**3GPP TSG-RAN WG1 Meeting #114 *R1-23xxxxx***

**Toulouse, France, August 21-25, 2023**

|  |
| --- |
| *CR-Form-v12.2* |
| **Draft CHANGE REQUEST** |
|  |
|  | **38.212** | **CR** |  | **rev** | **-** | **Current version:** | **17.5.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

|  |
| --- |
|  |
| ***Title:***  | Introduction of Rel-18 NR sidelink evolution |
|  |  |
| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_SL\_enh2-Core |  | ***Date:*** | 2023-09-01 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories 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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Introduction of Rel-18 NR sidelink evolution. |
|  |  |
| ***Summary of change:*** | Support of Rel-18 NR sidelink evolution:1. Section 3.3: Add the abbreviation CAPC.
2. Section 8.3.1.1: Update SCI format 1-A to reflect agreements related to sidelink operation on unlicensed spectrum.
3. Section 8.4.1.1: Update SCI format 2-A to reflect agreements related to sidelink operation on unlicensed spectrum.
 |
|  |  |
| ***Consequences if not approved:*** | NR sidelink evolution in Rel-18 will be incomplete.  |
|  |  |
| ***Clauses affected:*** | 2, 3.3, 8.3.1.1, 8.4.1.1, 8.4.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.213, TS 38. 214, TS 37.213 |
| ***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.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.201: "NR; Physical Layer – General Description"

[3] 3GPP TS 38.202: "NR; Services provided by the physical layer"

[4] 3GPP TS 38.211: "NR; Physical channels and modulation"

[5] 3GPP TS 38.213: "NR; Physical layer procedures for control"

[6] 3GPP TS 38.214: "NR; Physical layer procedures for data"

[7] 3GPP TS 38.215: "NR; Physical layer measurements"

[8] 3GPP TS 38.321: "NR; Medium Access Control (MAC) protocol specification"

[9] 3GPP TS 38.331: "NR; Radio Resource Control (RRC) protocol specification"

[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"

[14] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access"

< Unchanged parts are omitted >

3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

BCH Broadcast channel

CAPC Channel access priority class

CBG Code block group

CBGTI Code block group transmission information

CG Configured grant

CG-DFI CG downlink feedback information

CG-UCI CG uplink control information

CORESET Control resource set

COT Channel occupancy time

CQI Channel quality indicator

CRC Cyclic redundancy check

CRI CSI-RS resource indicator

CSI Channel state information

CSI-RS CSI reference signal

DAI Downlink assignment index

DCI Downlink control information

DL Downlink

DL-SCH Downlink shared channel

DMRS Demodulation reference signal

HARQ Hybrid automatic repeat request

HARQ-ACK Hybrid automatic repeat request acknowledgement

LDPC Low density parity check

LI Layer indicator

MBS Multicast broadcast services

MCS Modulation and coding scheme

OFDM Orthogonal frequency division multiplex

PBCH Physical broadcast channel

PCH Paging channel

PDCCH Physical downlink control channel

PDSCH Physical downlink shared channel

PMI Precoding matrix indicator

PRB Physical resource block

PRACH Physical random access channel

PSBCH Physical sidelink broadcast channel

PSCCH Physical sidelink control channel

PSFCH Physical sidelink feedback channel

PSSCH Physical sidelink shared channel

PTRS Phase-tracking reference signal

PUCCH Physical uplink control channel

PUSCH Physical uplink shared channel

RACH Random access channel

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

SL-SCH Sidelink shared channel

SR Scheduling request

SRS Sounding reference signal

SS Synchronisation signal

SUL Supplementary uplink

TPC Transmit power control

TrCH Transport channel

UCI Uplink control information

UE User equipment

UL Uplink

UL-SCH Uplink shared channel

VRB Virtual resource block

ZP CSI-RS Zero power CSI-RS

< 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 specified in clause 5.4.3.3 of [12, TS 23.287] and clause 5.22.1.3.1 of [8, TS 38.321]. Value '000' of Priority field corresponds to priority value '1', value '001' of Priority field corresponds to priority value '2', and so on.

