**3GPP TSG-RAN WG1 Meeting #101-e *R1-200xxxx***

**e-Meeting, May 25th – June 5th, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **38.212** | **CR** | **0040** | **rev** | **1** | **Current version:** | **16.1.0** |  |
|  |
| *For* [***HELP***](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 on 5G V2X sidelink features after RAN1#100bis-e and RAN1#101-e |
|  |  |
| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | 5G\_V2X\_NRSL-Core |  | ***Date:*** | 2020-06-05 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | Corrections based on text-proposals/agreements made at RAN1#100bis-e and RAN1#101-e including alignment across specifications. |
|  |  |
| ***Summary of change:*** | 1. Correction based on email thread [100b-e-NR-5G\_V2X\_NRSL-PHYstructure-04] (as endorsed text proposal in R1-2003034);
2. Correction based on email thread [100b-e-NR-5G\_V2X\_NRSL-PHY-Procedure-03] (as endorsed text proposal in R1-2003009);
3. Correction based on email thread [100b-e-NR-5G\_V2X\_NRSL-Mode-1-04] (as endorsed text proposal in R1-2003110);
4. Correction based on email thread [101-e-NR-5G\_V2X\_NRSL-SL\_PHY\_Procedure-03] (as endorsed text proposal in R1-2004933);
5. Correction based on email thread [101-e-NR-5G\_V2X\_NRSL-Mode-1-02] (as endorsed text proposal in R1-2005007);
6. Correction based on email thread [101-e-NR-5G\_V2X\_NRSL-Mode-1-03] (as endorsed text proposal in R1-2005008);
7. Correction based on email thread [101-e-NR-5G\_V2X\_NRSL-PHYstructure-01] (as endorsed text proposal in R1-2005018);
8. Correction based on email thread [101-e-NR-5G\_V2X\_NRSL-PHYstructure-03] (as endorsed text proposal in R1-2005020);
9. Correction based on email thread [101-e-NR-5G\_V2X\_NRSL-PHYstructure-04] (as endorsed text proposal in R1-2005021);
10. SCI format naming modification: A SCI consists of two stages: 1st-stage SCI and 2nd-stage SCI, to be represented as SCI 1-X and SCI 2-X, with X being A, B, C… meaning different types. SCI 1-A means 1st-stage SCI Ath type; SCI 2-A means 2nd-stage SCI Ath type; SCI 2-B means 2nd-stage SCI Bth type, and so on.
11. Add 2nd-stage SCI formats field value table of SCI format 1-A in 8.3.1.1.
12. Reference alignment and editorial changes
* For DCI format 3-0:
	+ Time and Frequency domain resource allocation for SL are defined in 8.1.2.1 and 8.1.2.2 of TS 38.214 respectively.
	+ Time and frequency resources of SL HARQ report are defined in 16.5 of TS 38.213.
* For SCI format 1-A:
	+ Priority is defined from TS 23.287.
	+ Time and frequency domain resource allocation for SL are defined in 8.1.2.1 and 8.1.2.2 of TS 38.214 respectively.
	+ Update number of bits for DMRS pattern field of SCI format 1-A in 8.3.1.1 redfined, based on entries of higher layer parameter *sl-PSSCH-DMRS-TimePatternList.*
	+ For “Reserved”, of which number of bits are provided by the higher layer parameter, remove the value range of the higher layer parameter and any particular value assigned to the reserved value.
	+ Table index alignment.
* For SCI format 2-B:
	+ Zone ID is determined at 5.8.1.1 of TS38.331
* For rate matching of 2nd-stage SCI
	+ Replace by to align the notation used in section 8.2.1 Data and control multiplexing.
	+ Replace 2 as in the equation of , to align the usage of the modulation order of 2nd-stage SCI elsewhere in TS38.212.
* For PSBCH
	+ Typo correction on “parameter”
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|  |  |
| ***Consequences if not approved:*** | Incomplete specification of 5G V2X sidelink. |
|  |  |
| ***Clauses affected:*** | 2, 7.3.1.1.2, 7.3.1.4.1, 8.1, 8.2, 8.2.1, 8.3.1.1, 8.4.1.1, 8.4.1.2(new clause), 8.4.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.211, TS 38.213, TS 38.214 |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

< Unchanged parts are omitted >

[10] 3GPP TS 38.473: "NG-RAN; F1 Application Protocol (F1AP)"

