**3GPP TSG- RAN4 Meeting #** **105 *R4-2219405***

**Toulouse, France, November 14 – November 18, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **2747** | **rev** | **1** | **Current version:** | **15.19.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Correction on Aperiodic CSI-RS RMCs and RLM in-sync test cases for R15 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Perf | | | | |  | ***Date:*** | | | 2022-11-06 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-15 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. In Radio Link Monitoring In-sync Test, T310 shall be larger than (T3+T4+IS evaluation period), T6>T310-T3-T4+OOS evaluation period+40ms, and T5>T6. However there are some errors in the current tests. 2. In aperiodic CSI-RS based L1-RSRP TCs UE is expect to perform aperiodic CSI reporting based on aperiodic CSI-RS resource. In test parameters we have:    1. reportSlotOffsetList = 8 (i.e. the reporting offset = 8 slots), UE is expected to sent CSI report 8 slot in slot n+8 when it receives DCI triggering CSI reporting in slot n.    2. aperiodic CSI-RS RMC CSI-RS.1.3 FDD/CSI-RS.1.3 TDD/CSI-RS.2.3 TDD are used in test. For these CSI-RS RMCs aperiodicTriggeringOffset = 4 (i.e. CSI triggering offset = 4 slots) according to 38.533 Annex.A.1.2. Then the TE is expected to start transmit CSI-RS resources from slot n+4, which is also described in the test procedure.     However, according to 38.214 the CSI-RS triggering offset is fixed to be 0 slot if the aperiodic CSI-RS resources are not type-D QCLed to some RSs.    According to 38.533 QCL type D is only configured for FR2 TCI-state RMC. As a result, the correct CSI-triggering offset in 4.6.4.3 should be fixed to 0 slot. TE starting transmitting CSI-RS from slot n+4 may fail conformant UEs.    We suggest allow config QCL type D for FR1 RRM tests and config SSB as L1-RSRP RS in 4.6.4.3/4 and 6.6.4.3/4. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. In Radio Link Monitoring In-sync Tests, to ensure T310 >(T3+T4+IS evaluation period), T6>T310-T3-T4+OOS evaluation period+40ms, and T5>T6, T310, T5 and T6 are revised in A6.5.1.8 In-sync test,   where IS evaluation period=1.5\*10\*40=600ms;  T310>T3+T4+IS evaluation=1.24+0.2+0.6=2.04s, according to T310 timer in TS38.331, T310 shall be set 4000ms;  T6>4000-1240-200+ 1200(OOS evaluation period)+40=3800ms;  T5>T6, so T5 is set 4s.   1. It’s allowed to configure QCL type D for FR1 RRM tests. Furthermore, SSB is configured as L1-RSRP RS in 4.6.4.3/4 and 6.6.4.3/4. QCL type C+D is configured | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Conformant UE may fail the test | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.3.16, A.4.6.4.3, A.4.6.4.4, A.6.5.1.8, A.6.6.4.3, A.6.6.4.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **x** |  | Test specifications | | | | TS38.533 | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change 1>

### A.3.16.2 TCI states

**Table A.3.16.2-1: TCI States**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **TCI.State.0** | **TCI.State.1** | **TCI.State.2** | **TCI.State.3** |
| tci-StateId | Id0 | Id1 | Id2 | Id3 |
| qcl-Type1 | typeC | typeC | typeA | typeA |
| qcl-Type2Note1 | typeD | typeD | typeD | typeD |
| referenceSignal | SSB0 | SSB1 | Resource #4 in TRS resource set 1 Note3 | Resource #4 in TRS resource set 2 Note3 |
| Note 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2 unless otherwise mentioned.  Note 2: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner.  Note 3: Reference TRS resource sets are defined in A.3.17, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. | | | | |

<End of Change 1>

<Start of Change 2>

#### A.4.6.4.3 CSI-RS based L1-RSRP measurement when DRX is not used

##### A.4.6.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.4.6.4.3.1-1.

Table A.4.6.4.3.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.4.6.4.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.3.2-1 and Table A.4.6.4.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2,4,5 and 8 for Config 3,6) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.4.6.4.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.4.6.4.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-RS configuration | 1,4 |  | CSI-RS 1.3 FDD |
| 2,5 | CSI-RS 1.3 TDD |
| 3,6 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DRX configuration | 1~6 |  | Off |
| reportConfigType | 1~6 |  | aperiodic |
| reportQuantity | 1~6 |  | cri-RSRP  ssb-Index-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| qcl-Info | 1~6 |  | QCL type C+D to SSB#0 for resource#0 |
| QCL type C+D to SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 8 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | 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. | | | |

