**3GPP TSG-RAN WG4 Meeting # 98-e R4-2103538**

**Electronic Meeting, 25 Jan.,- 5 Feb., 2021**

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | 1506 | **Rev** | **1** | **Current version:** | **16.6.0** |  |
|  |
| *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 |  |

|  |
| --- |
|  |
| ***Title:***  | BigCR: Introduction of Rel-16 NR V2X RRM performance requirements (Rel-16) |
|  |  |
| ***Source to WG:*** | LG Electronics |
| ***Source to TSG:*** | RAN4 |
|  |  |
| ***Work item code:*** | 5G\_V2X\_NRSL-Perf |  | ***Date:*** | 2021-01-14 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | Introduce NR V2X performance requirements such as measurement accuracies, side condition(annex) and test cases.  |
|  |  |
| ***Summary of change:*** | Introduce NR V2X performance requirements based on the endorsed draft big CR(R4-2017105), draft CR(R4-2104045) and following additional changes. * L1 SL-RSRP measurement accuracy requirements is updated from TBD to ±4.5dB based on ageed WF(R4-2017100).
* Remove all [ ].
* Add Note for SL Channel Bandwidth (BWchannel) in Tables in which the Note is missed.

Note : The UE is only required to be tested in one of the supported test configurations.* Timing offset among Synchronous SyncRef UEs is changed with CP/2 in Table A.9.1.3.1.1-1, Table A. 9.1.4.1.1-1, Table A. 9.1.4.2.1-1, Table A.9.1.4.3.1-1 and Table A.9.1.5.1-2.
* CC.1A HD and CD.1A HD are configured as PSCCH RMC and PSSCH RMC repectively in all related Tables.
* A.3.19 is updated with A.3.21 because A.3.19 is already used for ‘Test applicability for DAPS handover’ based on TS38.133 V16.6.0.
 |
|  |  |
| ***Consequences if not approved:*** | Miss NR V2X performance requirements. |
|  |  |
| ***Clauses affected:*** | 10.4, A.3.21, A.9, B.4 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.533  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | It is revison of R4-2100638.  |

< START OF CHANGE #1 >

## 10.4 V2X measurements

### 10.4.1 Introduction

The requirements in this section are applicable for a UE capable of V2X sidelink communication.

The accuracy requirements in this clause are:

- applicable for AWGN radio propagation conditions,

- assume independent interference (noise) at each receiver antenna port.

### 10.4.2 Intra-frequency PSBCH-RSRP accuracy requirements for FR1

#### 10.4.2.1 PSBCH-RSRP Absolute Accuracy

The requirements for absolute accuracy of PSBCH-RSRP in this clause apply to a V2X synchronization source on the same frequency as that of the own V2X UE performing the measurement in FR1.

The accuracy requirements in Table 10.4.2.1-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.

- Conditions defined in Clause 7.3E of TS38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for PSBCH-RSRP measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 10.4.2.1-1: Intra-frequency PSBCH-RSRP absolute accuracy in FR1**

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **Normal condition** | **Extreme condition** | **Ês/Iot Note 3** | **Io Note 1 range** |
| **NR V2X operating band groups Note 2** | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCSSL** | **dBm/BWChannel** | **dBm/BWChannel** |
| **SCSSL = 15 kHz** | **SCSSL = 30 kHz** | **SCSSL = 60 kHz** |
| ±4.5 | ±9 | ≥-6 | NR\_TDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| NR\_TDD\_FR1\_J | -116.5 | -113.5 | -110.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR\_TDD\_FR1\_B, NR\_TDD\_FR1\_J | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: NR V2X operating band groups in FR1 are as defined in clause 3.5.2.NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS. |

#### 10.4.2.2 PSBCH-RSRP Relative Accuracy

The relative accuracy of PSBCH-RSRP is defined as the PSBCH-RSRP measured from one V2X synchronization source compared to the PSBCH-RSRP measured from another V2X synchronization source on the same frequency in FR1.

The accuracy requirements in Table 10.4.2.2-1 are valid under the following conditions:

- Demodulation reference signals are transmitted from one port.

- Conditions defined in Clause 7.3E of TS38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for PSBCH-RSRP accuracy measurements are fulfilled according to Annex B.4.2 for a corresponding Band for each relevant PSBCH-DMRS.

**Table 10.4.2.2-1: Intra-frequency PSBCH-RSRP relative accuracy in FR1**

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **Normal condition** | **Extreme condition** | **Ês/Iot Note 3** | **Io Note 1 range** |
| **NR V2X operating band groups Note 2** | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCSSL** | **dBm/BWChannel** | **dBm/BWChannel** |
| **SCSSL = 15 kHz** | **SCSSL = 30 kHz** | **SCSSL = 60 kHz** |
| ±2 | ±3 | ≥-3 | NR\_TDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| NR\_TDD\_FR1\_J | -116.5 | -113.5 | -110.5 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 4 | Note 4 | Note 4 | Note 4 | N/A | Note 4 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: NR V2X operating band groups in FR1 are as defined in clause 3.5.2.NOTE 3: Ês/Iot for a SyncRef UE is the Ês/Iot of PSBCH-DMRS.NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. |

### 10.4.3 Intra-Frequency SL-RSSI Measurement Accuracy Requirements for FR1

#### 10.4.3.1 Absolute SL-RSSI Accuracy

The intra-frequency SL-RSSI requirements are specified in Table 10.4.3.1-1. The requirements apply for measurement period of 1slot and for any configured measurement bandwidth larger than 10 RBs, provided that:

- All symbols duing each RSSI measurement duration are available for RSSI sampling within the same measurement interval.

Table 10.4.3.1-1: Intra-frequency SL-RSSI absolute accuracy

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | Io Note 1 range |
| NR V2X operating band groups Note 2 | Minimum Io | Maximum Io |
| dB | dB |  | dBm/SCSSL | dBm/BWChannel |
| SCSSL = 15kHz | SCSSL = 30kHz | SCSSL = 60kHz |
| ±2.5 | ±5.5 | NR\_TDD\_FR1\_B | -120.5 | -117.5 | -114.5 | -50 |
| NR\_TDD\_FR1\_J | -116.5 | -113.5 | -110.5 | -50 |
| ±4.5 | ±7.5 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement. |

### 10.4.4 Intra-Frequency L1 SL-RSRP Measurement Accuracy Requirements for FR1

#### 10.4.4.1 Absolute L1 SL-RSRP Accuracy

The requirements for absolute accuracy of L1 SL-RSRP in this clause apply to a UE performing PSCCH-RSRP and/or PSSCH-RSRP measurements on the same frequency as used by operating V2X sidelink communication.

The accuracy requirements in Table 10.4.4.1-1 are valid under the following conditions:

- Demodulation reference signals for PSCCH and/or PSSCH are transmitted from one port.

- Conditions defined in clause 7.3E of TS38.101-1 [18] for reference sensitivity are fulfilled.

- PSCCH-RSRP|dBm and/or PSSCH-RSRP|dBm according to Annex B.4.4 for a corresponding Band are fulfilled.

Table 10.4.4.1-1: Intra-frequency L1 SL-RSRP absolute accuracy for UE capable of V2X sidelink communication

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | Ês/Iot Note 3 | Io Note 1 range |
| NR V2X operating band groups Note 2 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm/SCS | dBm/BWChannel | dBm/BWChannel |
| SCS = 15kHz | SCS = 30kHz | SCS = 60kHz |
| ± 4.5 | ± 9 | ≥0 dB | NR\_TDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| NR\_TDD\_FR1\_J | -116.5 | -113.5 | -110.5 | N/A | -70 |
| ± 8 | ± 11 | ≥0 dB | NR\_TDD\_FR1\_B NR\_TDD\_FR1\_J | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.NOTE 3: The parameter Ês/Iot is the Ês/Iot of PSCCH-DMRS and/or PSSCH-DMRS. |

< END OF CHANGE #1 >

< START OF CHANGE #2 >

## A.3.21 V2X sidelink communication

### A.3.21.1 Introduction

This clause also defines the principle and the reference configurations that are applicable to test cases verifying RRM core requirements for V2X sidelink communication.

