 6-31 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-23: Antenna port(s), transform precoder is disabled, *dmrs-Type*=2, *maxLength*=2, rank=4

|  |  |  |  |
| --- | --- | --- | --- |
| **Value** | **Number of DMRS CDM group(s) without data** | **DMRS port(s)** | **Number of front-load symbols** |
| 0 | 2 | 0-3 | 1 |
| 1 | 3 | 0-3 | 1 |
| 2 | 3 | 0,1,6,7 | 2 |
| 3 | 3 | 2,3,8,9 | 2 |
| 4 | 3 | 4,5,10,11 | 2 |
| 5-31 | Reserved | Reserved | Reserved |

Table 7.3.1.1.2-24: SRS request

|  |  |  |
| --- | --- | --- |
| Value of SRS request field | Triggered aperiodic SRS resource set(s) for DCI format 0\_1, 0\_2, 1\_1, 1\_2, and 2\_3 configured with higher layer parameter *srs-TPC-PDCCH-Group* set to 'typeB' | Triggered aperiodic SRS resource set(s) for DCI format 2\_3 configured with higher layer parameter *srs-TPC-PDCCH-Group* set to 'typeA' |
| 00 | No aperiodic SRS resource set triggered | No aperiodic SRS resource set triggered |
| 01 | SRS resource set(s) configured by *SRS-ResourceSet* with higher layer parameter *aperiodicSRS-ResourceTrigger* set to 1 or an entry in *aperiodicSRS-ResourceTriggerList* set to 1  SRS resource set(s) configured by *SRS-PosResourceSet* with an entry in *aperiodicSRS-ResourceTriggerList* set to 1 when triggered by DCI formats 0\_1, 0\_2, 1\_1, and 1\_2 | SRS resource set(s) configured with higher layer parameter *usage* in *SRS-ResourceSet* set to '*antennaSwitching*' and *resourceType* in *SRS-ResourceSet* set to 'aperiodic' for a 1st set of serving cells configured by higher layers |
| 10 | SRS resource set(s) configured by *SRS-ResourceSet* with higher layer parameter *aperiodicSRS-ResourceTrigger* set to 2 or an entry in *aperiodicSRS-ResourceTriggerList* set to 2  SRS resource set(s) configured by *SRS-PosResourceSet* with an entry in *aperiodicSRS-ResourceTriggerList* set to 2 when triggered by DCI formats 0\_1, 0\_2, 1\_1, and 1\_2 | SRS resource set(s) configured with higher layer parameter *usage* in *SRS-ResourceSet* set to '*antennaSwitching*' and *resourceType* in *SRS-ResourceSet* set to 'aperiodic' for a 2nd set of serving cells configured by higher layers |
| 11 | SRS resource set(s) configured by *SRS-ResourceSet* with higher layer parameter *aperiodicSRS-ResourceTrigger* set to 3 or an entry in *aperiodicSRS-ResourceTriggerList* set to 3  SRS resource set(s) configured by *SRS-PosResourceSet* with an entry in *aperiodicSRS-ResourceTriggerList* set to 3 when triggered by DCI formats 0\_1, 0\_2, 1\_1, and 1\_2 | SRS resource set(s) configured with higher layer parameter *usage* in *SRS-ResourceSet* set to '*antennaSwitching*' and *resourceType* in *SRS-ResourceSet* set to 'aperiodic' for a 3rd set of serving cells configured by higher layers |

Table 7.3.1.1.2-25: PTRS-DMRS association for UL PTRS port 0

|  |  |
| --- | --- |
| **Value** | **DMRS port** |
| 0 | 1st scheduled DMRS port |
| 1 | 2nd scheduled DMRS port |
| 2 | 3rd scheduled DMRS port |
| 3 | 4th scheduled DMRS port |

Table 7.3.1.1.2-26: PTRS-DMRS association for UL PTRS ports 0 and 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Value of MSB** | **DMRS port** |  | **Value of LSB** | **DMRS port** |
| 0 | 1st DMRS port which shares PTRS port 0 |  | 0 | 1st DMRS port which shares PTRS port 1 |
| 1 | 2nd DMRS port which shares PTRS port 0 |  | 1 | 2nd DMRS port which shares PTRS port 1 |