[11] 3GPP TS 36.212: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding"

[12] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services"

< Unchanged parts are omitted >

3.3 Abbreviations

< Unchanged parts are omitted >

RI Rank indicator

RSRP Reference signal received power

SCI Sidelink control information

SFCI Sidelink feedback control information

SFN System frame number

SL Sidelink

SL-BCH Sidelink broadcast channel

7 Downlink transport channels and control information

< Unchanged parts are omitted >

### 7.3.1 DCI formats

< Unchanged parts are omitted >

##### 7.3.1.1.2 Format 0\_1

< Unchanged parts are omitted >

- 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.

< Unchanged parts are omitted >

7.3.1.4.1 Format 3\_0

DCI format 3\_0 is used for scheduling of NR PSCCH and NR PSSCH in one cell.

The following information is transmitted by means of the DCI format 3\_0 with CRC scrambled by SL-RNTI or SL-CS-RNTI:

- Resource pool index – bits, where *I* is the number of resource pools for transmission configured by the higher layer parameter *sl-TxPoolScheduling*.

- Time gap – 3 bits determined by higher layer parameter *sl-DCI-ToSL-Trans,* as defined in clause 8.1.2.1 of [6, TS 38.214]

- HARQ process number – bitsas defined in clause 16.4 of [5, TS 38.213]

- New data indicator – 1 bitas defined in clause 16.4 of [5, TS 38.213]

- Lowest index of the subchannel allocation to the initial transmission – bits as defined in clause 8.1.2.2 of [6, TS 38.214]

- SCI format 1-A fields according to clause 8.3.1.1:

- Frequency resource assignment.

- Time resource assignment.

- PSFCH-to-HARQ feedback timing indicator – bits, where is the number of entries in the higher layer parameter *sl-PSFCH-ToPUCCH,* as defined in clause 16.5 of [5, TS 38.213]

- PUCCH resource indicator – 3 bitsas defined in clause 16.5 of [5, TS 38.213].

- Configuration index – 0 bit if the UE is not configured to monitor DCI format 3\_0 with CRC scrambled by SL-CS-RNTI; otherwise 3 bitsas defined in clause 8.1.2 of [6, TS 38.214]. If the UE is configured to monitor DCI format 3\_0 with CRC scrambled by SL-CS-RNTI, this field is reserved for DCI format 3\_0 with CRC scrambled by SL-RNTI.

- Counter sidelink assignment index – 2 bits

- 2 bits as defined in clause 16.5.2 of [5, TS 38.213] if the UE is configured with *pdsch-HARQ-ACK-Codebook = dynamic*

- 2 bits as defined in clause 16.5.1 of [5, TS 38.213] if the UE is configured with *pdsch-HARQ-ACK-Codebook = semi-static*

- Padding bits, if required

If multiple transmit resource pools are provided in *sl-TxPoolScheduling*, zeros shall be appended to the DCI format 3\_0 until the payload size is equal to the size of a DCI format 3\_0 given by a configuration of the transmit resource pool resulting in the largest number of information bits for DCI format 3\_0.

If the UE is configured to monitor DCI format 3\_1 and the number of information bits in DCI format 3\_0 is less than the payload of DCI format 3\_1, zeros shall be appended to DCI format 3\_0 until the payload size equals that of DCI format 3\_1.

< Unchanged parts are omitted >

# 8 Sidelink transport channels and control information

< Unchanged parts are omitted >

## 8.1 Sidelink broadcast channel

The processing for SL-BCH transport channel follows the BCH according to clause 7.1, with the following changes:

- Clause 7.1.1 for PBCH payload generation is replaced by Clause 8.1.1.

- Clause 7.1.2 for scrambling is not performed.

- In clause 7.1.5, the rate matching output sequence length E = 1386 when higher layer parameter *cyclicPrefix* is configured, otherwise, E = 1782.

< Unchanged parts are omitted >

## 8.2 Sidelink shared channel

The processing for SL-SCH transport channel follows the UL-SCH according to clause 6.2, with the following changes:

- Rate matching of SL-SCH follows the rate matching according to clause 6.2.5 by setting

- Clause 6.2.7 is replaced by clause 8.2.1

### 8.2.1 Data and control multiplexing

Denote the coded bits for SL-SCH as.