### A.3.21.2 Reference resource pool configurations for V2X Sidelink Communication

Table A.3.21.2-1: V2X sidelink SL-BWP configuration for NR

|  |
| --- |
| Derivation Path: 38.331 clause 6.3.5 |
| Information Element | Value | Comment |
| SL-BWP-ConfigCommon-r16::= SEQUENCE { |  |  |  |  |  |
| sl-BWP-Generic-r16 | SL-BWP-Generic-r16 ::= SEQUENCE{ |  |  |  |  |
|  | sl-LengthSymbols-r16 |  |  | sym14 |  |
|  | sl-StartSymbol-r16 |  |  | sym0 |  |
|  | } |  |  |  |  |
| sl-BWP-PoolConfigCommon-r16 | SL-BWP-PoolConfigCommon-r16 ::= SEQUENCE{ |  |  |  |  |
|  | sl-RxPool-r16 | SEQUENCE (SIZE (1..maxNrofRXPool-r16)) OF SL-ResourcePool-r16 |  |  | Indicates the receiving resource pool on the configured BWP. maxNrofRXPool-r16 = 1See Table A.3.21.2-2 |
|  | sl-TxPoolSelectedNormal-r16 | SEQUENCE (SIZE (1..maxNrofTXPool-r16)) OF SL-ResourcePoolConfig-r16 | SL-ResourcePoolConfig-r16 ::= SEQUENCE{ |  | Indicates the resources by which the UE is allowed to transmit NR sidelink communication by UE autonomous resource selection on the configured BWP.maxNrofTXPool-r16 = 1 |
|  |  |  | sl-ResourcePool-r16 |  | See Table A.3.21.2-2 |
|  |  |  | } |  |  |
|  | sl-TxPoolExceptional-r16 | SL-ResourcePoolConfig-r16 |  |  | Not present |
|  | } |  |  |  |  |
| } |  |  |  |  |  |

Table A.3.21.2-2: V2X sidelink resource pool configuration for NR

|  |
| --- |
| Derivation Path: 38.331 clause 6.3.5 |
| Information Element | Value | Comment |
| SL-ResourcePool-r16 ::= SEQUENCE{ |  |  |  |  |
|  | sl-SyncAllowed-r16 |  | *Set according to the specific test configuration* | ENUMERATED {gnss, gnbEnb, ue } |
|  | sl-TimeResource |  | 11111111111111111111 | Indicates the time resource of resource pool within sl-Period. |
|  | sl-SubchannelSize |  | 10 | ENUMERATED {n10}Minimum bandwidth of subchannel for adjacent transmission |
|  | sl-NumSubchannel |  | 1 | ENUMERATED {n1}Number of subchannel for adjacent transmission |
|  | sl-StartRB-Subchannel |  | 0 | Indicates the lowest RB index of the subchannel with the lowest index. |
|  | sl-MCS-Table |  | qam64 | Indicates the MCS table used in the resource pool. |
|  | sl-RxParametersNcell-r16 | SEQUENCE{ |  |  |
|  |  | sl-TDD-Config |  | Not presented  |
|  |  | sl-SyncConfigIndex-r16 |  | Not presented |
|  |  | } |  |  |
|  | sl-UE-SelectedConfigRP-r16 | SL-UE-SelectedConfigRP-r16::= SEQUENCE { |  |  |
|  |  | sl-MaxNumPerReserve | 2 | ENUMERATED{n2}. Indicates the maximum number of reserved PSCCH/PSSCH resources that can be indicated by an SCI. |
|  |  | sl-RS-ForSensing | {pssch} | Indicates whether DMRS of PSCCH or PSSCH is used for L1 RSRP measurement in the sensing operation. |
|  |  | sl-SensingWindow | 100ms | ENUMERATED {ms100}Parameter that indicates the start of the sensing window. |
|  |  | sl-SelectionWindow | {n20} | Parameter that determines the end of the selection window in the resource selection for a TB with respect to priority indicated in SCI. |
|  |  | sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16{ |  |  |
|  |  |  SL-ResourceReservePeriod-r16 | {s100} | Set of possible resource reservation period allowed in the resource pool. Up to 16 values can be configured per resource pool. |
|  |  | } |  |  |
|  |  |  SL-ThresPSSCH-RSRP-List-r16 | *Set according to the specific test configuration* | Indicates a list of 64 thresholds, and the threshold should be selected based on the priority in the decoded SCI and the priority in the SCI to be transmitted. A resource is excluded if it is indicated or reserved by a decoded SCI and PSSCH RSRP in the associated data resource is above a threshold. |
|  |  | } |  |  |
|  | sl-ZoneConfigMCR-List-r16 |  |  | Not present |
| } |  |  |  |  |

Table A.3.21.2-3: V2X sidelink UE autonomous resource selection configuration for NR

|  |
| --- |
| Derivation Path: 38.331 clause 6.3.5 |
| Information Element | Value  | Comment |
| SL-UE-SelectedConfig-r16::= SEQUENCE { |  |  |  |  |  |
|  | sl-ProbResourceKeep-r16 |  |  | 0.8 | ENUMERATED{v0dot8}. Indicates the probability with which the UE keeps the current resource when the resource reselection counter reaches zero for sensing based UE autonomous resource selection (see TS 38.321 [7]). |
|  | sl-ReselectAfter-r16 |  |  | 1 | ENUMERATED{n1}.Indicates the number of consecutive skipped transmissions before triggering resource reselection for sidelink communication (see TS 38.321 [7]). |
|  | sl-PreemptionEnable-r16 |  |  | {enabled} |  |
|  | sl-PSSCH-TxConfigList | SL-PSSCH-TxConfig-r16 ::= SEQUENCE{ |  |  |  |
|  |  | sl-TypeTxSync-r16 |  | *Set according to the specific test configuration* | This filed indicates the synchronization reference type. For configurations by the eNB/gNB, only gnbEnb can be configured; and for pre-configuration or when this filed is absent, the configuration is applicable for all synchronization reference types. |
|  |  | sl-ThresUE-Speed |  | kmph200 | This filed indicates a UE absolute speed threshold. |
|  |  | sl-ParametersAboveThres-r16 | SL-PSSCH-TxParameters-r16 ::= SEQUENCE{ |  |  |
|  |  |  | sl-MinMCS-PSSCH-r16 | 0 | This field indicates the minimum and maximum MCS values used for transmissions on PSSCH. |
|  |  |  | sl-MaxMCS-PSSCH-r16 | 15 |
|  |  |  | sl-MinSubChannelNumPSSCH-r16 | 1 | This field indicates the minimum and maximum number of sub-channels which may be used for transmissions on PSSCH. |
|  |  |  | sl-MaxSubchannelNumPSSCH-r16 | 1 |
|  |  |  | sl-MaxTxTransNumPSSCH-r16 | Both | Indicates the maximum transmission number (including new transmission and retransmission) for PSSCH. |
|  |  |  | sl-MaxTxPower-r16 | Not present | This filed indicates the maximum transmission power for transmission on PSSCH and PSCCH. |
|  |  |  | } |  |  |
|  |  | sl-ParametersBelowThres-r16 |  |  |  |
|  |  |  |  sl-ParametersBelowThres-r16 SEQUENCE { |  |  |
|  |  |  |  sl-MinMCS-PSSCH-r16 | 4 |  |
|  |  |  |  sl-MaxMCS-PSSCH-r16 | 25 |  |
|  |  |  |  sl-MinSubChannelNumPSSCH-r16 | 1 |  |
|  |  |  |  sl-MaxSubchannelNumPSSCH-r16 | 1 |  |
|  |  |  |  sl-MaxTxTransNumPSSCH-r16 | n1 |  |
|  |  |  |  sl-MaxTxPower-r16 | Not present |  |
|  |  |  | } |  |  |
|  |  | } |  |  |  |
| } |  |  |  |  |  |

### A.3.21.3 Reference measurement channels for V2X Sidelink Communication

Table A.3.21.3-1: PSCCH Reference Measurement Channels

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | CC.1A HD |
| Channel bandwidth | MHz | Note2 |
| Number of PSCCH symbols per slot |  | 2 |
| Number of PSCCH RB |  | 10 |
| Modulation |  | QPSK |
| Information Bit Payload (without CRC) | Bits | 26 |
| Information Bit | Number of DMRS ports |  | 0 (1 port) |
| Priority |  | As set by higher layers |
| Resource reservation period |  | N/A |
| Modulation and coding scheme |  | Set as the PSSCH MCS specified in the test |
| DMRS pattern |  | 0 (2 DMRS) |
| 2nd stage SCI format |  | 0 (Multi-cast) |
| Beta offset indicator |  | Set as specified in the test |
| Frequency resource assignment |  | Set as per PSSCH RB allocation specific in the test |
| Time resource assignment |  | Set as per PSSCH slot allocation specific in the test |
| Reserved bits |  | Set all these bits to 0 |
| Transport block CRC | Bits | 24 |
| Binary Channel Bits (see Note 1) | Bits | 360  |
| Note 1: Binary channel bits calculated under assumption of 2 CP-OFDM symbols per subframe.Note 2: Channel bandwidth depends on test configuration. |

Table A.3.21.3-2: PSSCH Reference Measurement Channels

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel  |  | CD.1A HD |
| Sidelink transmission mode |  | 2 |
| Channel bandwidth | MHz | Note1 |
| Allocated PSSCH resource blocks |  | 10 |
| Number of PSSCH symbols per slot  |  | 10 |
| Modulation |  | QPSK |
| Target Code Rate |  | 1/3 |
| Information Bit Payload (Transport block size) | Bits | 672 |
| Transport block CRC | Bits | 24 |
| Number of PSSCH HARQ retransmissions |  | 0 |
| Binary Channel Bits  | Bits | 2160 |
| Note 1: Channel bandwidth depends on test configuration.Note 2: 2nd state SCI and PSFCH are not allocated per slot. |

< END OF CHANGE #2 >

< START OF CHANGE #3 >

# A.9 V2X Tests

## A.9.1 V2X Tests in FR1

### A.9.1.1 Test for V2X UE Transmit Timing

#### A.9.1.1.1 Test for GNSS as Synchronization Reference Source

##### A.9.1.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE timing requirements as specified in clause 12.2.2, when the GNSS is used as timing reference. For this test, the UE is triggered by the test loop function to transmit for V2X sidelink communication.