Table 7.3.1.1.2-27: void

Table 7.3.1.1.2-28: SRI indication for non-codebook based PUSCH transmission, 

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bit field mapped to index | SRI(s), | Bit field mapped to index | SRI(s), | Bit field mapped to index | SRI(s), |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 |
|  |  | 2 | 2 | 2 | 2 |
|  |  | 3 | reserved | 3 | 3 |

Table 7.3.1.1.2-29: SRI indication for non-codebook based PUSCH transmission, 

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bit field mapped to index | SRI(s), | Bit field mapped to index | SRI(s), | Bit field mapped to index | SRI(s), |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 0,1 | 2 | 2 | 2 | 2 |
| 3 | reserved | 3 | 0,1 | 3 | 3 |
|  |  | 4 | 0,2 | 4 | 0,1 |
|  |  | 5 | 1,2 | 5 | 0,2 |
|  |  | 6-7 | reserved | 6 | 0,3 |
|  |  |  |  | 7 | 1,2 |
|  |  |  |  | 8 | 1,3 |
|  |  |  |  | 9 | 2,3 |
|  |  |  |  | 10-15 | reserved |

Table 7.3.1.1.2-30: SRI indication for non-codebook based PUSCH transmission, 

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bit field mapped to index | SRI(s), | Bit field mapped to index | SRI(s), | Bit field mapped to index | SRI(s), |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 0,1 | 2 | 2 | 2 | 2 |
| 3 | reserved | 3 | 0,1 | 3 | 3 |
|  |  | 4 | 0,2 | 4 | 0,1 |
|  |  | 5 | 1,2 | 5 | 0,2 |
|  |  | 6 | 0,1,2 | 6 | 0,3 |
|  |  | 7 | reserved | 7 | 1,2 |
|  |  |  |  | 8 | 1,3 |
|  |  |  |  | 9 | 2,3 |
|  |  |  |  | 10 | 0,1,2 |
|  |  |  |  | 11 | 0,1,3 |
|  |  |  |  | 12 | 0,2,3 |
|  |  |  |  | 13 | 1,2,3 |
|  |  |  |  | 14-15 | reserved |

Table 7.3.1.1.2-31: SRI indication for non-codebook based PUSCH transmission, 

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Bit field mapped to index | SRI(s), | Bit field mapped to index | SRI(s), | Bit field mapped to index | SRI(s), |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 0,1 | 2 | 2 | 2 | 2 |
| 3 | reserved | 3 | 0,1 | 3 | 3 |
|  |  | 4 | 0,2 | 4 | 0,1 |
|  |  | 5 | 1,2 | 5 | 0,2 |
|  |  | 6 | 0,1,2 | 6 | 0,3 |
|  |  | 7 | reserved | 7 | 1,2 |
|  |  |  |  | 8 | 1,3 |
|  |  |  |  | 9 | 2,3 |
|  |  |  |  | 10 | 0,1,2 |
|  |  |  |  | 11 | 0,1,3 |
|  |  |  |  | 12 | 0,2,3 |
|  |  |  |  | 13 | 1,2,3 |
|  |  |  |  | 14 | 0,1,2,3 |
|  |  |  |  | 15 | reserved |

Table 7.3.1.1.2-32: SRI indication for codebook based PUSCH transmission, if *ul-FullPowerTransmission-r16* is not configured, or *ul-FullPowerTransmission-r16 = fullpowerMode1, or ul-FullPowerTransmission-r16 = fullpowerMode2, or ul-FullPowerTransmission-r16 = fullpower* and

|  |  |
| --- | --- |
| Bit field mapped to index | SRI(s), |
| 0 | 0 |
| 1 | 1 |

Table 7.3.1.1.2-32A: SRI indication for codebook based PUSCH transmission, if *ul-FullPowerTransmission-r16 = fullpowerMode2* and

|  |  |
| --- | --- |
| Bit field mapped to index | SRI(s), |
| 0 | 0 |
| 1 | 1 |
| 2 | 2 |
| 3 | Reserved |