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

- If higher layer parameter *transmissionStructureForPSCCHandPSSCH* in *SL-BWP-Config* is not configured or configured to ‘*contigousRB*’

- 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 8.1.5 of [6, TS 38.214].

- If the higher layer parameter *transmissionStructureForPSCCHandPSSCH* in *SL-BWP-Config* is configured to ‘*interlaceRB*’

- X + Y bits provide the frequency domain resource allocation according to Clause x.x of [6, TS 38.214], where the X MSBs provide the RB set allocation and the Y LSBs provide the sub-channel allocation,

- the value of X is determined by when the value of the higher layer parameter *sl-MaxNumPerReserve* is configured to 2, or determined by when the value of the higher layer parameter *sl-MaxNumPerReserve* is configured to 3, where is the number of RB sets in a resource pool

- the value of Y is determined by when the value of the higher layer parameter *sl-MaxNumPerReserve* is configured to 2, or determined by when the value of the higher layer parameter *sl-MaxNumPerReserve* is configured to 3, where is the number of sub-channels for each RB set.

- 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 8.1.5 of [6, TS 38.214].

- Resource reservation period – bits as defined in clause 16.4 of [5, TS 38.213], 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*.

- 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 the following:

- bits as configured by higher layer parameter *sl-NumReservedBits,* with value set to zero, if higher layer parameter *sl-IndicationUE-B* is not configured, or if higher layer parameter *sl-IndicationUE-B* is configured to 'disabled';

- bits otherwise, with value set to zero.

- Conflict information receiver flag – 0 or 1 bit

- 1 bit if higher layer parameter *sl-IndicationUE-B* is configured to 'enabled', where the bit value of 0 indicates that the UE cannot be a UE to receive conflict information and the bit value of 1 indicates that the UE can be a UE to receive conflict information as defined in Clause 16.3.0 of [5, TS 38.213];

- 0 bit otherwise.

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 | SCI format 2-C |
| 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 >

8.4.1.1 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, 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-A:

- HARQ process number – bits.

- New data indicator – 1 bit.

- Redundancy version – 2 bits as defined in Table 7.3.1.1.1-2.

- 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 and in clause 8.1 of [6, TS 38.214].

- CSI request – 1 bit as defined in clause 8.2.1 of [6, TS 38.214] and in clause 8.1 of [6, TS 38.214].

If higher layer parameter *transmissionStructureForPSCCHandPSSCH* in *SL-BWP-Config* is configured, all the remaining fields are set as follows:

- CAPC – 2 bits. Value '00' of CAPC field corresponds to CAPC value '1', value '01' of CAPC field corresponds to priority value '2', and so on.

- COT sharing cast type – 2 bits as defined in Table 8.4.1.1-1.

- COT sharing additional ID – 24 bits. The 16 LSBs provide layer 1 destination ID and the 8 MSBs provide layer 1 source ID, as defined in [6, TS 38.214]. The 8 MSBs are reserved when value of COT sharing cast type field is set to '00' or '01'.

- Remaining COT duration – bits as defined in clause 4.5.3 of [14, TS 37.213], where is defined in Table 4.2-1 of Clause 4.2 of [4, TS 38.211].

**Table 8.4.1.1-1: Cast type indicator or COT sharing cast type**

|  |  |
| --- | --- |
| **Value of Cast type indicator or COT sharing cast type** | **Cast type** |
| 00 | Broadcast |
| 01 | Groupcast when HARQ-ACK information includes ACK or NACK |
| 10 | Unicast |
| 11 | Groupcastwhen HARQ-ACK information includes only NACK |
| Note: The row with value '11' is reserved, if higher layer parameter *transmissionStructureForPSCCHandPSSCH* in *SL-BWP-Config* is configured. |

< 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 carry PSCCH and PSCCH DMRS associated with 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 *startingSymbolFirst* and *startingSymbolSecond* are provided for the SL-BWP, = *numRefSymbolLength* - 2, where *numRefSymbolLength* is provided by higher layers. 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.