**3GPP TSG-RAN WG4 Meeting #** **110bisR4-2405158**

**Changsha, China, April 15th- 19th, 2024**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-4** | **CR** | **Draft CR** | **rev** |  | **Current version:** | **18.3.0** |  |
|  |
| *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 |  | Core Network |  |

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|  |
| ***Title:***  | Draft CR Introduction of PSSCH demodulation requirements for SL-U |
|  |  |
| ***Source to WG:*** | Huawei,HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_SL\_enh2-Perf |  | ***Date:*** | 2024-03-21 |
|  |  |  |  |  |
| ***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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | Based on WF R4-2402869, Huawei is responsible for CR work: PSSCH demodulation requirements for SL-U |
|  |  |
| ***Summary of change:*** | Capture PSSCH requirements, Applicability rules, RMC and corresponding transmission burst model |
|  |  |
| ***Consequences if not approved:*** | The related content will be missing |
|  |  |
| ***Clauses affected:*** | 11.1.1, 11.1.2, A.6.2.2, B.5.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | 38.521-4 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

# 11 V2X requirements

This clause contains the performance requirements for the sidelink physical channels specified for V2X Sidelink Communication.

## 11.1 Demodulation performance requirements (Conducted requirements)

11.1.1 General

#### 11.1.1.1 Applicability of requirements

##### 11.1.1.1.1 General

The minimum performance requirements are applicable to all V2X operating bands defined in TS 38.101-1[6] Clause 5.2E.

The minimum performance requirements in Clause 11.1 are mandatory for UE supporting NR SL operation (*sl-Reception-r16*), except test cases listed in Clauses 11.1.1.1.2.

##### 11.1.1.1.2 Applicability of requirements for mandatory UE V2X features with capability signalling

The performance requirements in Table 11.1.1.1.2-1 shall apply for V2X UEs which support mandatory UE features with capability signalling only.

Table 11.1.1.1.2-1: Requirements applicability for mandatory features with UE capability signalling

|  |  |  |  |
| --- | --- | --- | --- |
| UE feature/capability [14] | Test type | Test list | Applicability notes |
| Support of synchronization sources for NR sidelink (*sync-Sidelink-r16*) | FR1 | PSSCH | Clause 11.1.2.1.1Clause 11.1.6.1.1Clause 11.1.7.1.1Clause 11.1.2.1.2Clause 11.1.2AClause 11.1.8AClause 11.1.9A |  |
|  |  | PSCCH | Clause 11.1.3.1.1Clause 11.1.8.1.1 |  |
|  |  | PSBCH | Clause 11.1.4.1.1 |  |
|  |  | PSFCH | Clause 11.1.5.1.1Clause 11.1.9.1.1 |  |
| Supports of PSFCH format 0 (*psfch-FormatZeroSidelink-r16)* | FR1 | PSSCH | Clause 11.1.2.1.1Clause 11.1.6.1.1Clause 11.1.7.1.1Clause 11.1.2.1.2Clause 11.1.2AClause 11.1.8AClause 11.1.9A |  |
| PSCCH | Clause 11.1.3.1.1Clause 11.1.8.1.1 |
| PSFCH | Clause 11.1.5.1.1Clause 11.1.9.1.1 |

##### 11.1.1.1.4 Applicability of requirements for PSSCH with shared spectrum access

The applicability rules of requirements for PSSCH with shared spectrum access are captured in Table 11.1.1.1.4-1

Table 11.1.1.1.4-1: Requirements applicability for PSSCH with shared spectrum access

|  |  |  |  |
| --- | --- | --- | --- |
| UE feature/capability [14] | Test type | Test list | Applicability notes |
| Support of NR SL in shared spectrum(sl-DynamicChannelAccess-r18) | FR1 | PSSCH | Clause 11.1.2.1.2 |  |
| Support of interlace RB-based SL transmissons and receptions (*sl-Interlace-RB-TxRx-r18*) | FR1 | PSSCH | Clause 11.1.2.1.2 |  |

### 11.1.2 PSSCH demodulation requirements

#### 11.1.2.1 2Rx requirements

##### 11.1.2.1.1 Minimum requirements

*<Unchanged skipped>*

##### 11.1.2.1.2 Minimum requirements for PSSCH with shared spectrum access

The purpose of the requirements in this subclause is to verify the PSSCH for V2X demodulation performance with shared spectrum access with interlace RB allocationThe minimum requirements are specified in Table 11.1.2.1.2-2 with the test parameters specified in Table 11.1.2.1.2-1. In this test scenario, GNSS or GNSS-equivalent synchronization source is used and sidelink UE 1 transmits PSCCH and PSSCH.