Table 7.3.1.1.2-32B: SRI indication for codebook based PUSCH transmission, if *ul-FullPowerTransmission-r16 = fullpowerMode2* and

|  |  |
| --- | --- |
| Bit field mapped to index | SRI(s), |
| 0 | 0 |
| 1 | 1 |
| 2 | 2 |
| 3 | 3 |

Table 7.3.1.1.2-33: Joint indication of minimum applicable scheduling offset K0/K2

|  |  |  |
| --- | --- | --- |
| **Bit field mapped to index** | **Minimum applicable K0 for the active DL BWP, if *minimumSchedulingOffsetK0* is configured for the DL BWP** | **Minimum applicable K2 for the active UL BWP, if *minimumSchedulingOffsetK2* is configured for the UL BWP** |
| 0 | The first value configured by *minimumSchedulingOffsetK0* for the active DL BWP | The first value configured by *minimumSchedulingOffsetK2* for the active UL BWP |
| 1 | The second value configured by *minimumSchedulingOffsetK0* for the active DL BWP if the second value is configured; 0 otherwise | The second value configured by *minimumSchedulingOffsetK2* for the active UL BWP if the second value is configured; 0 otherwise |

Table 7.3.1.1.2-34: Redundancy version

|  |  |
| --- | --- |
| **Value of the Redundancy version field** | **Value of  to be applied** |
| 0 | 0 |
| 1 | 2 |

Table 7.3.1.1.2-35: Allowed entries for DCI format 0\_1, configured by higher layer parameter *ul-dci -triggered-UL-ChannelAccess-CPext-CAPC-r16*

|  |  |  |  |
| --- | --- | --- | --- |
| **Entry index** | **Channel Access Type** | **The CP extension T\_"ext" index defined in Clause 5.3.1 of [4, 38.211]** | **CAPC** |
| 0 | Type2C-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 0 | 1 |
| 1 | Type2C-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 0 | 2 |
| 2 | Type2C-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 0 | 3 |
| 3 | Type2C-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 0 | 4 |
| 4 | Type2C-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 2 | 1 |
| 5 | Type2C-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 2 | 2 |
| 6 | Type2C-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 2 | 3 |
| 7 | Type2C-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 2 | 4 |
| 8 | Type2B-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 0 | 1 |
| 9 | Type2B-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 0 | 2 |
| 10 | Type2B-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 0 | 3 |
| 11 | Type2B-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 0 | 4 |
| 12 | Type2B-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 2 | 1 |
| 13 | Type2B-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 2 | 2 |
| 14 | Type2B-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 2 | 3 |
| 15 | Type2B-ULChannelAccess  defined in [clause 4.2.1.2.3 in 37.213] | 2 | 4 |
| 16 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 0 | 1 |
| 17 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 0 | 2 |
| 18 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 0 | 3 |
| 19 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 0 | 4 |
| 20 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 1 | 1 |
| 21 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 1 | 2 |
| 22 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 1 | 3 |
| 23 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 1 | 4 |
| 24 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 3 | 1 |
| 25 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 3 | 2 |
| 26 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 3 | 3 |
| 27 | Type2A-ULChannelAccess defined in [clause 4.2.1.2.1 in 37.213] | 3 | 4 |
| 28 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 0 | 1 |
| 29 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 0 | 2 |
| 30 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 0 | 3 |
| 31 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 0 | 4 |
| 32 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 1 | 1 |
| 33 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 1 | 2 |
| 34 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 1 | 3 |
| 35 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 1 | 4 |
| 36 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 2 | 1 |
| 37 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 2 | 2 |
| 38 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 2 | 3 |
| 39 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 2 | 4 |
| 40 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 3 | 1 |
| 41 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 3 | 2 |
| 42 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 3 | 3 |
| 43 | Type1-ULChannelAccess defined in [clause 4.2.1.1 in 37.213] | 3 | 4 |

##### 7.3.1.1.3 Format 0\_2

DCI format 0\_2 is used for the scheduling of PUSCH in one cell.

The following information is transmitted by means of the DCI format 0\_2 with CRC scrambled by C-RNTI or CS-RNTI or SP-CSI-RNTI or MCS-C-RNTI:

- Identifier for DCI formats – 1 bit

- The value of this bit field is always set to 0, indicating an UL DCI format

- Carrier indicator – 0, 1, 2 or 3 bits determined by higher layer parameter *carrierIndicatorSizeForDCI-Format0-2*, as defined in Clause 10.1 of [5, TS38.213].

