**3GPP TSG- RAN4 Meeting #111R4-2410362**

**Fukuoka City, Fukuoka, Japan, 20th – 24th May, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **DraftCR** | **rev** | **1** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *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 | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Draft CR on test cases for performance accuracy for multi-Rx | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | vivo | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_FR2\_multiRX\_DL-Perf | | | | |  | ***Date:*** | | | 2024-5-23 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories 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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | In the RAN4#111 meeting, it was agreed to introduce test case to verify L1-RSRP accuracy requirements for multi-Rx. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Added test cases for verifying L1-RSRP performance accuracy requirements for multi-Rx. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The L1-RSRP accuracy for simultaneous reception from different directions cannot be guaranteed. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.7.7.X | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change #1>

### A.7.7.X L1-RSRP measurement for group-based beam reporting

#### A.7.7.X.1 SSB based L1-RSRP measurement

##### A.7.7.X.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy for group-based beam reporting is within the specified limits. This test will verify the requirements in clauses 9.5.2 and clause 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.7.7.X.1.1-1.

The AoA setup for this test is Setup X1 as defined in clause A.3.15.X1.

Table A.7.7.X.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

##### A.7.7.X.1.2 Test parameters

In this set of test cases there is one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.X.1.2-1 and Table A.7.7.X.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements is tested by using the parameters in Table A.7.7.X.1.2-1 and Table A.7.7.X.1.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured two CSI resource sets with one SSB resource in each set. UE is configured to perform RLM, BFD measurement based on the SSB resources 0 and UE is configured to perform group-based L1-RSRP measurement based on the SSB resources 0 and 1.

Table A.7.7.X.1.2-1: FR2 SSB based L1-RSRP general test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | Test 2 |
| SSB GSCN | 1, 2 |  | freq1 | freq1 |
| Duplex mode | 1, 2 |  | TDD | TDD |
| TDD Configuration | 1, 2 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1, 2 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Data RBs allocated | 1, 2 |  | 66 | 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.2 TDD | SR.3.2 TDD |
| 2 | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | CR.3.1 TDD |
| 2 | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| 2 | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 | SSB.1 FR2 |
|  | 2 |  | SSB.2 FR2 | SSB.2 FR2 |
| OCNG Patterns | 1, 2 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1, 2 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1, 2 |  | DLBWP.1.3  ULBWP.1.3 | DLBWP.1.3  ULBWP.1.3 |
| TRS Configuration | 1, 2 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1, 2 |  | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1, 2 |  | SMTC.1 | SMTC.1 |
| reportConfigType | 1, 2 |  | periodic | periodic |
| reportQuantity | 1, 2 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1, 2 |  | 2 | 2 |
| L1-RSRP reporting period | 1, 2 |  | slot320 | slot320 |
| Propagation condition | 1, 2 |  | AWGN | AWGN |
| Antenna configuration | 1, 2 |  | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1, 2 | dB | 0 | 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 DMRS |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |
| 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. | | | | |

Table A.7.7.X.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|  |  |  | SSB0 | SSB1 | SSB0 | SSB1 |
| Angle of arrival configuration |  |  | Setup X1 according to A.3.15.X1 | | Setup X1 according to A.3.15.X1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | | Rough | |
|  | 1~2 | dBm/15kHz | -100 | | n.a. | |
|  | 1 | dBm/SSB SCS | -91 | | n.a. | |
|  | 2 |  | -88 | | n.a. | |
|  | 1~2 | dB | 10 | -2 | n.a. | |
| SSB\_RPNote1 | 1 | dBm/SCS | -81 | -93 | As in Table B.2.4-2 | |
|  | 2 |  | -78 | -90 | As in Table B.2.4-2 | |
| IoNote1 | 1~2 | dBm/  95.04MHz | -51.57 | | SSB\_RP+28.98 | |
|  | 1~2 | dB | 10 | -2 | n.a. | |
| Note 1: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Void  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.7.7.X.1.3 Test Requirements

After 320ms from the beginning of the test, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 1 shall fulfil the requirements in clauses 10.1.20.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB0 and SSB1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.X.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.1.2-1.