Table A.9.1.1.1.1-1 defines test parameters for UE transmit timing accuracy tests for V2X. There is one GNSS based synchronization source during the test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B.4.1.

Table A.9.1.1.1.1-1: V2X Sidelink Test Parameters for UE Transmit Timing Tests for GNSS as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1 | TDD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 1 | MHz | 20 (NRB,c = 50) or40 (NRB,c = 100) |  |
| Active cell |  | None |  |
| Active SyncRef UE |  | None |  |
| V2X sidelink communication preconfiguration |  | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel |  | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel |  | CD.1A HD | As specified in Table A.3.21.3-2 |
| Propagation condition |  | AWGN |  |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |

##### A.9.1.1.1.2 Test requirements

For parameters specified in Tables A.9.1.1.1-1, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.2. The timing accuracy is verified by using PSSCH transmissions.

#### A.9.1.1.2 Test for SyncRef UE as Synchronization Reference Source

##### A.9.1.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the timing requirements for V2X sidelink transmissions specified in clause 12.2.5, when SyncRef UE is used as timing reference. For this test, the UE is triggered by the test loop function to transmit for V2X sidelink communication.

Table A.9.1.1.2.1-1 defines test parameters for UE transmit timing accuracy tests for V2X sidelink Communication. There is one active SyncRef UE in this test without either serving cell and or GNSS signals. Before the test starts, the UE has been synchronized to the SyncRef UE. The transmit timing accuracy is verified by using the transmission timing of PSSCH transmissions.

Table A.9.1.1.2.1-1: General Test Parameters for V2X UE Transmit Timing Test for SyncRef UE as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1 | TDD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 3 | MHz | 20 (NRB,c = 50) or40 (NRB,c = 100) |  |
| Active cell |  | None |  |
| Active SyncRef UE |  | SyncRef UE 1 | Transmitting SLSS+MIB-SL on uplink of RF channel number 1 |
| V2X sidelink communication preconfiguration |  | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel |  | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel |  | CD.1A HD | As specified in Table A.3.21.3-2 |
|  |  |  |  |
|  Note1,2 | dBm/30kHz | -95 |  |
| SyncRef UE 1 | sl-SSB-TimeAllocation |  | sl-SSB-TimeAllocation1 |  |
| slssid |  | 30 |  |
| inCoverage |  | TRUE | In MIB-SL |
| networkControlledSyncTx |  | ON |  |
| V2X sidelink communication configuration |  | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
|  |  | 3 |  |
| PSBCH-RSRP Note1, Note 2 | dBm/30kHz | -92 |  |
| Propagation condition |  | AWGN |  |
| Note 1: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 2: PSSSS Es/Noc and PSPSS Es/Noc are set the same as PSBCH Es/Noc.Note 3: The UE is only required to be tested in one of the supported test configurations. |

##### A.9.1.1.2.2 Test requirements

For parameters specified in Tables A.9.1.1.2.1-1, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.5. The timing accuracy is verified by using PSSCH transmissions.

#### A.9.1.1.3 Test for FR1 NR Cell as Synchronization Reference Source

##### A.9.1.1.3.1 Test Purpose and Environment

The purpose of this test is to verify the timing requirements for V2X sidelink transmissions specified in clause 12.2.3, when the downlink timing of the serving cell (RRC\_IDLE) or PCell (RRC\_CONNECTED) on a non-V2X sidelink carrier is used as timing reference. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X sidelink communication.

This test is applicable for V2X sidelink communication capable UEs that support NR Uu and sidelink operation.

Table A.9.1.1.3.1-1, A.9.1.1.3.1-2 and A.9.1.1.3.1-3 define test parameters for UE transmit timing accuracy tests for V2X sidelink Communication. There is one active cell (PCell) in this test. The transmit timing accuracy is verified by using the transmission timing of PSSCH transmissions.

Table A.9.1.1.3.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 |

Table A.9.1.1.3.1-2: V2X Sidelink Test Parameters for V2X UE Transmit Timing Accuracy Test for gNB as Timing Reference

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1 | TDD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 1 | MHz | 20 (NRB,c = 50) or40 (NRB,c = 100) |  |
| Active cell |  | Cell 1 |  |
| Active SyncRef UE |  | None |  |
| V2X sidelink communication configuration |  | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel |  | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel |  | CD.1A HD | As specified in Table A.3.21.3-2 |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |

Table A.9.1.1.3.1-3: Cell Test Parameters for V2X UE Transmit Timing Accuracy Test for gNB as Timing Reference

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 1 |
| RF Channel Number |  | 2 |
| Duplex Mode | Config 1 |  | FDD |
| Config 2,3 |  | TDD |
| TDD configuration | Config 1 |  | Not Applicable |
| Config 2 |  | TDDConf.1.1 |
| Config 3 |  | TDDConf.2.1 |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10: NRB,c = 52 |
| Config 3 | 40: NRB,c = 106  |
| Initial BWP Configuration |  | DLBWP.0.1ULBWP.0.1 |
| Dedicated BWP Configuration |  | DLBWP.1.1ULBWP.1.1 |
| DRX Cycle |  | N/A |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC Configuration |  | SMTC.2 |
| OCNG Patterns |  | OP.1 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS  |
| EPRE ratio of PDSCH to PDSCH  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
|  Note2 | Config 1,2,3 | dBm/15 kHz | -98 |
|  Note2 | Config 1,2 | dBm/SCS | -98 |
| Config 3 | -95 |
|  | dB | 3 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 |
| Config 3 | -92 |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.2 |
| Config 3 | dBm/38.1 MHz | -59.2 |
| Propagation Condition  |  | AWGN |
| Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

##### A.9.1.1.3.2 Test requirements

For parameters specified in Tables A.9.1.1.3.1-1 A.9.1.1.3.1-2 and A.9.1.1.3.1-3, the timing accuracy for V2X sidelink transmission shall be within the limits defined in clause 12.2.3. The timing accuracy is verified by using PSSCH transmissions.

### A.9.1.2 Test for Initiation/Cease of SLSS Transmission with V2X Sidelink Communication

#### A.9.1.2.1 Test for FR1 NR Cell as synchronization reference source without gap under non-DRX

##### A.9.1.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the V2X UE meets the requirements related to the maximum evaluation time allowed to initiate and cease SLSS transmissions defined in clause 12.3.1.1, when the reference timing used for sidelink transmissions is a NR serving cell in FR1 on a non-V2X sidelink carrier. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X sidelink communication.

This test is applicable for V2X sidelink communication capable UEs that support NR Uu and sidelink operation.

Supported test configurations for FR1 NR cell are shown in Table A.9.1.2.1.1-1.

**Table A.9.1.2.1.1-1: Supported Test Configurations for FR1 NR cell as synchronization reference source**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note 1: The UE is only required to pass in one of the supported test configurations in FR1.Note 2: For NR SL, SL BW is one between 20MHz and 40MHz, and SL SCS is 30kHz. |

The test parameters are given in Table A.9.1.2.1.1-2 and Table A.9.1.2.1.1-3 below. There is one active cell in this test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the SS-RSRP of the PCell is above *syncTxThreshIC* and the UE is not expected to be transmitting SLSS.

During T2, the SS-RSRP of the PCell is lowered below *syncTxThreshIC* and the UE is expected to initiate SLSS transmissions.

During T3, the SS-RSRP of the PCell is increased back to be above *syncTxThreshIC* and the UE is expected to cease SLSS transmissions.