- UL/SUL indicator – 0 bit for UEs not configured with *supplementaryUplink* in *ServingCellConfig* in the cell or UEs configured with *supplementaryUplink* in *ServingCellConfig* in the cell but only one carrier in the cell is configured for PUSCH transmission; otherwise, 1 bit as defined in Table 7.3.1.1.1-1.

- Bandwidth part indicator – 0, 1 or 2 bits as determined by the number of UL BWPs configured by higher layers, excluding the initial UL bandwidth part. The bitwidth for this field is determined as bits, where

- if , in which case the bandwidth part indicator is equivalent to the ascending order of the higher layer parameter *BWP-Id*;

- otherwise , in which case the bandwidth part indicator is defined in Table 7.3.1.1.2-1;

If a UE does not support active BWP change via DCI, the UE ignores this bit field.

- Frequency domain resource assignment – number of bits determined by the following:

- bits if only resource allocation type 0 is configured, where is defined in Clause 6.1.2.2.1 of [6, TS 38.214]

- bits if only resource allocation type 1 is configured, or bits if both resource allocation type 0 and 1 are configured, where is the size of the active UL bandwidth part, is defined as in clause 4.4.4.4 of [4, TS 38.211] and is given by higher layer parameter *ResourceAllocationType1-granularity-ForDCIFormat0\_2.* If the higher layer parameter *ResourceAllocationType1-granularity-ForDCIFormat0\_2* is not configured, is equal to 1.

- If both resource allocation type 0 and 1 are configured, the MSB bit is used to indicate resource allocation type 0 or resource allocation type 1, where the bit value of 0 indicates resource allocation type 0 and the bit value of 1 indicates resource allocation type 1.

- For resource allocation type 0, the LSBs provide the resource allocation as defined in Clause 6.1.2.2.1 of [6, TS 38.214].

- For resource allocation type 1, the LSBs provide the resource allocation as follows:

- For PUSCH hopping with resource allocation type 1:

- MSB bits are used to indicate the frequency offset according to Clause 6.3 of [6, TS 38.214], where if the higher layer parameter *frequencyHoppingOffsetLists-ForDCIFormat0\_2* contains two offset values and if the higher layer parameter *frequencyHoppingOffsetLists-ForDCIFormat0\_2* contains four offset values

- bits provides the frequency domain resource allocation according to Clause 6.1.2.2.2 of [6, TS 38.214]

- For non-PUSCH hopping with resource allocation type 1:

- bits provides the frequency domain resource allocation according to Clause 6.1.2.2.2 of [6, TS 38.214]

If "Bandwidth part indicator" field indicates a bandwidth part other than the active bandwidth part and if both resource allocation type 0 and 1 are configured for the indicated bandwidth part, the UE assumes resource allocation type 0 for the indicated bandwidth part if the bitwidth of the "Frequency domain resource assignment" field of the active bandwidth part is smaller than the bitwidth of the "Frequency domain resource assignment" field of the indicated bandwidth part.

- Time domain resource assignment – 0, 1, 2, 3, 4, 5 or 6 bits as defined in Clause 6.1.2.1 of [6, TS38.214]. The bitwidth for this field is determined as bits, where *I* is the number of entries in the higher layer parameter *PUSCH-TimeDomainResourceAllocationList-ForDCIformat0\_2* if the higher layer parameter is configured, or *I* is the number of entries in the higher layer parameter *PUSCH-TimeDomainResourceAllocationList* if the higher layer parameter *PUSCH-TimeDomainResourceAllocationList* is configured and the higher layer parameter *PUSCH-TimeDomainResourceAllocationList-ForDCIformat0\_2* is not configured; otherwise *I* is the number of entries in the default table*.*

- Frequency hopping flag – 0 or 1 bit:

- 0 bit if the higher layer parameter *frequencyHoppingForDCI-Format0-2* is not configured;

- 1 bit according to Table 7.3.1.1.1-3 otherwise, only applicable to resource allocation type 1, as defined in Clause 6.3 of [6, TS 38.214].

