**3GPP TSG-RAN WG1 Meeting 102eR1-20xxxxx**

**Elbonia, August 17 – 28, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  | **38.211** | **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 to V2X | | | | | | | | | |
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| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_V2X\_NRSL-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. Incomplete specification of PSFCH sequence generation. 2. Reference to incorrect clause number for PSSCH. 3. Misalignment between 38.331 and 38.211 with respect to the higher-layer parameter name determining the DC subcarrier. 4. Duplication of the first OFDM symbol of PSFCH and PSCCH should include any reference signals occuring in that symbol. 5. Incorrect mapping of PT-RS 6. Unclear how the number of DM-RS symbols are obtained by the receiver. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Define u, v, and c\_init for the PSFCH sequence (R1-2007162) 2. Correct the reference in 8.2.1 from clause 8.3.3.3 to clause 8.3.1.5. 3. Correcting the parameter name in clause 8.2.5 4. Clarifying duplication of DM-RS, CSI-RS, and PT-RS 5. Correcting the PT-RS mapping 6. Clarifying that the number of DM-RS is signaled in the DCI. | | | | | | | | |
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| ***Consequences if not approved:*** | | 1. Incomplete support for V2X. 2. Inconsistent specification. 3. Inconsistencies across specifications. 4. Incorrect handling of duplication for AGC purposes. 5. incorrect PT-RS description. 6. Unclear description of DM-RS | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.2.1, 8.2.5, 8.3.4.2.1, 8.3.4.2.2, 8.4.1.2.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

### 8.2.1 General

The OFDM symbol immediately following the last symbol used for PSSCH, PSFCH, or S-SSB serves as a guard symbol.

The first OFDM symbol of a PSSCH and its associated PSCCH is duplicated as described in clauses 8.3.1.5 and 8.3.2.3. The first OFDM symbol of a PSFCH is duplicated as described in clause 8.3.4.2.2

### 8.2.5 Resource grid

The resource grid for sidelink transmission is defined in clause 4.4.2.

For sidelink, the carrier bandwidth for subcarrier spacing configuration provided by the higher-layer parameter *subcarrierSpacing-SL* is given by the higher-layer parameter *carrierBandwidth-SL*. The starting position for subcarrier spacing configuration is given by the higher-layer parameter *offsetToCarrier-SL*.

For the sidelink, the higher-layer parameter *sl-TxDirectCurrentLocation-r16* indicates the location of the transmitter DC subcarrier in the sidelink for each of the configured bandwidth parts. Values in the range 0 – 3299 represent the number of the DC subcarrier, the value 3300 indicates that the DC subcarrier is located outside the resource grid, and the value 3301 indicates that the position of the DC subcarrier in the sidelink is undetermined. The DC subcarrier location offset relative to the center of the indicated subcarrier is given by if *frequencyShift7p5khzSL* is provided and by otherwise, where is given by the higher-layer parameter *valueN*.

#### 8.3.1.5 Mapping to virtual resource blocks

For each of the antenna ports used for transmission of the PSSCH, the block of complex-valued symbols shall be multiplied with the amplitude scaling factor in order to conform to the transmit power specified in [5, TS 38.213] and mapped to resource elements in the virtual resource blocks assigned for transmission, where is the first subcarrier in the lowest-numbered virtual resource block assigned for transmission.

The mapping operation shall be done in two steps:

- first, the complex-valued symbols corresponding to the bit for the 2nd-stage SCI in increasing order of first the index over the assigned virtual resource blocks and then the index , starting a the first PSSCH symbol carrying an associated DM-RS and meeting all of the following criteria:

- the corresponding resource elements in the corresponding physical resource blocks are not used for transmission of the associated DM-RS, PT-RS, or PSCCH;

- secondly, the complex-valued modulation symbols not corresponding to the 2nd -stage SCI shall be in in increasing order of first the index over the assigned virtual resource blocks, and then the index with the starting position given by [6, TS 38.214] and meeting all of the following criteria:

- the resource elements are not used for 2nd-stage SCI in the first step;

- the corresponding resource elements in the corresponding physical resource blocks are not used for transmission of the associated DM-RS, PT-RS, CSI-RS, or PSCCH.

The resource elements used for the PSSCH in the first OFDM symbol in the mapping operation above, including any DM-RS, PT-RS, or CSI-RS occurring in the first OFDM symbol, shall be duplicated in the OFDM symbol immediately preceding the first OFDM symbol in the mapping.

#### 8.3.2.3 Mapping to physical resources

The set of complex-valued modulation symbols shall be multiplied with the amplitude scaling factor in order to conform to the transmit power specified in [5, TS 38.213] and mapped in sequence starting with to resource elements assigned for transmission according to clause 16.4 of [5, TS 38.213], and not used for the demodulation reference signals associated with PSCCH, in increasing order of first the index over the assigned physical resources, and then the index on antenna port.

The resource elements used for the PSCCH in the first OFDM symbol in the mapping operation above, including any DM-RS, PT-RS, or CSI-RS occurring in the first OFDM symbol, shall be duplicated in the immediately preceding OFDM symbol.

##### 8.3.4.2.1 Sequence generation

The sequence shall be generated according to

where is given by clause 6.3.2.2 with the following exceptions:

- is given by clause 16.3 of [5, TS 38.213];

- is given by clause 16.3 of [5, TS 38.213];

- is the OFDM symbol number in the PSFCH transmission where corresponds to the first OFDM symbol of the PSFCH transmission;

- is the index of the OFDM symbol in the slot that corresponds to the first OFDM symbol of the PSFCH transmission in the slot given by [5, TS 38.213];

- and with given by the higher-layer parameter *sl-PSFCH-HopID* if configured; otherwise, .