For Test 2:

Absolute accuracy of SSB resource reported by UE in L1-RSRP report (SSB0 or SSB1). The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.X.1.3-1.

Relative accuracy of SSB0 compared with SSB1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.1.2-1.

Table A.7.7.X.1.3-1: L1-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| SSB0 | SSB\_RP0 - δ+ Gmin ≤ Reported RSRP (dBm) ≤ SSB\_RP0 + δ+ Gmax |
| SSB1 | SSB\_RP1 - δ+ Gmin ≤ Reported RSRP (dBm) ≤ SSB\_RP1 + δ+ Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.20.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

#### A.7.7.X.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

##### A.7.7.X.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy for group-based beam reporting is within the specified limits. This test will verify the requirements in clauses 9.5.3 and clause 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.7.7.X.2.1-1.

The AoA setup for this test is Setup X1 as defined in clause A.3.15.X1.

Table A.7.7.X.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

##### A.7.7.X.2.2 Test parameters

In this set of test cases there is one cell in the test, PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.7.7.X.2.2-1 and Table A.7.7.X.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements is tested by using the parameters in Table A.7.7.X.2.2-1 and Table A.7.7.X.2.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured two CSI resource sets with one CSI-RS resource in each set. UE is configured to perform RLM and BFD based on SSB 0 and 1 and UE is configured to perform group-based L1-RSRP measurement based on the CSI resources. CSI-RS resources are not transmitted in the same OFDM symbols as SSB.

Table A.7.7.X.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | Test 2 |
| SSB GSCN | 1 |  | freq1 | freq1 |
| Duplex mode | 1 |  | TDD | TDD |
| TDD Configuration | 1 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1 |  | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1 |  | SSB.1 FR2 | SSB.1 FR2 |
| OCNG Patterns | 1 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| TRS Configuration | 1 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1 |  | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1 |  | SMTC.1 | SMTC.1 |
| CSI-RS resource sets | 1 |  | TBD | TBD |
| reportConfigType | 1 |  | periodic | periodic |
| reportQuantity | 1 |  | cri-RSRP | cri-RSRP |
| Number of reported RS | 1 |  | 2 | 2 |
| L1-RSRP reporting period | 1 |  | slot80 | slot80 |
| Propagation condition | 1 |  | AWGN | AWGN |
| Antenna configuration | 1 |  | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1 | dB | 0 | 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 DMRS |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |
| 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. | | | | |

Table A.7.7.X.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
|  |  |  | CSI-RS0 | CSI-RS1 | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration |  |  | Setup X1 according to A.3.15.X1 | | Setup X1 according to A.3.15.X1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | | Rough | |
|  | 1~2 | dBm/15kHz | -100 | | n.a. | |
|  | 1~2 | dBm/SSB SCS | -91 | | n.a.  n.a. | |
|  | 1~2 | dB | 10 | -2 | n.a. | |
| CSI-RS-RSRPNote1 | 1~2 | dBm/SCS | -81 | -93 | As in Table B.2.4-2 | |
| IoNote1 | 1~2 | dBm/  95.04MHz | -59.86 | | SS-RSRP+28.98 | |
|  | 1~2 | dB | -51.57 | -2 | n.a. | |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.7.7.X.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 1 shall fulfil the requirements in clause 10.1.20.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0 and CSI-RS1. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.X.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

For Test 2:

Absolute accuracy of CSI-RS resource reported by UE in L1-RSRP report (CSI-RS0 or CSI-RS1). The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.7.7.X.2.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-RSRP meets the requirements in Table 10.1.20.2.2-1.

Table A.7.7.X.2.3-1: L1-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3 |
| CSI-RS0 | CSI-RS \_RP0 - δ+ Gmin ≤ Reported RSRP(dBm) ≤CSI-RS \_RP0 + δ+ Gmax |
| CSI-RS1 | CSI-RS \_RP1 - δ+ Gmin ≤ Reported RSRP(dBm) ≤CSI-RS \_RP1 + δ+ Gmax |
| Note 1: CSI-RS\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.20.2.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

<End of Change #1>