Denote the coded bits for the 2nd-stage SCI, as .

Denote the multiplexed data and control coded bit sequence as , where *G* is the total number of coded bits for transmission.

Assuming that is the number of layers onto which the SL-SCH transport block is mapped, the multiplexed data and control coded bit sequence is obtained as follows:

Denote is modulation order of the 2nd-stage SCI.

## 8.3 Sidelink control information on PSCCH

< Unchanged parts are omitted >

### 8.3.1 1st-stage SCI formats

< Unchanged parts are omitted >

#### 8.3.1.1 SCI format 1-A

SCI format 1-A is used for the scheduling of PSSCH and 2nd-stage-SCI on PSSCH

The following information is transmitted by means of the SCI format 1-A:

- Priority – 3 bits as defined in clause 5.4.3.3 of [12, TS 38.287].

- Frequency resource assignment – bits when the value of the higher layer parameter *sl-MaxNumPerReserve* is configured to 2; otherwise bits when the value of the higher layer parameter *sl-MaxNumPerReserve* is configured to 3, as defined in clause 8.1.2.2 of [6, TS 38.214].

- Time resource assignment – 5 bits when the value of the higher layer parameter *sl-MaxNumPerReserve* is configured to 2; otherwise 9 bits when the value of the higher layer parameter *sl-MaxNumPerReserve* is configured to 3, as defined in clause 8.1.2.1 of [6, TS 38.214].

- Resource reservation period – bits as defined in clause 8.1.4 of [6, TS 38.214], where is the number of entries in the higher layer parameter *sl-ResourceReservePeriodList*, if higher layer parameter *sl-MultiReserveResource* is configured; 0 bit otherwise.

- DMRS pattern – bits as defined in clause 8.4.1.1.2 of [4, TS 38.211], where is the number of DMRS patterns configured by higher layer parameter *sl-PSSCH-DMRS-TimePatternList*; 0 bit if *sl-PSSCH-DMRS-TimePatternList* is not configured.

- 2nd-stage SCI format – 2 bits as defined in Table 8.3.1.1-1.

- Beta\_offset indicator – 2 bits as provided by higher layer parameter *sl-BetaOffsets2ndSCI* and Table 8.3.1.1-2.

- Number of DMRS port – 1 bit as defined in Table 8.3.1.1-3.

- Modulation and coding scheme – 5 bits as defined in clause 8.1.3 of [6, TS 38.214].

- Additional MCS table indicator – as defined in clause 8.1.3.1 of [6, TS 38.214]: 1 bit if one MCS table is configured by higher layer parameter *sl-Additional-MCS-Table*; 2 bits if two MCS tables are configured by higher layer parameter *sl- Additional-MCS-Table*; 0 bit otherwise.

- PSFCH overhead indication – 1 bit as defined clause 8.1.3.2 of [6, TS 38.214] if higher layer parameter *sl-PSFCH-Period* = 2 or 4; 0 bit otherwise.

- Reserved – a number of bits as determined by higher layer parameter *sl-NumReservedBits*.

Table 8.3.1.1-1: 2nd-stage SCI formats

|  |  |
| --- | --- |
| **Value of 2nd-stage SCI format field** | **2nd-stage SCI format** |
| 00 | SCI format 2-A |
| 01 | SCI format 2-B |
| 10 | Reserved |
| 11 | Reserved |

**Table 8.3.1.1-2: Mapping of Beta\_offset indicator values to indexes in Table 9.3-2 of [5, TS38.213]**

|  |  |
| --- | --- |
| **Value of Beta\_offset indicator** | **Beta\_offset index in Table 9.3-2 of [5, TS38.213]** |
| 00 | 1st index provided by higher layer parameter *sl-BetaOffsets2ndSCI* |
| 01 | 2nd index provided by higher layer parameter *sl-BetaOffsets2ndSCI* |
| 10 | 3rd index provided by higher layer parameter *sl-BetaOffsets2ndSCI* |
| 11 | 4th index provided by higher layer parameter *sl-BetaOffsets2ndSCI* |

Table 8.3.1.1-3: Number of DMRS port(s)

|  |  |
| --- | --- |
| **Value of the Number of DMRS port field** | **Antenna ports** |
| 0 | 1000 |
| 1 | 1000 and 1001 |

< Unchanged parts are omitted >

## 8.4 Sidelink control information on PSSCH

< Unchanged parts are omitted >

### 8.4.1 2nd-stage SCI formats

< Unchanged parts are omitted >

#### 8.4.1.1 SCI format 2-A

SCI format 2-A is used for the decoding of PSSCH, with HARQ operation when HARQ-ACK information includes ACK or NACK, or when there is no feedback of HARQ-ACK information.