- with given by the higher-layer parameter *sl-PSFCH-HopID* if configured; otherwise, .

##### 8.3.4.2.2 Mapping to physical resources

The sequence shall be multiplied with the amplitude scaling factor in order to conform to the transmit power specified in [5, TS 38.213] and mapped in sequence starting with to resource elements assigned for transmission according to clause 16.3 of [5, TS 38.213] in increasing order of first the index over the assigned physical resources, and then the index on antenna port.

The resource elements used for the PSFCH in the first OFDM symbol in the mapping operation above, including any DM-RS, PT-RS, or CSI-RS occurring in the first OFDM symbol, shall be duplicated in the immediately preceding OFDM symbol.

##### 8.4.1.1.2 Mapping to physical resources

The sequence shall be mapped to the intermediate quantity according to clause 6.4.1.1.3 using configuration type 1 without transform precoding, and where , , and are given by Table 8.4.1.1.2-2, and is specified in clause 8.4.1.1.1.

The patterns used for the PSSCH DM-RS is indicated in the SCI as described in clause 8.3.1.1 of [4, TS 38.212].

The intermediate quantity shall be precoded, multiplied with the amplitude scaling factor specified in clause 8.3.1.5, and mapped to physical resources according to

where

- the precoding matrix is given by clause 8.3.1.4,

- the set of antenna ports is given by clause 8.3.1.4, 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 PSSCH transmission.

The quantity is defined relative to subcarrier 0 in common resource block 0 and the quantity is defined relative to the start of the scheduled resources for transmission of PSSCH and the associated PSCCH, including the OFDM symbol duplicated as described in clauses 8.3.1.5 and 8.3.2.3.

The position(s) of the DM-RS symbols is given by according to Table 8.4.1.1.2-1 where the number of PSSCH DM-RS is indicated in the DCI, and is the duration of the scheduled resources for transmission of PSSCH and the associated PSCCH, including the OFDM symbol duplicated as described in clauses 8.3.1.5 and 8.3.2.3.

Table 8.4.1.1.2-1: PSSCH DM-RS time-domain location.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| in symbols | DM-RS position | | | | | |
| PSCCH duration 2 symbols | | | PSCCH duration 3 symbols | | |
| Number of PSSCH DM-RS | | | Number of PSSCH DM-RS | | |
| 2 | 3 | 4 | 2 | 3 | 4 |
| 6 | 1, 5 |  |  | 1, 5 |  |  |
| 7 | 1, 5 |  |  | 1, 5 |  |  |
| 8 | 1, 5 |  |  | 1, 5 |  |  |
| 9 | 3, 8 | 1, 4, 7 |  | 4, 8 | 1, 4, 7 |  |
| 10 | 3, 8 | 1, 4, 7 |  | 4, 8 | 1, 4, 7 |  |
| 11 | 3, 10 | 1, 5, 9 | 1, 4, 7, 10 | 4, 10 | 1, 5, 9 | 1, 4, 7, 10 |
| 12 | 3, 10 | 1, 5, 9 | 1, 4, 7, 10 | 4, 10 | 1, 5, 9 | 1, 4, 7, 10 |
| 13 | 3, 10 | 1, 6, 11 | 1, 4, 7, 10 | 4, 10 | 1, 6, 11 | 1, 4, 7, 10 |

Table 8.4.1.1.2-2: Parameters for PSSCH DM-RS.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | CDM group |  |  | |  | |
|  |  |  |  |  |  |  |
| 1000 | 0 | 0 | +1 | +1 | +1 | +1 |
| 1001 | 0 | 0 | +1 | -1 | +1 | +1 |

##### 8.4.1.2.2 Mapping to physical resources

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

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

when all the following conditions are fulfilled

- is within the OFDM symbols allocated for the PSSCH transmission;

- resource element  is not used for sidelink CSI-RS, PSCCH, nor DM-RS associated with PSSCH;

- and correspond to

The precoding matrix is given by clause 8.3.1.4*.*

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

1. set and

2. if any symbol in the interval overlaps with a symbol used for DM-RS according to clause 8.4.1.1.3

- set

- set to the symbol index of the DM-RS symbol

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

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

4. increment by one

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

where is given by clause 8.4.3 of [6, TS 38.214].

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

where

-

- is given by Table 8.4.1.2.2-1 for the DM-RS port associated with the PT-RS port according to clause 8.2.4 in [6, TS 38.214].

- is the number of resource blocks scheduled;

- is given by [6, TS 38.214];

- where the quantity equals the decimal representation of CRC on the PSCCH associated with the PSSCH according to with and given by clause 7.3.2 in [4, TS 38.212].

PSSCH PT-RS shall not be mapped to resource elements containing PSCCH or PSCCH DMRS by puncturing PSSCH PT-RS.

A UE is not expected to receive sidelink CSI-RS and PSSCH PT-RS on the same resource elements.

Table 8.4.1.2.2-1: The parameter .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DM-RS antenna port |  | | | |
|  | *resourceElementOffset* | | | |
|  | offset00 | offset01 | offset10 | offset11 |
| 0 | 0 | 2 | 6 | 8 |
| 1 | 2 | 4 | 8 | 10 |