- Modulation and coding scheme –5 bits as defined in Clause 6.1.4.1 of [6, TS 38.214]

- New data indicator – 1 bit

- Redundancy version – 0, 1 or 2 bits determined by higher layer parameter *numberOfBitsForRV-ForDCI-Format0-2*

- If 0 bit is configured, *rvid* to be applied is 0;

- 1 bit according to Table 7.3.1.2.3-1;

- 2 bits according to Table 7.3.1.1.1-2.

- HARQ process number – 0, 1, 2, 3 or 4 bits determined by higher layer parameter *harq-ProcessNumberSizeForDCI-Format0-2*

- Downlink assignment index – 0, 1, 2 or 4 bits

- 0 bit if the higher layer parameter *downlinkAssignmentIndexForDCI-Format0-2* is not configured;

- 1, 2 or 4 bits otherwise,

- 1st downlink assignment index – 1 or 2 bits:

- 1 bit for semi-static HARQ-ACK codebook;

- 2 bits for dynamic HARQ-ACK codebook.

- 2nd downlink assignment index – 0 or 2 bits

- 2 bits for dynamic HARQ-ACK codebook with two HARQ-ACK sub-codebooks;

- 0 bit otherwise.

When two HARQ-ACK codebooks are configured for the same serving cell and if higher layer parameter *priorityIndicatorForDCI-Format0-2* is configured, if the bit width of the Downlink assignment index in DCI format 0\_2 for one HARQ-ACK codebook is not equal to that of the Downlink assignment index in DCI format 0\_2 for the other HARQ-ACK codebook, a number of most significant bits with value set to '0' are inserted to smaller Downlink assignment index until the bit width of the Downlink assignment index in DCI format 0\_2 for the two HARQ-ACK codebooks are the same.

- TPC command for scheduled PUSCH – 2 bits as defined in Clause 7.1.1 of [5, TS38.213]

- SRS resource indicator – or bits, where is the number of configured SRS resources in the SRS resource set configured by higher layer parameter *srs-ResourceSetToAddModListForDCI-Format0-2*, and associated with the higher layer parameter *usage* of value '*codeBook*' or '*nonCodeBook*',

-  bits according to Tables 7.3.1.1.2-28/29/30/31 if the higher layer parameter *txConfig = nonCodebook*, where is the number of configured SRS resources in the SRS resource set configured by higher layer parameter *srs-ResourceSetToAddModListForDCI-Format0-2*, and associated with the higher layer parameter *usage* of value '*nonCodeBook*' and

- if UE supports operation with *maxMIMO-LayersForDCI-Format0-2* and the higher layer parameter *maxMIMO-LayersForDCI-Format0-2* of *PUSCH-ServingCellConfig* of the serving cell is configured, *Lmax* is given by that parameter

- otherwise, *Lmax* is given by the maximum number of layers for PUSCH supported by the UE for the serving cell for non-codebook based operation.

- bits according to Tables 7.3.1.1.2-32 if the higher layer parameter *txConfig = codebook*, where is the number of configured SRS resources in the SRS resource set configured by higher layer parameter *srs-ResourceSetToAddModListForDCI-Format0-2*, and associated with the higher layer parameter *usage* of value '*codeBook*'.

- Precoding information and number of layers – number of bits determined by the following:

- 0 bits if the higher layer parameter *txConfig = nonCodeBook*;

- 0 bits for 1 antenna port and if the higher layer parameter *txConfig = codebook*;

- 4, 5, or 6 bits according to Table 7.3.1.1.2-2 for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank-ForDCIFormat0\_2*, and *codebookSubset-ForDCIFormat0\_2*;

- 4 or 5 bits according to Table 7.3.1.1.2-2A for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16=fullpowerMode1,* the values of higher layer parameters *maxRankForDCI-Format0-2=2,* transform precoder is disabled, and according to the value of higher layer parameter *codebookSubsetForDCI-Format0-2*;

- 4 or 6 bits according to Table 7.3.1.1.2-2B for 4 antenna ports, if *txConfig = codebook, ul-FullPowerTransmission-r16=fullpowerMode1,* the values of higher layer parameters *maxRankForDCI-Format0-2=3 or 4,* transform precoder is disabled, and according to the value of higher layer parameter *codebookSubsetForDCI-Format0-2*;