Table A.4.6.4.3.2-2: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
| Note1 | 1~6 | dBm/15kHz | -94.65 | |
| Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| 3,6 | -91.65 | |
|  | 1~6 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.65 |
| 3,6 | -91.65 | -88.65 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~6 | dB | 0 | 3 |
| 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: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.4.6.4.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.4.6.4.4 CSI-RS based L1-RSRP measurement when DRX is used

##### A.4.6.4.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.4.6.4.4.1-1.

Table A.4.6.4.4.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.4.6.4.4.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.4.2-1 and Table A.4.6.4.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2,4,5 and 8 for Config 3,6) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.4.6.4.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.4.6.4.4.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-RS configuration | 1,4 |  | CSI-RS 1.3 FDD |
| 2,5 | CSI-RS 1.3 TDD |
| 3,6 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | aperiodic |
| reportQuantity | 1~6 |  | cri-RSRP  ssb-Index-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| qcl-Info | 1~6 |  | QCL type C+D to SSB#0 for resource#0 |
| QCL type C+D to SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 8 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | 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. | | | |

Table A.4.6.4.4.2-2: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Note1 | 1~6 | dBm/15kHz | -94.65 | |
| Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| 3,6 | -91.65 | |
|  | 1~6 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.65 |
| 3,6 | -91.65 | -88.65 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~6 | dB | 0 | 3 |
| 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: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.4.6.4.4.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

<End of Change 2>

<Start of Change 3>

#### A.6.5.1.8 Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode

##### A.6.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.6.5.1.8.1-1, A.6.5.1.81-2, A.6.5.1.8.1-3 and A.6.5.1.8.1-3A below. There is one cells, cell 1which is the PCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.1.8.1-1 shows the variation of the downlink SNR in the PCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test. In the test, SSB0 is configured as the BFD-RS.

Table A.6.5.1.8.1-1: Supported test configurations for FR1 PSCell

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

Table A.6.5.1.8.1-2: General test parameters for FR1 PCell for CSI-RS in-sync testing in non-DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Value |
|  | |  | Test 1 |
| Active PCell | |  | Cell 1 |
| 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 |
| DL initial BWP configuration | Config 1, 2, 3 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3 |  | ULBWP.1.1 |
| RMSI 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 |  | SSB.1 FR1 |
|  | Config 2 |  | SSB.1 FR1 |
|  | Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 |  | SMTC.1 |
|  | Config 3 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 |  | 15 kHz |
|  | Config 3 | 30 kHz |
| TRS configuration | Config 1 |  | TRS.1.1 FDD |
|  | Config 2 |  | TRS.1.1 TDD |
|  | Config 3 |  | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1 |  | Resource #4 in TRS.1.1 FDD |
|  | Config 2 |  | Resource #4 in TRS.1.1 TDD |
|  | Config 3 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State. 2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| In sync transmission parameters | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level | CCE | 4 |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
|  | DMRS precoder granularity |  | REG bundle size |
|  | REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | gp0 |
| Layer 3 filtering | |  | Enabled |
| T310 timer | | ms | 4000 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 FDD |
|  | Config 2 |  | CSI-RS.1.1 TDD |
|  | Config 3 |  | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.24 |
| T4 | | s | 0.2 |
| T5 | | s | 4 |
| T6 | | s | 3.8 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | |

Table A.6.5.1.8.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSSPDCCH\_beta | | dB | 4 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH\_DMRS\_beta | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH\_beta | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS\_beta | | dB |  | | | | |
| EPRE ratio of PSS to SSSSSS\_beta | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH\_beta | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1 | dB | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 2 |  | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 3 |  | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 1 | dBm/15kHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 3 |  | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.6.5.1.8.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1. | | | | | | | |

Table A.6.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
| Value |
| gapOffset | 0 |
| Note 1: Void | |

Table A.6.5.1.8.1-4: Void

Table A.6.5.1.8.1-5: Void

Table A.6.5.1.8.1-6: Void

****

Figure A.6.5.1.8.1-1: SNR variation for CSI-RS in-sync testing

##### A.6.5.1.8.2 Test Requirements

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90%.

