**3GPP TSG-RAN WG4 Meeting #97-e *R4-2017108***

**Electronic Meeting, 2-13 Nov., 2020**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** |  | **Rev** | **1** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | RRM test cases for NR V2X Synchronization Reference Selection/Reselection | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Xiaomi | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_V2X\_NRSL-Pref | | | | |  | ***Date:*** | | | 2020-10-23 |
|  |  | | | |  | |  | | |  |
| ***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 can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Add the Rel-16 NR V2X Synchronization Reference Selection/Reselection test case | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | NR V2X Synchronization Reference Selection/Reselection test case | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The V2X Synchronization Reference Selection/Reselection test case for Rel-16 NR V2X not be added. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.9.1.3 (New) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS38.521-3 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |

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| --- | --- |
| ***This CR's revision history:*** |  |

## **--------------Start of change-------------**

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

### 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.

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 1  SyncRef UE 2  SyncRef UE 3 | Transmitting SLSS+MIB-SL on RF channel number 1 (TDD carrier in Band n47 or n38) |
| Timing offset among SyncRef UEs | | μs | 1.5 | 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. 3.19.2-2 | 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 n47 or n38) | | | | | | | | |
| SCS | kHz | 30 | | | | | | | | |
| BWchannelNote 4 | MHz | 20 or 40 | | | | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.19.2-2 | | | | | | | | |
| 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 in TS 38.133)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 12.3 in TS 38.133)

- 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 in TS 38.133)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 12.3 in TS 38.133)

- 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.6.1. 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.

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 1  SyncRef 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.3.19.2-2 | 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 n47 or n38) | | | | | |
| SCS | kHz | 30 | | | | | |
| BWchannel Note 4 | MHz | 20 or 40 | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.19.2-2 | | | As specified in Table A.3.19.2-2 | | |
| 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. | | | | | | | |

#### 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%.

## **-------------End of change-------------**