- 2, 4, or 5 bits according to Table 7.3.1.1.2-3 for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank-ForDCIFormat0\_2*, and *codebookSubset-ForDCIFormat0\_2*;

- 3 or 4 bits according to Table 7.3.1.1.2-3A for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16=fullpowerMode1*, *maxRankForDCI-Format0-2=1*, and according to whether transform precoder is enabled or disabled, and the value of higher layer parameter *codebookSubsetForDCI-Format0-2*;

- 2 or 4 bits according to Table7.3.1.1.2-4 for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank-ForDCIFormat0\_2* and *codebookSubset-ForDCIFormat0\_2*;

- 2 bits according to Table 7.3.1.1.2-4A for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16=fullpowerMode1*, transform precoder is disabled, the *maxRankForDCI-Format0-2=2*, and *codebookSubsetForDCI-Format0-2=nonCoherent*;

- 1 or 3 bits according to Table7.3.1.1.2-5 for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16* is not configured or configured to *fullpowerMode2* or configured to *fullpower,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank-ForDCIFormat0\_2* and *codebookSubset-ForDCIFormat0\_2*;

- 2 bits according to Table 7.3.1.1.2-5A for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission-r16=fullpowerMode1*, *maxRankForDCI-Format0-2=1*, and according to whether transform precoder is enabled or disabled, and the value of higher layer parameter *codebookSubsetForDCI-Format0-2*.

For the higher layer parameter *txConfig=codebook*, if *ul-FullPowerTransmission-r16* is configured to *fullpowerMode2*, the values of higher layer parameters *maxRankForDCI-Format0-2* is configured to be larger than 2, and at least one SRS resource with 4 antenna ports is configured in an SRS resource set with usage set to 'codebook' and an SRS resource with 2 antenna ports is indicated via SRI in the same SRS resource set, then Table 7.3.1.1.2-4 is used.

For the higher layer parameter *txConfig = codebook*, if different SRS resources with different number of antenna ports are configured, the bitwidth is determined according to the maximum number of ports in an SRS resource among the configured SRS resources in an SRS resource set with usage set to 'codebook'. If the number of ports for a configured SRS resource in the set is less than the maximum number of ports in an SRS resource among the configured SRS resources, a number of most significant bits with value set to '0' are inserted to the field.

- Antenna ports – number of bits determined by the following:

- 0 bit if higher layer parameter *antennaPortsFieldPresenceForDCI-Format0-2* is notconfigured;

- 2, 3, 4, or 5 bits otherwise,

- 2 bits as defined by Tables 7.3.1.1.2-6, if transform precoder is enabled, *dmrs-Type*=1, and *maxLength*=1, except that *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured and π/2 BPSK modulation is used;

- 2 bits as defined by 7.3.1.1.2-6A, if transform precoder is enabled, and *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured, π/2 BPSK modulation is used, *dmrs-Type*=1, and *maxLength*=1, where nSCID is the scrambling identity for antenna ports defined in Clause 6.4.1.1.1.2, in [4, TS38.211];

- 4 bits as defined by Tables 7.3.1.1.2-7, if transform precoder is enabled, *dmrs-Type*=1, and *maxLength*=2, except that *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured and π/2 BPSK modulation is used;

- 4 bits as defined by Tables 7.3.1.1.2-7A, if transform precoder is enabled, and *dmrs-UplinkTransformPrecoding-r16* and *tp-pi2BPSK* are both configured, π/2 BPSK modulation is used, *dmrs-Type*=1, and *maxLength*=2, where *nSCID* is the scrambling identity for antenna ports defined in Clause 6.4.1.1.1.2, in [4, TS38.211];

- 3 bits as defined by Tables 7.3.1.1.2-8/9/10/11, if transform precoder is disabled, *dmrs-Type*=1, and *maxLength*=1, and the value of rank is determined according to the SRS resource indicator field if the higher layer parameter *txConfig = nonCodebook* and according to the Precoding information and number of layers field if the higher layer parameter *txConfig = codebook*;