<End of Change 3>

<Start of Change 4>

#### A.6.6.4.3 CSI-RS based L1-RSRP measurement when DRX is not used

##### A.6.6.4.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.6.6.4.3.1-1.

Table A.6.6.4.3.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.6.6.4.3.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.3.2-1 and Table A.6.6.4.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.4.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.6.6.4.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~3 |  | freq1 |
| Duplex mode | 1 |  | FDD |
| 2 | TDD |
| 3 | TDD |
| TDD Configuration | 1 |  | N/A |
| 2 | TDDConf.1.1 |
| 3 | TDDConf.2.1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 |
| 2 | 10: NRB,c = 52 |
| 3 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR1 |
| 2 | SSB.3 FR1 |
| 3 | SSB.4 FR1 |
| CSI-RS configuration | 1 |  | CSI-RS 1.3 FDD |
| 2 | CSI-RS 1.3 TDD |
| 3 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~3 |  | OP.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD |
| 2 |  | TRS.1.1 TDD |
| 3 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 |
| DRX configuration | 1~3 |  | Off |
| reportConfigType | 1~3 |  | aperiodic |
| reportQuantity | 1~3 |  | cri-RSRP  ssb-Index-RSRP |
| Number of reported RS | 1~3 |  | 2 |
| qcl-Info | 1~3 |  | QCL type C+D to SSB#0 for resource#0 |
| QCL type C+D to SSB#1 for resource#1 |
| reportSlotOffsetList | 1~3 | slots | 8 |
| T1 | 1~3 | s | 5 |
| EPRE ratio of PSS to SSS | 1~3 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~3 |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.6.6.4.3.2-2: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
| Note1 | 1~3 | dBm/15kHz | -94.65 | |
| Note1 | 1,2 | dBm/SSB SCS | -94.65 | |
| 3 | -91.65 | |
|  | 1~3 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2 | dBm/SSB SCS | -94.65 | -91.65 |
| 3 | -91.65 | -88.65 |
| Io Note2 | 1,2 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~3 | dB | 0 | 3 |
| 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: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.6.6.4.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

#### A.6.6.4.4 CSI-RS based L1-RSRP measurement when DRX is used

##### A.6.6.4.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement. This test will partly verify the L1-RSRP measurement requirements in clause 9.5.4.2, with the testing configurations for NR cells in Table A.6.6.4.4.1-1.

Table A.6.6.4.4.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.6.6.4.4.2 Test parameters

There is one cells in the test, the FR1 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.6.6.4.4.2-1 and Table A.6.6.4.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 80ms from the beginning of the test, the DCI trigger comes in slot n (0 for Config 1,2 and 8 for Config 3) of a frame and UE provides the report back based on the reporting configuration as defined in Table A.6.6.4.4.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs.

Table A.6.6.4.4.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~3 |  | freq1 |
| Duplex mode | 1 |  | FDD |
| 2 | TDD |
| 3 | TDD |
| TDD Configuration | 1 |  | N/A |
| 2 | TDDConf.1.1 |
| 3 | TDDConf.2.1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 |
| 2 | 10: NRB,c = 52 |
| 3 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| SSB configuration | 1 |  | SSB.3 FR1 |
| 2 | SSB.3 FR1 |
| 3 | SSB.4 FR1 |
| CSI-RS configuration | 1 |  | CSI-RS 1.3 FDD |
| 2 | CSI-RS 1.3 TDD |
| 3 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~3 |  | OP.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD |
| 2 |  | TRS.1.1 TDD |
| 3 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 |
| DRX configuration | 1~3 |  | DRX.3 |
| reportConfigType | 1~3 |  | aperiodic |
| reportQuantity | 1~3 |  | cri-RSRP  ssb-Index-RSRP |
| Number of reported RS | 1~3 |  | 2 |
| qcl-Info | 1~3 |  | QCL type C+D to SSB#0 for resource#0 |
| QCL type C+D to SSB#1 for resource#1 |
| reportSlotOffsetList | 1~3 | slots | 8 |
| T1 | 1~3 | s | 5 |
| EPRE ratio of PSS to SSS | 1~3 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~3 |  | AWGN |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.6.6.4.4.2-2: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
| Note1 | 1~3 | dBm/15kHz | -94.65 | |
| Note1 | 1,2 | dBm/SSB SCS | -94.65 | |
| 3 | -91.65 | |
|  | 1~3 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2 | dBm/SSB SCS | -94.65 | -91.65 |
| 3 | -91.65 | -88.65 |
| Io Note2 | 1,2 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~3 | dB | 0 | 3 |
| 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: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.6.6.4.4.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.20.1.1 and relative accuracy requirement in clause 10.1.20.1.2.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

<End of Change 4>