The following information is transmitted by means of the SCI format 2-A:

- HARQ process number – bits as defined in clause 16.4 of [5, TS 38.213].

- New data indicator – 1 bit as defined in clause 16.4 of [5, TS 38.213].

- Redundancy version – 2 bits as defined in clause 16.4 of [6, TS 38.214].

- Source ID – 8 bits as defined in clause 8.1 of [6, TS 38.214].

- Destination ID – 16 bits as defined in clause 8.1 of [6, TS 38.214].

- HARQ feedback enabled/disabled indicator – 1 bit as defined in clause 16.3 of [5, TS 38.213].

- Cast type indicator – 2 bits as defined in Table 8.4.1.1-1.

- CSI request – 1 bit as defined in clause 8.2.1 of [6, TS 38.214].

**Table 8.4.1.1-1: Cast type indicator**

|  |  |
| --- | --- |
| **Value of Cast type indicator** | **Cast type** |
| 00 | Broadcast |
| 01 | Groupcast |
| 10 | Unicast |
| 11 | Reserved |

#### 8.4.1.2 SCI format 2-B

SCI format 2-B is used for the decoding of PSSCH, with HARQ operation when HARQ-ACK information includes only NACK, or when there is no feedback of HARQ-ACK information.

The following information is transmitted by means of the SCI format 2-B:

- HARQ process number – bits as defined in clause 16.4 of [5, TS 38.213].

- New data indicator – 1 bit as defined in clause 16.4 of [5, TS 38.213].

- Redundancy version – 2 bits as defined in clause 16.4 of [6, TS 38.214].

- Source ID – 8 bits as defined in clause 8.1 of [6, TS 38.214].

- Destination ID – 16 bits as defined in clause 8.1 of [6, TS 38.214].

- HARQ feedback enabled/disabled indicator – 1 bit as defined in clause 16.3 of [5, TS 38.213].

- Zone ID – 12 bits as defined in clause 5.8.1.1 of [9, TS 38.331].

- Communication range requirement – 4 bits as defined in [9, TS 38.331]

< Unchanged parts are omitted >

### 8.4.4 Rate Matching

For 2nd-stage SCI transmission on PSSCH with SL-SCH, the number of coded modulation symbols generated for 2nd-stage SCI transmission prior to duplication for the 2nd layer if present, denoted as , is determined as follows:

where

-  is the number of the 2nd-stage SCI bits

-  is the number of CRC bits for the 2nd-stage SCI, which is 24 bits.

-  is indicated in the corresponding 1st-stage SCI.

- is the scheduled bandwidth of PSSCH transmission, expressed as a number of subcarriers;

- is the number of subcarriers in OFDM symbol that carries DMRS, in the PSSCH transmission.

- is the number of subcarriers in OFDM symbol that carries PT-RS, in the PSSCH transmission.

-  is the number of resource elements that can be used for transmission of the 2nd-stage SCI in OFDM symbol , for and for , in PSSCH transmission, where = *sl-lengthSymbols* - 2, where *sl-lengthSymbols* is the number of sidelink symbols within the slot provided by higher layers as defined in [6, TS 38.214]. If higher layer parameter *sl-PSFCH-Period* = 2 or 4, = 3 if "PSFCH overhead indication" field of SCI format 1-A indicates "1", and = 0 otherwise. If higher layer parameter *sl-PSFCH-Period* = 0, . If higher layer parameter *sl-PSFCH-Period* is 1, .

-  = - -

- is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.

- is the coding rate as indicated by "Modulation and coding scheme" field in SCI format 1-A.

- is configured by higher layer parameter *sl-Scaling*.

The input bit sequence to rate matching is , where is the number of coded bits.

Rate matching is performed according to Clause 5.4.1 by setting .

The output bit sequence after rate matching is denoted as , where and is modulation order of the 2nd-stage SCI. A UE is not expected to have.

< Unchanged parts are omitted >