- 4 bits as defined by Tables 7.3.1.1.2-12/13/14/15, if transform precoder is disabled, *dmrs-Type*=1, and *maxLength*=2, and the value of rank is determined according to the SRS resource indicator field if the higher layer parameter *txConfig = nonCodebook* and according to the Precoding information and number of layers field if the higher layer parameter *txConfig = codebook*;

- 4 bits as defined by Tables 7.3.1.1.2-16/17/18/19, if transform precoder is disabled, *dmrs-Type*=2, and *maxLength*=1, and the value of rank is determined according to the SRS resource indicator field if the higher layer parameter *txConfig = nonCodebook* and according to the Precoding information and number of layers field if the higher layer parameter *txConfig = codebook*;

- 5 bits as defined by Tables 7.3.1.1.2-20/21/22/23, if transform precoder is disabled, *dmrs-Type*=2, and *maxLength*=2, and the value of rank is determined according to the SRS resource indicator field if the higher layer parameter *txConfig = nonCodebook* and according to the Precoding information and number of layers field if the higher layer parameter *txConfig = codebook*.

where the number of CDM groups without data of values 1, 2, and 3 in Tables 7.3.1.1.2-6 to 7.3.1.1.2-23 refers to CDM groups {0}, {0,1}, and {0, 1,2} respectively.

If a UE is configured with both *dmrs-UplinkForPUSCH-MappingTypeA-ForDCI-Format0-2* and *dmrs-UplinkForPUSCH-MappingTypeB-ForDCI-Format0-2* and is configured with *antennaPortsFieldPresenceForDCI-Format0-2*, the bitwidth of this field equals , where is the "Antenna ports" bitwidth derived according to *dmrs-UplinkForPUSCH-MappingTypeA-ForDCI-Format0-2* and is the "Antenna ports" bitwidthderived according to *dmrs-UplinkForPUSCH-MappingTypeB-ForDCI-Format0-2*. A number of zeros are padded in the MSB of this field, if the mapping type of the PUSCH corresponds to the smaller value of and .

If a UE is not configured with higher layer parameter *AntennaPorts-FieldPresence-ForDCIFormat0\_2,* antenna port(s) are defined assuming bit field index value 0 in Tables 7.3.1.1.2-6 to 7.3.1.1.2-23.

- SRS request – 0, 1, 2 or 3 bits

- 0 bit if the higher layer parameter *srs-RequestForDCI-Format0-2* is not configured;

- 1 bit as defined by Table 7.3.1.1.3-1 if higher layer parameter *srs-RequestForDCI-Format0-2 = 1* and for UEs not configured with *supplementaryUplink* in *ServingCellConfig* in the cell;

- 2 bits if higher layer parameter *srs-RequestForDCI-Format0-2 = 1* and for UEs configured with *supplementaryUplink* in *ServingCellConfig* in the cell, where the first bit is the non-SUL/SUL indicator as defined in Table 7.3.1.1.1-1 and the second bit is defined by Table 7.3.1.1.3-1;

- 2 bits as defined by Table 7.3.1.1.2-24 if higher layer parameter *srs-RequestForDCI-Format0-2 = 2* and for UEs not configured with *supplementaryUplink* in *ServingCellConfig* in the cell;

- 3 bits if higher layer parameter *srs-RequestForDCI-Format0-2 = 2* and for UEs configured with *supplementaryUplink* in *ServingCellConfig* in the cell, where the first bit is the non-SUL/SUL indicator as defined in Table 7.3.1.1.1-1 and the second and third bits are defined by Table 7.3.1.1.2-24;

- CSI request – 0, 1, 2, 3, 4, 5, or 6 bits determined by higher layer parameter *reportTriggerSizeForDCI-Format0-2*.

- PTRS-DMRS association – number of bits determined as follows

- 0 bit if *PTRS-UplinkConfi*g is not configured in either *dmrs-UplinkForPUSCH-MappingTypeA* or *dmrs-UplinkForPUSCH-MappingTypeB* and transform precoder is disabled, or if transform precoder is enabled, or if *maxRank-ForDCIFormat0\_2=1*;

- 2 bits otherwise, where Table 7.3.1.1.2-25 and 7.3.1.1.2-26 are used to indicate the association between PTRS port(s) and DMRS port(s) for transmission of one PT-RS port and two PT-RS ports respectively, and the DMRS ports are indicated by the Antenna ports field.