Table A.9.1.2.1.1-2: Test Parameters for Initiation/Cease of SLSS Transmission Test for FR1 NR cell as synchronization reference source

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Active cell |  | Cell 1 | Serving cell on RF channel number 1 |
| Active SyncRef UE |  | None |  |
| Active V2X UE |  | V2X UE | Transmitting SLSS+MIB-SL on RF channel number 2(TDD carrier in Band n47 or n38) |
| V2X sidelink communication configuration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test |
| networkControlledSyncTx |  | Not configured |  |
| syncTxThreshIC | dBm/SCS | -110 | In SIB12 |
| DRX |  | OFF |  |
| T1 | s | 3 |  |
| T2 | s | 5.24 |  |
| T3 | s | 5.24 |  |

Table A.9.1.2.1.1-3: FR1 NR Cell Specific Test Parameters for Initiation/Cease of SLSS Transmission Test for FR1 NR cell as synchronization reference source

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell1 |
| T1 | T2 | T3 |
| NR RF Channel Number |  | 1 |
| Duplex Mode | Config 1 |  | FDD |
| Config 2,3 |  | TDD |
| TDD configuration | Config 1 |  | Not applicable |
| Config 2 | TDDConf.1.1 |
| Config 3 | TDDConf.2.1 |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10:NRB,c = 52 |
| Config 3 | 40:NRB,c = 106 |
| Initial BWP Configuration |  | DLBWP.0.1ULBWP.0.1 |
| Dedicated BWP Configuration |  | DLBWP.1.1ULBWP.1.1 |
| DRx Cycle | ms | N/A |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD |
| Config 2 | SR.1.1 TDD |
| Config 3 | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
| Config 2 | CR.1.1 TDD |
| Config 3 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD |
| Config 2 | CCR.1.1 TDD |
| Config 3 | CCR.2.1 TDD |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 |
| Config 3 | SSB.2 FR1 |
| SMTC Configuration | Config 1 |  | SMTC.2 |
| Config 2,3 | SMTC.1 |
| TRS configuration | Config 1 |  | TRS.1.1 FDD |
| Config 2 | TRS.1.1 TDD |
| Config 3 | TRS.1.2 TDD |
| OCNG Patterns |  | OP.1 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS  |
| EPRE ratio of PDSCH to PDSCH  |
| EPRE ratio of OCNG DMRS to SSS Note 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note2 | Config 1,2,3 | dBm/15 kHz | -110 |
| Config 1,2 | dBm /SCS | -110 |
| Config 3 | -107 |
|  | dB | 4.5 | -4.5 | 4.5 |
|  | dB | 4.5 | -4.5 | 4.5 |
| SS-RSRPNote3 | Config 1,2 | dBm /SCS | -105.5 | -114.5 | -105.5 |
| Config 3 | -102.5 | -111.5 | -102.5 |
| IoNote3 | Config 1,2 | dBm /9.36MHz | -76.2 | -80.7 | -76.2 |
| Config 3 | dBm/ 38.16MHz | -70.1 | -74.6 | -70.1 |
| Propagation condition |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. |

##### A.9.1.2.1.2 Test Requirements

The SLSS transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the SLSS transmission.

The SLSS transmission initiation delay shall be less than 0.56 s.

The SLSS transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the SLSS transmission.

The SLSS transmission cease delay shall be less than 0.56 s.

The rate of correct initiation/cease delay of SLSS transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of SLSS transmissions can be expressed as: Tevaluate,SLSS + SLSS period,

Where:

* Tevaluate,SLSS = 0.4 sec (as specified in clause 12.3.1.1);
* SLSS period = 160ms.

#### A.9.1.2.2 Test for SyncRef UE as synchronization reference source

##### A.9.1.2.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to the evaluation time allowed to initiate and cease SLSS transmissions defined in clause 12.3.1.4, when the reference timing used for sidelink transmissions is a SyncRef UE. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X sidelink communication.

The test parameters are given in Table A.9.1.2.2.1-1 and Table A.9.1.2.2.1-2 below. There are neither active cells nor GNSS signals in this test. There is one active SyncRef UE (SyncRef UE 1) in this test. The test system shall emulate SyncRef UE 1 to transmit SLSS and MIB-SL every synchronization period.

Prior to start of test, test system is required to ensure that the V2X UE is synchronized to the SyncRef UE 1 and is transmitting SLSS + MIB-SL as derived from the SLSS + MIB-SL of SyncRef UE 1 as per clause 5.8.5.3 of TS 38.331[2]. For the test configuration, the SLSSID used by the V2X UE shall be 30 with *inCoverage* IE in MIB-SL set as FALSE. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the PSBCH-RSRP of SyncRef UE 1 is above *syncTxThreshOOC* and the UE is not expected to be transmitting SLSS.

During T2, the PSBCH-RSRP of SyncRef UE 1 is lowered below *syncTxThreshOOC* and the UE is expected to initiate SLSS transmissions.

During T3, the PSBCH-RSRP of SyncRef UE 1 is increased back to be above *syncTxThreshOOC* and the UE is expected to cease SLSS transmissions.

Table A.9.1.2.2.1-1: Test Parameters for Initiation/Cease of SLSS Transmission Test for SyncRef UE as synchronization reference source

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Active cell |  | None |  |
| Active SyncRef UE |  | SyncRef UE 1 | Transmitting SLSS + MIB-SL on RF channel number 1(TDD carrier in Band n47 or n38) |
| Active V2X UE |  | V2X UE | Transmitting SLSS + MIB-SL on RF channel number 1(TDD carrier in Band n47 or n38) |
| V2X sidelink communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test |
| networkControlledSyncTx |  | Not configured |  |
| syncTxThreshOoC | dBm/30kHz | -97 |  |
| T1 | s | 3 |  |
| T2 | s | 5.24 |  |
| T3 | s | 5.24 |  |

Table A.9.1.2.2.1-2: SyncRef UE Specific Test Parameters for Initiation/Cease of SLSS Transmission Test for SyncRef UE as synchronization reference source

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell1 |
| T1 | T2 | T3 |
| NR RF Channel Number |  | 1 |
| V2X SL communication resource pool configuration |  | As specified in Table A.3.21.2-2 |
| Channel Bandwidth (BWchannel) Note3 | MHz | 20(NRB,c = 50) or 40(NRB,c = 100) |
| SLSSID |  | 30 |
| inCoverage  |  | FALSE |
| networkControlledSyncTx |  | ON |
| Note1 | dBm/30 kHz | -98 |
|  | dB | 5.5 | -3.5 | 5.5 |
| PSBCH | dB | 5.5 | -3.5 | 5.5 |
| PSBCH-RSRPNote2 | dBm/30 kHz | -92.5 | -101.5 | -92.5 |
| IoNote2 | dBm /3.96MHz | -70.2 | -75.2 | -70.2 |
| Propagation condition |  | AWGN |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: PSBCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io level is based on the allocated RBs for PSPSS/PSSSS/PSBCH symbols.Note 3: The UE is only required to be tested in one of the supported test configurations.Note 4: PSSSS Es/Noc and PSPSS Es/Noc are set the same as PSBCH Es/Noc. |

##### A.9.1.2.2.2 Test Requirements

The SLSS transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the SLSS transmission.

The SLSS transmission initiation delay shall be less than 0.8 s.

The SLSS transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the SLSS transmission.

The SLSS transmission cease delay shall be less than 0.8 s.

The rate of correct initiation/cease delay of SLSS transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of SLSS transmissions can be expressed as: Tevaluate,SLSS + SLSS period,

Where:

* Tevaluate,SLSS = 0.64 sec (as specified in clause 12.3.1.4);
* SLSS period = 160ms.

### A.9.1.3 Test for V2X Synchronization Reference Selection/Reselection

#### A.9.1.3.1 Test for GNSS configured as the highest priority

##### A.9.1.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 12.4, when GNSS is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.3.1.1-1and A.9.1.3.1.1-2 below. There are no GNSS signals in this test. There are three active SyncRef UEs (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3) in this test. The test system shall emulate SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 to transmit SLSS and MIB-SL every SLSS period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its SLSS+MIB-SL transmissions. When the V2X UE is not synchronized to any SyncRef UE, then the V2X UE shall use the SLSS ID pre-configured in the V2X UE. When the V2X UE is synchronized to a SyncRef UE, the V2X UE shall derive its SLSS ID from the SLSS ID of the SyncRef UE as per clause 5.8.5.3 of TS 38.331[2].

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 are all powered off before starting the test. During T1, SyncRef UE 1 is powered ON and the V2X UE will select SyncRef UE 1 as synchronization source. During T2, SyncRef UE 2 is powered ON and the V2X UE will select SyncRef UE 2 as the synchronization source. During T3, a higher priority SyncRef UE 3 is additionally powered ON and the V2X UE will reselect to the higher priority SyncRef UE 2 as the synchronization source.