Table 11.1.2.1.2-1: Test parameters

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Active cell(s) |  | None |
| SL transmission model |  | As specified in B.5.2 |
| Resource pool configuration  | Number of interlaces per sub-channel within a resource pool (*sl-NumInterlacePerSubchannel-r18*) |  | 1 |
| Reference number of PRBs of one interlace within 1 RB set for TBS determination (*sl-NumReferencePRBs-OfInterlac*e) |  | 11 |
| Reference number of symbols for TBS determination. *(sl-NumRefSymbolLength)* |  | 14 |
| CPE starting position within the GP symbol before PSFCH transmission(*sl-CPE-StartingPositionPSFCH*) |  | Not configured |
| PSFCH transmission structure *(sl-TransmissionStructureForPSFCH-r18)* |  | CommonInterlace |
| Number of dedicated PRBs for PSFCH*(sl-NumDedicatedPRBs-ForPSFCH-r18)* |  | 1 |
| The common interlace index for PSFCH(*sl-PSFCH-CommonInterlaceIndex-r18*) |  | 0 |
| Number of PSFCH occasiopns corresponding to one PSSCH/PSCCH transmission. (*sl-NumPSFCH-Occasions-r18*) |  | 1 |
| Sidelink Transmisson Modelparameters | SL transmission duration values | Slots | {2,4,8} |
| Channel access procedure |  | Type 1 |
| LBT failure probability (*pLBT*) |  | [0.25] |
| Sidelink UE 1 | Sidelink transmissions |  | PSCCH + PSSCH  |
| PSSCH DMRS pattern (Note 1) |  | {2,2} |
| Allocated RBs |  | Subchannel 0 |
| Timing offset (Note 2) | μs | CP/2-12\*64\*Tc |
| Frequency offset (Note 3) | Hz | +650 |
| Synchronization |  | GNSS or GNSS-equivalent |
| Antenna configuration |  | 1x2 Low |
| PSFCH resource period | Slot | 4 |
| MinTimeGapPSFCH | Slot | 3 |
| Note 1: {x, y}: x and y means the number of DMRS symbols for slot with PSFCH transmission and without PSFCH transmission, respectively. Note 2: Time offset of transmitted Sidelink UE signal with respect to GNSS referring timing. Note 3: Frequency offset of transmitted Sidelink UE signal with respect to GNSS reference frequency. |

Table 11.1.2.1.2-2: Minimum performance

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test num. | Reference channel | Bandwidth (MHz)/Subcarrier spacing(kHz) | Modulation format and code rate | Propagation condition | Reference value |
| PSSCH BLER (%) | SNR(dB) of PSSCH |
| 1 | R.PSSCH.2-1.6 | 20 / 30 | 16QAM, 0.37 | TDLA30-195 | 10 % | [9.3] |

### A.6.2.2 Reference measurement channels for SCS 30 kHz FR1

Table A.6.2.2-1: PSSCH Reference Channel

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PSSCH.2-1.1 | R.PSSCH.2-1.2 | R.PSSCH.2-1.3 | R.PSSCH.2-1.4 | R.PSSCH.2-1.5 |
| Channel bandwidth | MHz | 20 | 20 | 20 | 20 | 20 |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 | 30 |
| Allocated resource blocks | RB | 20 | 20 | 10 | 10 | 10 |
| CP-OFDM symbols for slot with PSFCH(Note 1) |  | 9 | 9 | 9 | 9 | 9 |
| CP-OFDM symbols for slot without PSFCH(Note 2)  |  | 12 | 12 | 12 | 12 | - |
| Modulation order |  | QPSK | 16QAM | 64QAM | QPSK | 64QAM |
| MCS index |  | 4 | 11 | 17 | 4 | 27 |
| Number of MIMO layers |  | 1 | 1 | 1 | 1 | 1 |
| Number of DMRS REs |  | 21 | 15 | 12 | 15 | 12 |
| Number of REs for SCI format 1-A |  | 240 | 240 | 240 | 240 | 240 |
| 2nd stage SCI format 2-A configuration | Payloads | Bits | 35 | 35 | 35 | 35 | 35 |
| *α* |  | 1 | 1 | 1 | 1 | 1 |
| *βoffset* |  | 3.5 | 5 | 5 | 3.5 | 2.5 |
| Overhead for TBS determination |  | 0 | 0 | 0 | 0 | 0 |
| Transport Block Size for slot with PSFCH | Bits | 704 | 1800 | 984 | 208 | 3496 |
| Transport Block Size for slot without PSFCH | Bits | 1128 | 2856 | 1928 | 432 | - |
| Transport block CRC | Bits | 24 | 24 | 24 | 24 | 16 |
| Maximum number of HARQ transmissions |  | 1 | 1 | 1 | 1 | 2 |
| Binary Channel Bits for slots with PSFCH |  | 2304 | 4848 | 2232 | 744 | 3816 |
| Binary Channel Bits for slots without PSFCH | Bits | 3744 | 7728 | 4392 | 1464 | - |
| Note 1: OFDM symbols is for PSCCH/PSSCH transmission not including first symbol (AGC), PSFCH symbols, and guard symbols.Note 2: OFDM symbols is for PSCCH/PSSCH transmission not including first symbol (AGC) and guard symbols. |