If "Bandwidth part indicator" field indicates a bandwidth part other than the active bandwidth part and the "PTRS-DMRS association" field is present for the indicated bandwidth part but not present for the active bandwidth part, the UE assumes the "PTRS-DMRS association" field is not present for the indicated bandwidth part.

- beta\_offset indicator – 0 bit if the higher layer parameter *betaOffsets = semiStatic*; otherwise 1 bit if 2 offset indexes are configured by higher layer parameter *dynamicForDCI-Format0-2* as defined by Table 9.3-3A in [5, TS 38.213], and 2 bits if 4 offset indexes are configured by higher layer parameter *dynamicForDCI-Format0-2* as defined by Table 9.3-3 in [5, TS 38.213].

When two HARQ-ACK codebooks are configured for the same serving cell and if higher layer parameter *priorityIndicatorForDCI-Format0-2* is configured, if the bit width of the beta\_offset indicator in DCI format 0\_2 for one HARQ-ACK codebook is not equal to that of the beta\_offset indicator in DCI format 0\_2 for the other HARQ-ACK codebook, a number of most significant bits with value set to '0' are inserted to smaller beta\_offset indicator until the bit width of the beta\_offset indicator in DCI format 0\_2 for the two HARQ-ACK codebooks are the same.

- DMRS sequence initialization – 0 or 1 bit

- 0 bit if the higher layer parameter *dmrs-SequenceInitializationForDCI-Format0-2* is not configured or if transform precoder is enabled;

- 1 bit if transform precoder is disabled and the higher layer parameter *dmrs-SequenceInitializationForDCI-Format0-2* is configured.

- UL-SCH indicator – 1 bit. A value of "1" indicates UL-SCH shall be transmitted on the PUSCH and a value of "0" indicates UL-SCH shall not be transmitted on the PUSCH. Except for DCI format 0\_2 with CRC scrambled by SP-CSI-RNTI, a UE is not expected to receive a DCI format 0\_2 with UL-SCH indicator of "0" and CSI request of all zero(s).

- Open-loop power control parameter set indication – 0 or 1 or 2 bits.

- 0 bit if the higher layer parameter *p0-PUSCH-SetList* is not configured;

- 1 or 2 bits otherwise,

- 1 bit if SRS resource indicator is present in the DCI format 0\_2;

- 1 or 2 bits as determined by higher layer parameter *olpc-ParameterSetForDCI-Format0-2* if SRS resource indicator is not present in the DCI format 0\_2;

- Priority indicator – 0 bit if higher layer parameter *priorityIndicatorForDCI-Format0-2* is not configured; otherwise 1 bit as defined in Clause 9 in [5, TS 38.213].

- Invalid symbol pattern indicator – 0 bit if higher layer parameter *InvalidSymbolPatternIndicator-ForDCIFormat0\_2* is not configured; otherwise 1 bit as defined in Clause 6.1.2.1 in [6, TS 38.214].

A UE does not expect that the bit width of a field in DCI format 0\_2 with CRC scrambled by CS-RNTI is larger than corresponding bit width of same field in DCI format 0\_2 with CRC scrambled by C-RNTI for the same serving cell. If the bit width of a field in the DCI format 0\_2 with CRC scrambled by CS-RNTI is not equal to that of the corresponding field in the DCI format 0\_2 with CRC scrambled by C-RNTI for the same serving cell, a number of most significant bits with value set to '0' are inserted to the field in DCI format 0\_2 with CRC scrambled by CS-RNTI until the bit width equals that of the corresponding field in the DCI format 0\_2 with CRC scrambled by C-RNTI for the same serving cell.

Table 7.3.1.1.3-1: 1 bit SRS request in DCI format 0\_2 and DCI format 1\_2

|  |  |
| --- | --- |
| Value of SRS request field | Triggered aperiodic SRS resource set(s) for DCI format 0\_2 and 1\_2 |
| 0 | No aperiodic SRS resource set triggered |
| 1 | SRS resource set(s) configured with higher layer parameter *aperiodicSRS-ResourceTrigger* set to 1 or an entry in *aperiodicSRS-ResourceTriggerList* set to 1 |