**Table A.9.1.3.1.1-1:** **Test Parameters** **for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority**

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Initial condition | Active synchronization source |  | Sync Ref UE 1 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 30 and in-coverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 2 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 336 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 3 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL. |
| Active SyncRef UEs |  | SyncRef UE 1SyncRef UE 2SyncRef UE 3 | Transmitting SLSS+MIB-SL on RF channel number 1 (TDD carrier in Band n47 or n38) |
| Timing offset among SyncRef UEs | μs | CP/2 | Synchronous |
| Frequency offset of SyncRef UE 1 | ppm | 0 |  |
| Frequency offset of SyncRef UE 2 | ppm | 5 |  |
| Frequency offset of SyncRef UE 3 | ppm | 10 |  |
| V2X sidelink Communication configuration |  | As specified in Table A. 3.21.2-2 | IE values unless specified otherwise in this test. |
| typeTxSync |  | gnss |  |
| slssid |  | 30 |  |
| syncTxThreshIC |  | +infinity |  |
| T1 | s | 24 |  |
| T2 | s | 16 |  |
| T3 | s | 3.2 |  |

**Table A.9.1.3.1.1-2: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | SyncRef UE 2 | SyncRef UE 3 |
| T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number |  | 1(TDD carrier in Band n47 or n38) |
| SCS | kHz | 30 |
| Channel Bandwidth (BWchannel)Note 4 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.21.2-2 |
| networkControlledSyncTx |  | N/A | N/A | ON |
| syncTxThreshOoC | dBm/15 kHz | +infinity | +infinity | N/A |
| slssid |  | 30 | 336 | 0 |
| inCoverage (in MIB-SL) |  | TRUE | FALSE | FALSE |
|  Note1 | dBm/30 kHz | -95 |
|  | dB | 3 | 0 | 0 | -infinity | 0 | 0 | -infinity | -infinity | 3 |
|  | dB | 0 | -4.76 | -4.76 | -infinity | 0 | -4.76 | -infinity | -infinity | 0 |
| PSBCH-RSRPNote2, Note 3 | dBm/30 kHz | -92 | -95 | -95 | -infinity | -95 | -95 | -infinity | -infinity | -92 |
| Propagation Condition  |  | AWGN |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: PSSSS Es/Iot is set the same as PSPSS/PSBCH Es/Iot.Note 4: The UE is only required to be tested in one of the supported test configurations. |

##### A.9.1.3.1.2 Test Requirements

1) During T1, SyncRef UE reselection delay is defined as the time from the beginning of T1 to the time UE is synchronized to SyncRef UE 1, and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T1.

The SyncRef UE reselection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

 SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 sec (as specified in sub-clause 12.3)

- SLSS period = 160ms

This gives a total of 8.8 seconds.

2) During T2, SyncRef UE selection delay is defined as the time from the beginning of T2 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2 and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will be changed to 336 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T2.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

 SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 12.3)

- SLSS period = 160ms

This gives a total of 8.8seconds.

3) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 2 to SyncRef UE 3, and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 3 as the synchronization source. For the test configuration, the SLSS ID will still be 0 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T3.

The SyncRef UE reselection delay shall be less than 2.4sec. The SyncRef UE selection/reselection delay can be expressed as:

 SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 1.6sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 12.3)

- SLSS period = 160ms

This gives a total of 2.4seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and SLSS transmissions during the duration of T2, and does not drop or delay more than 30% of its SLSS transmissions during the duration of T3.

The rate of correct SyncRef UE selection / reselection observed during repeated tests shall be at least 90%.

#### A.9.1.3.2 Test for FR1 NR Cell configured as the highest priority

##### A.9.1.3.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 12.4, when gNB is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

This test is applicable for V2X sidelink communication capable UEs that support NR Uu and sidelink operation.

Supported test configurations for FR1 NR cell are shown in Table A.9.1.3.2.1-1.

**Table A. 9.1.3.2.1-1: Supported Test Configurations for FR1 NR cell**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 |

The test parameters are given in Table A.9.1.3.2.1-2and A.9.1.3.2.1-3 below. There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B. 4.1. There are two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2) in this test. The test system shall emulate SyncRef UE 1 and SyncRef UE 2 to transmit SLSS and MIB-SL every SLSS period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its SLSS+MIB-SL transmissions. When the V2X UE is not synchronized to any SyncRef UE, then the V2X UE shall use the SLSS ID pre-configured in the V2X UE. When the V2X UE is synchronized to a SyncRef UE, the V2X UE shall derive its SLSS ID from the SLSS ID of the SyncRef UE as per clause 5.8.5.3 of TS 38.331[2].

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. During T1, both SyncRef UE 1 and SyncRef UE 2 are powered off and the V2X UE will select GNSS as synchronization source. During T2, SyncRef UE 1 is powered ON and the V2X UE will select SyncRef UE 1 as the synchronization source. During T3, a higher priority SyncRef UE 2 is additionally powered ON and the V2X UE will reselect to the higher priority SyncRef UE 2 as the synchronization source.

**Table A.9.1.3.2.1-2: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for FR1 NR Cell configured as the highest priority**

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Initial condition | Active synchronization source |  | GNSS | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 0 and in-coverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 1 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 336+59 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 2 | UE transmits for V2X Sidelink Communication and SLSS+MIB-SL with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL. |
| Active cell |  | None |  |
| Active SyncRef UEs |  | SyncRef UE 1SyncRef UE 2 | Transmitting SLSS+MIB-SL on RF channel number 1 |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 | ms | 3 | Asynchronous |
| Frequency offset of SyncRef UE 1 | ppm | 0 |  |
| Frequency offset of SyncRef UE 2 | ppm | 5 |  |
| V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| syncPriority |  | *gnb* |  |
| syncTxThreshOoC |  | 13 (+infinity) |  |
| T1 | s | 24 |  |
| T2 | s | 16 |  |
| T3 | s | 16 |  |

**Table A.9.1.3.2.1-3: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for FR1 NR Cell configured as the highest priority**

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | SyncRef UE 1 | SyncRef UE 2 |
| T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number |  | 1(TDD carrier in Band n47 or n38) |
| SCS | kHz | 30 |
| Channel Bandwidth (BWchannel) Note 4 | MHz | 20(NRB,c = 50) or 40(NRB,c = 100) |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.21.2-2 | As specified in Table A.3.21.2-2 |
| networkControlledSyncTx |  | N/A | ON |
| syncTxThreshOoC | dBm/15 kHz | +infinity | N/A |
| slssid  |  | 336+59 | 30 |
| inCoverage (in MIB-SL) |  | FALSE | TRUE |
|  Note1 | dBm/30 kHz | -95 |
|  | dB | -infinity | 0 | 0 | -infinity | -infinity | 3 |
|  | dB | -infinity | 0 | -4.76 | -infinity | -infinity | 0 |
| PSBCH-RSRP Note2, Note 3 | dBm/30 kHz | -infinity | -95 | -95 | -infinity | -infinity | -92 |
| Propagation Condition  |  | AWGN |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: PSSSS Es/Iot is set the same as PSPSS/PSBCH Es/Iot.Note 4: The UE is only required to be tested in one of the supported test configurations. |

##### A.9.1.3.2.2 Test Requirements

1) During T2, SyncRef UE selection delay is defined as the time from the beginning of T2 to the time UE is synchronized to SyncRef UE 1 and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 336+59 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T2.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

 SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64sec (as specified in sub-clause 12.3)

- SLSS period = 160ms

This gives a total of 8.8 seconds.

2) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2, and changes its SLSS transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will be changed to 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T3.

The SyncRef UE reselection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

 SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + SLSS period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 sec (as specified in sub-clause 12.3)

- SLSS period = 160ms

This gives a total of 8.8 seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and SLSS transmissions during the duration of T2 and T3.

The rate of correct SyncRef UE selection / reselection observed during repeated tests shall be at least 90%.

### A.9.1.4 Test for L1 SL-RSRP Measurement

#### A.9.1.4.1 Test for V2X UE Autonomous Resource Selection/Reselection

##### A.9.1.4.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource selection / reselection for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.4.1.1-1and A. 9.1.4.1.1-2 below. There are 50 active V2X sidelink UEs (UE0~UE49) in this test. Both the UE under test and active V2X sidelink UEs select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test parameters for GNSS signals are defined in B.4.1. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH every 5ms. At the beginning of whole test, the test equipment shall send one message with a SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test needs continuously transmit PSCCH/PSSCH.

The test consists of two duration T1 and T2. During T1, the signal from Test Equipement are configured such that

- the measured PSSCH-RSRP for 10 active V2X sidelink UEs(UE20~UE29) is above the measurement threshold, and the resource occupied by the 10 active V2X sidelink UEs is expected to be excluded in the resource selection procedure and,

- the measured PSSCH-RSRP for other 40 active V2X sidelink UEs(UE0~UE19, UE30~UE49) is low the measurement threshold, and the resource occupied by the 40 active V2X sidelink UEs is expected to be included in the resource selection procedure.

During T2, the signal from Test Equipement are configured such that

- the measured PSSCH-RSRP for the 10 active V2X sidelink UEs(UE20~UE29) is below the measurement threshold, and the resource occupied by the 10 active V2X sidelink UEs is expected to be included in the resource selection procedure and,

- the measured PSSCH-RSRP for other 40 active V2X sidelink UEs(UE0~UE19, UE30~UE49) is above the measurement threshold, and the resource occupied by the 40 active V2X sidelink UEs is expected to be excluded in the resource selection procedure.