Table A.6.2.2-2: PSSCH Reference Channel with shared spectrum access

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | R.PSSCH.2-1.6 |  |  |  |  |
| Channel bandwidth | MHz | 20 |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |
| Allocated resource blocks | RB | 11 |  |  |  |  |
| CP-OFDM symbols for slot with PSFCH(Note 1) |  | 9 |  |  |  |  |
| CP-OFDM symbols for slot without PSFCH(Note 2)  |  | 12 |  |  |  |  |
| Modulation order |  | 16QAM |  |  |  |  |
| MCS index |  | 11 |  |  |  |  |
| Number of MIMO layers |  | 1 |  |  |  |  |
| Number of DMRS REs |  | 12 |  |  |  |  |
| Number of REs for SCI format 1-A |  | 240 |  |  |  |  |
| 2nd stage SCI format 2-A configuration | Payloads | Bits | 35 |  |  |  |  |
| *α* |  | 1 |  |  |  |  |
| *βoffset* |  | 2.5 |  |  |  |  |
| Overhead for TBS determination |  | 0 |  |  |  |  |
| Transport Block Size for slot with PSFCH | Bits | TBD |  |  |  |  |
| Transport Block Size for slot without PSFCH | Bits | TBD |  |  |  |  |
| Transport block CRC | Bits | 24 |  |  |  |  |
| Maximum number of HARQ transmissions |  | 1 |  |  |  |  |
| Binary Channel Bits for slots with PSFCH |  | TBD |  |  |  |  |
| Binary Channel Bits for slots without PSFCH | Bits | TBD |  |  |  |  |
| Note 1: OFDM symbols is for PSCCH/PSSCH transmission not including first symbol (AGC), PSFCH symbols, and guard symbols.Note 2: OFDM symbols is for PSCCH/PSSCH transmission not including first symbol (AGC) and guard symbols. |

# B.5 Transmission Model for requirements on bands with shared spectrum access

Clause B.5.1 provides a description of the Downlink Transmission Model to be used in PDSCH Demodulation and CQI reporting performance tests on bands with shared spectrum access. The model as designed in the clause B.5.1 applies to both configurations for *channelAccessMode*=’semiStatic’ or ‘dynamic’.Clause B.5.2 provides a description of the Sidelink Transmission Model to be used in PSSCH performance tests on bands with shared spectrum access.

## B.5.1 Downlink Transmission Model for bands with shared spectrum access

The Downlink Period for performance tests on bands with shared spectrum access is defined as the duration included in the Test Configuration Parameters.

For tests configured with the RRC Parameter *channelAccessMode*=’semiStatic’, the duration of the Fixed Frame Period (FFP) equals the duration of the Downlink Period.

For each Downlink Period, the downlink signal to be transmitted is allocated according to the steps listed below:

1. Select the Downlink Transmission Duration in number of slots, randomly and with equally distributed probability, from the set of possible Downlink Transmission Duration values as included in the Test Configuration Parameters;

a. This duration includes occupied OFDM symbols and non-occupied OFDM symbols within the Downlink Transmission;

2. Depending on the Downlink Transmission Duration chosen in the previous step:

b. If the Downlink Transmission Duration equals 2 slots, all the OFDM symbols in both slots are fully allocated to downlink transmission, else;

c. If the Downlink Transmission Duration is larger than 2 slots, the configuration of occupied symbols in the last slot included in the downlink duration is selected in number of symbols, randomly and with equally distributed probability, from the set of possible ‘Occupied OFDM symbols in the last slot of the downlink duration’ as included in the Test Configuration Parameters;

For each Downlink Period, the last Slot is not scheduled for downlink transmission. This is to comply with the Idle period requirement in case of *channelAccessMode*=’semiStatic’, and to align the test setup. In the case of *channelAccessMode*=’semiStatic’, it can be assumed that the Channel Occupancy Time (COT) covers the entire duration of the Downlink Period except for the last slot.

For each Downlink Period, a uniform random variable from [0, 1] is generated. If the random variable is less than the *pLBT* value included in the Test Configuration Parameters, the entire Downlink Period duration is muted across the entire bandwidth. This applies to all the signals that were scheduled for transmission, including but not limited to PDSCH, PDCCH, SSB, TRS, CSI-RS, etc.

## B.5.2 Sidelink Transmission Model for bands with shared spectrum access

The sidelink transmission model is defined with following steps:

1. Select the sidelink tranmisson duration randomly with equal distributed probability, from the set of possible Downlink Transmission Duration values as included in the Test Configuration Parameters.

2. Uniform random variable from [0, 1] is generated.

* If the random variable is higer than the LBT failure probability as defned in the Test Configuration Parameters:

- Start sidelink burst transmission with Sidelink Transmisson Duration selected in step1 at the end of last slot of previous transmission burst. For all slots within one transmission burst, not the first slot, CP of the first symbol with PSSCH/PSCCH is extended to make the gap located in last symbol of previous slot equal to 16us.

* Otherwise, the transmission is muted and the muting duration is the same as the number of slots for Sidelink Transmisson Duration selected in step1.