Table A. 9.1.4.1.1-1: Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | TDD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 2 | MHz | 20 (NRB,c = 50) or40 (NRB,c = 100) |  |
| SCS | kHz | 30 |  |
| V2X sidelink communication pre-configuration |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | 1111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 5 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Number of Active Sidelink UEs |  | 50 | Active Sidelink UE i = 0, .., 49 |
| *SL-ThresPSSCH-RSRP* |  | 12 | Corresponding -106 dBm as defined in Section 6.3.5 in TS38.331[2] |
| Active Sidelink UEs (UE i = 0, .., 49) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-1And A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool |  | floor(i/10)x10 | Indicates the lowest RB index of the subchannel with the lowest index.UE 0~9 start RB=0;UE 10~19 start RB=10;UE 20~29 start RB=20;UE 30~39 start RB=30;UE 40~49 start RB=40; |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Timing offset among Active Sidelink UEs | μs | CP/2 | Synchronous |
| Note 1: {1i}is a sequence of nine 0’s with one 1 in (mod(i,10 )+1’th position.Note 2: The UE is only required to be tested in one of the supported test configurations. |

Table A. 9.1.4.1.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Active Sidelink UE i(i = 0, .., 49) |
| T1 | T2 |
| NR RF Channel Number | - | 1 |
| Channel Bandwidth (BWchannel)Note 5 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) |
| SCS | kHz | 30 |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD  |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD |
|  Note1 | dBm/30 kHz | -111 | -121 |
|  Note3 | dB | 10 |
|  Note2,3 | dB | 10 |
|  Note4  | dB | 0 | 20 |
|  Note2,4 | dB | 0 | 20 |
| PSSCH-RSRP1 Note 2,3 | dBm/30kHz | -101 | -111 |
| PSSCH -RSRP2 Note 2,4 | dBm/30kHz | -111 | -101 |
| SL-RSSI1 Note 2,3 | dBm/3.6 MHz | -79.79 | -89.79 |
| SL-RSSI2 Note 2,4 | dBm/3.6 MHz | -87.20 | -80.17 |
| Antenna Configuration | - | 1x2 |
| Propagation Condition | - | AWGN |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: Es/Iot, PSSCH-RSRP and SL-RSSI levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: For UE 20 to 29, occupying subchannel #2Note 4: For UE 0 to 19 and 30 to 49, occupying subchannel #0/1/3/4Note 5: The UE is only required to be tested in one of the supported test configurations. |

##### A.9.1.4.1.2 Test Requirements

The test time T1 and T2 should be long enough. The rate of PSSCH transmissions on the resources on subchannel #2 shall be less than 10% during T1. The rate of PSSCH transmissions on the resources on subchannel #2 shall be more than 90% during T2.

#### A. 9.1.4.2 Test for V2X UE Resource Pre-emption

##### A. 9.1.4.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource pre-emption for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A. 9.1.4.2.1-1and A.12. 9.1.4.1-2 below. There is one active V2X sidelink UE in this test. Both the UE under test and the active V2X sidelink UE select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test parameters for GNSS signals are defined in B.4.1. At the beginning of whole test, the test equipment shall send one message with a SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test needs continuously transmit PSCCH/PSSCH.

The test consists of two duration T1 and T2. During T1, the signal from Test Equipement are configured such that the active V2X sidelink UE is not transmitting. The UE under test shall transmit SL data and reserve future resources. The resource reservation is decoded by the active V2X sidelink UE. The point in time at which resource reservation from the UE under test is decoded by the active V2X sidelink UE defines the start of time period T2. During T2, the active V2X sidelink UE reserves the same resource as the UE under test with high priority data no later than slot n- Tpre-empt.

Table A. 9.1.4.2.1-1: Test Parameters for V2X UE Resource Pre-emption Tests for PSSCH-RSRP measurements

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | TDD carrier in Band n47 and n38 |
| Channel Bandwidth (BWchannel) Note 1 | MHz | 20 (NRB,c = 50) or40 (NRB,c = 100) |  |
| V2X sidelink communication pre-configuration |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool in SL-ResourcePool in sl-TxPoolSelectedNormal-r16 |  | 10000000000000000000 | Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [3]) Note that this is for Tx pool. |
| sl-TimeResource-r16 included in SL-ResourcePool in sl-RxPool-r16 |  | 11111111111111111111 | Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [3]) Note that this is for Rx pool. |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of subchannels in the corresponding resource pool, which consists of contiguous PRBs only |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool |  | 10 | Indicates the lowest RB index of the subchannel with the lowest index. |
| Number of Active Sidelink UEs |  | 1 |  |
| *SL-ThresPSSCH-RSRP* |  | 12 | Corresponding -106 dBm as defined in Section 6.3.8 in TS38.331[2] |
| Active Sidelink UEs | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | 11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool |  | 10 | Indicates the lowest RB index of the subchannel with the lowest index. |
| Sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Timing offset among Active Sidelink Ues | μs | CP/2 | Synchronous |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |

Table A.9.1.4.2.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Resource Pre-emption Tests for PSSCH-RSRP measurements

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Active Sidelink UE |
| T1 | T2 |
| NR RF Channel Number | - | 1 |
| Channel Bandwidth (BWchannel) Note 3 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) |
| SCS | kHz | 30 |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD  |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD |
|  Note1 | dBm/30 kHz | N/A | -100 |
| PSCCH  | dB | 5 |
| PSSCH  | dB | 5 |
| PSCCH  Note2 | dB | 5 |
| PSSCH  Note2 | dB | 5 |
| PSSCH-RSRP Note 2 | dBm/30kHz | -95 |
| Antenna Configuration | - | 1x2 |
| Propagation Condition | - | AWGN |
| Note 1: Interference from other Ues and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: Es/Iot, PSSCH-RSRP have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: The UE is only required to be tested in one of the supported test configurations. |

##### A.9.1.4.2.2 Test Requirements

The test time T1 and T2 should be long enough. The UE under test is required to trigger resource reselection and not to transmit on the reserved resource at slot n when the high priority reservation is transmitted by the active V2X sidelink UE before n-Tpre-empt, where

Tpre-empt = T3+Tproc,0

T3 = 2ms and Tproc,0= 1 slot for FR1.

The rate of PSSCH transmissions on the resources at slot n shall be less than 10% during repeated tests.

#### A.9.1.4.3 Test for V2X UE Resource Re-evaluation

##### A.9.1.4.3.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource re-evaluation for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.4.3.1-1, A.9.1.4.3.1-2 and A.9.1.4.3.1-3 below. There are 130 active V2X sidelink Ues in this test. The first 100 active V2X sidelink Ues are scheduled with 50ms periodicity. The last 30 active V2X sidelink Ues are aperiodic service UE with retransmission reservation period equaling 15ms.

Both the UE under test and active V2X sidelink Ues select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink Ues. The test parameters for GNSS signals are defined in B.4.1.

The test consists of three duration T0, T1, T2.

During T0, the signal from Test Equipement are configured. The resource occupied by the active V2X sidelink UEs is expected to be excluded in the resource selection procedure such that the measured PSSCH-RSRP is above the measurement threshold. The test equipment shall just configure the resource pool for the test UE without the MAC PDU for transmission channel configuration.

During T1, the signal from Test Equipement are configured. Some of the resource occupied by the active V2X sidelink Ues is expected to be excluded in the resource selection procedure such that the measured PSSCH-RSRP is above the measurement threshold and some of the resource occupied by the active V2X sidelink Ues is expected to be included in the resource selection procedure such that the measured PSSCH-RSRP is below the measurement threshold. The test system shall emulate the active V2X sidelink Ues to transmit PSCCH/PSSCH every 50ms according to the RSRP level specified in the Table A. 9.1.4.3.1-2, but UE #0~29 will be silent during T2.

At the end of T1, where slot index mod 100 = 99, the test equipment shall send one message with a SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test shall be scheduled to periodically transmit PSCCH/PSSCH.

During T2, the additional aperiodic active V2X sidelink UEs from Test Equipement are configured in the beginning 30 slots, and the resource occupied by these active V2X sidelink UEs is expected to be excluded in the resource re-evaluation procedure such that the measured PSSCH-RSRP is above the measurement threshold shown in Table A. 9.1.4.3.1-2. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH with the maximum number of reserved PSCCH/PSSCH resources equalling n2 and time resource assignment interval as 15ms.

During T2, the test UE is expeted to reselect the resources and transmit the PSCCH/PSSCH in the newly re-evaluated resources.

Table A.9.1.4.3.1-1: Test Parameters for V2X UE Resource Selection Tests for Re-evaluation

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | TDD carrier in Band n47 and n38 |
| Channel Bandwidth (BWchannel) Note 2 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) |  |
| SCS | kHz | 30 |  |
| V2X sidelink communication pre-configuration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | 1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 |  |
| sl-StartRB-Subchannel-r16 |  | 0 |  |
| Number of Active Sidelink UEs |  | 130 | Active Sidelink UE i = 0, .., 129 |
| SL-ThresPSSCH-RSRP-r16 |  | 17 | Corresponding -96 dBm as defined in Section 6.3.5 in TS38.331[2] |
| Active Sidelink UEs(UE i=0-99) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the size of sub-channels for TX resource pool |
| sl-ResourceReservePeriod2-r16 |  | 50 | Unit:ms |
| Active Sidelink UEs(UE i= 100-129) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize included in SL-ResourcePool |  | 10 | Indicates the size of sub-channels for TX resource pool |
| sl-MultiReserveResource-r16 |  | enabled |  |
| sl-MaxNumPerReserve-r16 |  | n2 |  |
| sl-ResourceReservePeriod2-r16 |  | 0 | Unit:ms |
| Timing offset among Active Sidelink UEs | μs | CP/2 | Synchronous |
| T0 | s | 1 |  |
| T1 | ms | 50 |  |
| T2 | ms | 50 |  |
| Note 1: {1i} is a sequence of ninety-nine 0’s with one 1 in (mod(i,100)+1)’th position.Note 2: The UE is only required to be tested in one of the supported test configurations. |

Table A.9.1.4.3.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Resource Selection Tests for Re-evaluation (UE #0...99)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Active Sidelink UE i(i = 0, .., 99) |
| T1 | T2 |
| NR RF Channel Number | - | 1 |
| Channel Bandwidth (BWchannel) Note 7 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) |
| SCS | kHz | 30 |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD  |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD |
|  Note1 | dBm/SCS | -103 |
| PSSCH1  Note 3  | dB | 22 | 22 |
| PSSCH2  Note 4 | dB | 2 | 2 |
| PSSCH3  Note 5 | dB | 12 | -infinity |
| PSSCH4  Note 6 | dB | 12 | 12 |
| PSSCH1  Note2,3 | dB | 22 | 22 |
| PSSCH2  Note2,4 | dB | 2 | 2 |
| PSSCH3  Note2,5 | dB | 12 | -infinity |
| PSSCH4  Note2,6 | dB | 12 | 12 |
| PSSCH -RSRP1 Note 2, 3  | dBm/SCS | -81 | -81 |
| PSSCH -RSRP2 Note 2, 4 | dBm/SCS | -101 | -101 |
| PSSCH -RSRP3 Note 2, 5 | dBm/SCS | -91 | -infinity |
| PSSCH -RSRP4 Note 2, 6 | dBm/SCS | -91 | -91 |
| Antenna Configuration | - | 1x2 |
| Propagation Condition | - | AWGN |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: , PSSCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: UE #50~64 and UE #85~99 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #50-64 and #85-99.Note 4: UE #30~49 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #30-49.Note 5: UE #0~29 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #0-29.Note 6: UE #65~84 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #65-84.Note 7: The UE is only required to be tested in one of the supported configurations. |

Table A.9.1.4.3.1-3: Active Sidelink UE Specific Test Parameters for V2X UE Resource Selection Tests for Re-evaluation (UE #100…129)

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Active Sidelink UE i(i = 100, .., 129) |
| T1 | T2 |
| NR RF Channel Number | - | 1 |
| Channel Bandwidth (BWchannel) Note 4 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) |
| SCS | kHz | 30 |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD  |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1 A HD |
|  Note1 | dBm/SCS | -103 |
| PSSCH  | dB | -infinity | 22 |
| PSSCH  Note2 | dB | -infinity | 22 |
| PSSCH-RSRP Note 2, Note 3 | dBm/SCS | -infinity | -81 |
| Antenna Configuration | - | 1x2 |
| Propagation Condition | - | AWGN |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: Es/Iot, PSSCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: UE #100~129 will occupy the subchannels on the slots with “#slot index mod 100”= #0-29 during T2.Note 4: The UE is only required to be tested in one of the supported configurations. |

##### A.9.1.4.3.2 Test Requirements

The rate of PSSCH transmissions on the resources of the subchannels which are occupied by UE #65-84 shall be more than 90% during T2.

### A.9.1.5 Test for Congestion Control Measurement

#### A.9.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the V2X UE makes correct reporting of an event. This test will verify the congestion control measurement requirements in section 12.6.

This test is applicable for V2X sidelink communication capable UEs that support NR Uu and sidelink operation.

The test parameters are given in Table A.9.1.5.1-1, Table A.9.1.5.1-2 and A.9.1.5.1-3 below. In the measurement control information it is indicated to the V2X UE that event-triggered reporting with Event C1 is used. There are 4 active V2X sidelink UEs in this test. The test system shall emulate the active sidelink UE to transmit PSCCH/PSSCH every 50ms. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During T1, all of active V2X sidelink UEs are configured to transmit PSCCH/PSSCH with lower transmission power every 50ms. During T2, all of active V2X sidelink UEs are configured to transmit PSCCH/PSSCH with higher transmission power every 50ms.

 Supported test configurations for FR1 NR cell are shown in Table A.9.1.5.1.1-1.

**Table A.9.1.5.1.1-1: Supported Test Configurations for FR1 NR cell**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 |

Table A.9.1.5.1-2: General test parameters for Congestion Control Measurement Test for V2X UE

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | TDD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel)Note 2  | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) |  |
| SCS | kHz | 30 |  |
| V2X sidelink communication configuration |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool  |  | 1111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | ENUMERATED {n1} |
| sl-SubchannelSize included in SL-ResourcePool |  | 10 | ENUMERATED {n10} |
| sl-StartRB-Subchannel-r16 |  | 0 |  |
| *threshS-RSSI-CBR* |  | 19 | Corresponding -74dBm as defined in Section 6.3.8 in TS38.331[2] |
| Number of Active Sidelink UEs every 50ms |  | 4 | Active Sidelink UE i, where i = 0, 1, 2, 3 |
| Active Sidelink UEs (i = 0,1,2,3) | V2X sidelink Communication configuration |  | As specified in Table A.3.21.2-1and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 |  |
| sl-SubchannelSize included in SL-ResourcePool |  | 10 |  |
| Timing offset between V2X UE and Active Sidelink UEs | μs | CP/2 | Synchronous |
| c1-Threshold-r16 |  | 2 | Corresponding 0.02 as defined in Section 6.3.2 in TS38.331[2] |
| Hysteresis |  | 0 |  |
| Time To Trigger | s | 0 |  |
| Filter coefficient |  | 0 | L3 filtering is not used |
| T1 | s | 5 |  |
| T2 | s | 5 |  |
| Note 1: {1i}is a sequence of ninety nine 0’s with one 1 in i+1’th position.Note 2: The UE is only required to be tested in one of the channel bandwidths. |

Table A.9.1.5.1-3: Active sidelink UE specific test parameters for Congestion Control Measurement Test for V2X UE

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Active Sidelink UE *i* (*i* = 0, 1, 2, 3) |
| T1 | T2 |
| NR RF Channel Number |  | 1 |
| Channel Bandwidth (BWchannel) Note 7 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) |
| SCS | kHz | 30 |
| PSCCH RMC (defined in A.3.21.3) |  | CC.1A HD |
| PSSCH RMC (defined in A.3.21.3) |  | CD.1A HD |
|  Note1 | dBm/30 kHz | -103 |
|  | dB | 4.35 | 10.32 |
| PSSCH-RSRP Note 2 | dBm/30 kHz | -98.65 | -92.68 |
| SL-RSSI1 Note 2,3 | dBm/3.6 MHz | -76.5 | -71.5 |
| SL-RSSI2 Note 2,4 | dBm/3.6 MHz | -82.21 | -82.21 |
| Io1 Note 2,5 | dBm/3.6 MHz | -76.5 | -71.5 |
| Io2 Note 2,6 | dBm/3.6 MHz | -82.21 | -82.21 |
| Propagation Condition  | - | AWGN |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: PSSCH Es/Noc, PSSCH-RSRP, SL-RSSI1, SL-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: SL-RSSI1 is the SL-RSSI level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.Note 4: SL-RSSI2 is the SL-RSSI level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.Note 5: Io1 is the Io level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.Note 6: Io2 is the Io level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.Note 7: The UE is only required to be tested in one of the supported test configurations. |

#### A.9.1.5.2 Test Requirements

The UE shall not send event C1 triggered measurement reports during T1 and shall send event C1 triggered measurement reports during T2.

The rate of correct events observed during repeated tests shall be at least 98%.

### A.9.1.6 Test for Interruption

#### A.9.1.6.1 Test for Interruption to WAN due to V2X Sidelink Communication

##### A.9.1.6.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to interruptions due to V2X sidelink communication defined in clause 12.7.1 under the following additional conditions:

- The UE is out of coverage on the V2X sidelink carrier and is associated with a serving cell on a non-V2X sidelink carrier

This test is applicable for V2X sidelink communication capable UEs that support inter-band concurrent V2X sidelink operation.

For this test, the UE is triggered by the test loop function or the upper layers to monitor V2X sidelink communication.

The test parameters are given in Table A.9.1.6.1.1-1, Table A.9.1.6.1.1-2, Table A.9.1.6.1.1-3 and Table A.9.1.6.1.1-4. The test consists of one active cell (PCell) on the serving RF channel 1, and there are no active cells on RF channel 2. On RF channel 2, the test consists of 8 active Sidelink UEs in this test transmitting V2X sidelink communication.

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the UE is in RRC\_IDLE and monitoring the V2X sidelink communication transmission from other active Sidelink UEs on the V2X sidelink communication resources.

During T2, the test system establishes a RRC connection with the UE. No PDSCH traffic is scheduled for UE, and the UE is expected to transmit *SidelinkUEInformationNR* indicating *sl-RxInterestedFreqList*. On reception of *SidelinkUEInformationNR*, thetest system shall send RRC reconfiguration message to the UE and wait for the UE to respond with RRC reconfiguration complete message before transitioning to T3. If the UE does not transmit *SidelinkUEInformationNR* for up to 2 second, the test system shall transition to T3.

During T3, the UE is scheduled with PDSCH traffic on PCell downlink. The test system will count the missed ACK/NACKs during T3 to verify the allowed interruptions during V2X sidelink communication (no missed ACK/NACKs are allowed).

Table A.9.1.6.1.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 |

Table A.9.1.6.1.1-2: Test Parameters for Interruptions due to V2X Sidelink Communication

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number | - | 1, 2 | RF channel 1 is non-V2X sidelink carrierRF channel 2 is V2X sidelink carrier |
| Active cell | - | Cell 1 | PCell on RF channel number 1 |
| CP length of Cell 1 | - | Normal |  |
| T1 | s | 5.12 |  |
| T2 | s | Up to receiving RRC reconfiguration setup complete from the UE, or up to 2 second if UE does not transmit *SidelinkUEInformationNR* during this period. |  |
| T3 | s | 10 |  |

Table A.9.1.6.1.1-3: Slidelink Communication Configuration for Interruptions due to V2X Sidelink Communication

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number | - | 2 | TDD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 1 | MHz  | 20 (NRB,c = 50) or40 (NRB,c = 100) |  |
| SCS | kHz | 30 |  |
| V2X sidelink Communication configuration | - | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| Number of Active Sidelink UEs | - | 8 | Active Sidelink UE i = 0, .., 7 |
| Active Sidelink UEs (UE i = 0, .., 7) | V2X sidelink Communication configuration | - | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel | - | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel | - | CD.1A HD | As specified in Table A.3.21.3-2 |
| sl-NumSubchannel-r16 included in SL-ResourcePool | - | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool | - | i | Indicates the lowest RB index of the subchannel with the lowest index for active Sidelink UE i = 0, .., 7. |
| PSBCH-RSRP | dBm/30kHz | -95 |  |
| Note 1: The UE is only required to be tested in one of the supported test configurations. |

Table A.9.1.6.1.1-4: Cell specific test parameters for interruptions due to V2X slidelink communication

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 1 |
| T1 | T2 | T3 |
| RF Channel Number |  | 1 |
| UE RRC state |  | IDLE | CONNECTED |
| Duplex Mode | Config 1 |  | FDD |
| Config 2,3 |  | TDD |
| TDD configuration | Config 1 |  | Not Applicable |
| Config 2 |  | TDDConf.1.1 |
| Config 3 |  | TDDConf.2.1 |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10: NRB,c = 52 |
| Config 3 | 40: NRB,c = 106 |
| Initial BWP Configuration |  | DLBWP.0.1ULBWP.0.1 |
| Dedicated BWP Configuration |  | DLBWP.1.1ULBWP.1.1 |
| DRX Cycle |  | N/A |
| PDSCH Reference measurement channel | Config 1 |  | N/A | None | SR.1.1 FDD |
| Config 2 |  | N/A | None | SR.1.1 TDD |
| Config 3 |  | N/A | None | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC Configuration |  | SMTC.2 |
| OCNG Patterns |  | OP.1 |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS  |
| EPRE ratio of PDSCH to PDSCH  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
|  Note2 | Config 1,2,3 | dBm/15 kHz | -98 |
|  Note2 | Config 1,2 | dBm/SCS | -98 |
| Config 3 | -95 |
|  | dB | 3 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 |
| Config 3 | -92 |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.3 |
| Config 3 | dBm/38.1 MHz | -59.2 |
| Antenna Configuration |  | 1x2 |
| Propagation Condition  |  | AWGN |
| Note 1: OCNG shall be used such that cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

##### A.9.1.6.1.2 Test Requirements

The UE shall be continuously scheduled on PCell on RF channel 1 during T3. During T3, 100% of all expected ACK/NACKs shall be transmitted by the V2X UE.

< END OF CHANGE #3 >

< START OF CHANGE #4 >

# B.4 Conditions for V2X

## B.4.1 Test parameters for GNSS signals

This clause defines the reference signal power levels of generated salellites for a corresponding GNSS, which will be used in V2X test cases.

Table B.4.1-1: GNSS Referenece Signal Power Parameters

| System | Parameters | Unit | Value |
| --- | --- | --- | --- |
|  | Number of generated satellites per system | - | 6 |
| GPS(1) | Reference signal power level for all satellites | dBm | -128.5 |
| Galileo | Reference signal power level for all satellites | dBm | -127 |
| GLONASS | Reference signal power level for all satellites | dBm | -131 |
| BDS | Reference signal power level for all satellites | dBm | -133 |
| NOTE 1: "GPS" here means GPS L1 C/A, Modernized GPS, or both, dependent on UE capabilities.NOTE 2: The DUT UE does not need to support all systems. The DUT UE shall support at least one system and will be test for the supported systems. |

## B.4.2 Conditions for PSBCH-RSRP Accuracy Requirements

This clause defines the following conditions for PSBCH-RSRP measurement accuracy requirements applicable for a corresponding operating band.

The conditions are defined in Table B.4.2-1 for FR1.

Table B.4.2-1: Conditions for PSBCH-RSRP measurements in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | NR V2X operating band groups Note1 | Minimum S-SSB\_RP | S-SSB Ês/Iot |
| dBm/SCSS-SSB | dB |
| SCSS-SSB = 15kHz | SCSS-SSB = 30kHz | SCSS-SSB = 60kHz |
| NR\_TDD\_FR1\_B | -126.5 | -123.5 | -120.5 | ≥ -6 |
| NR\_TDD\_FR1\_J | -122.5 | -119.5 | -116.5 |
| NOTE 1: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands. |

## B.4.3 Conditions for Selection/Reselection to Intra-frequency SyncRef UE

This clause defines the S-SSB\_RP and S-SSB Ês/Iot applicable for a corresponding operating band.

The conditions for selection/reselection to intra-frequency SyncRef UE are defined in Table B.4.3-1 for FR1.

Table B.4.3-1: V2X synchronization measurements in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | NR V2X operating band groups Note1 | Minimum S-SSB\_RP | S-SSB Ês/Iot |
| dBm/SCSS-SSB | dB |
| SCSS-SSB = 15kHz | SCSS-SSB = 30kHz | SCSS-SSB = 60kHz |
| NR\_TDD\_FR1\_B | -120.5 | -117.5 | -114.5 | ≥ 0 |
| NR\_TDD\_FR1\_J | -116.5 | -113.5 | -110.5 | ≥ 0 |
| NOTE 1: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands. |

## B.4.4 Conditions for L1 SL-RSRP Accuracy Requirements

This clause defines the following condtions for L1 SL-RSRP measurement accuracy requirements applicable for a corresponding operating band.

The conditions are defined in Table B.4.4-1 for FR1.

Table B.4.4-1: Conditions for L1 SL-RSRP measurements in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | NR V2X operating band groups Note1 | Minimum L1 SL-RSRP | Ês/Iot |
| dBm/SCS | dB |
| SCS= 15kHz | SCS= 30kHz | SCS = 60kHz |
| NR\_TDD\_FR1\_B | -120.5 | -117.5 | -114.5 | ≥ 0 |
| NR\_TDD\_FR1\_J | -116.5 | -113.5 | -110.5 |
| NOTE 1: NR V2X operating band groups are as defined in Section 3.5 for the corresponding NR operating bands.NOTE 2: The parameter Ês/Iot is the Ês/Iot of PSCCH-DMRS and/or PSSCH-DMRS.NOTE 3: The SCS is for PSCCH and/or PSSCH. |

< END OF CHANGE #4 >