**3GPP TSG-RAN4 Meeting # 98bis-e *R4-2105724***

**Electronic Meeting, 12th April 2021 - 20th April 2021**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **draftCR** | **rev** | 1 | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | Draft CR: Update of beam management test cases for NR-U | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_unlic-Perf | | | | |  | ***Date:*** | | | 2021-04-19 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Many parameters are in [].  CCA probability parameters are TBD.  Time durations are TBD. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Remove [].  Set CCA probability parameters  Set time duration parameters.  Remove configurations 2, 3, 5 and 6 from L1-RSRP repoting for EN-DC case because in the cases with NR-U PSCC, there is no other NR cell will be without CCA. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Cannot perform beam failure recovery tests for NR-U. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.9.3.3, A.10.3.4, A.10.4.3, A.11.4.4, A.11.5.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | Revised from R4-2106875; all the CCA probablities to TBD | | | | | | | | |

----------------------------------------------------- Beginning of Change ------------------------------------------------------------

### A.9.3.3 L1-RSRP measurements for beam reporting

#### A.9.3.3.1 SSB based L1-RSRP measurement when DRX is not used

##### A.9.3.3.1.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.9.3.3.1.1-1.

Table A.9.3.3.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  With CCA: 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.9.3.3.1.2 Test parameters

There are two cells in the tests, FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 and Cell 2 are given in Table A.9.3.3.1.2-1 and Table A.9.3.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.9.3.3.1.2-1: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Value |  |
|  |  |  | Cell 1 | Cell 2 |
| Active PCell/SCell Configuration |  |  | PCell | SCell |
| RF Channel Number |  |  | 1 | 2 |
| DL CCA model | 1~3 |  | N/A | As specifieed in A.3.20.2.1 |
| UL CCA model | 1~3 |  | N/A | As specified in A.3.20.2.2 |
| Duplex mode | 1 |  | FDD | TDD |
|  | 2 |  | TDD |  |
|  | 3 |  | TDD |  |
| TDD Configuration | 1 |  | N/A | TDDConf.1.1 CCA |
|  | 2 |  | TDDConf.1.1 |  |
|  | 3 |  | TDDConf.2.1 |  |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | 40: NRB,c = 106 |
|  | 2 |  | 10: NRB,c = 52 |  |
|  | 3 |  | 40: NRB,c = 106 |  |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | SR.1.1 CCA |
|  | 2 |  | SR.1.1 TDD |  |
|  | 3 |  | SR.2.1 TDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | CR.1.1 CCA |
|  | 2 |  | CR.1.1 TDD |  |
|  | 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | CCR.1.1 CCA |
|  | 2 |  | CCR.1.1 TDD |  |
|  | 3 |  | CCR.2.1 TDD |  |
| SSB configuration | 1 |  | SSB.3 FR1 | SSB.3 CCA |
|  | 2 |  | SSB.3 FR1 |  |
|  | 3 |  | SSB.4 FR1 |  |
| OCNG Patterns | 1~3 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 | N/A |
| DBT Window Configuration | 1~3 |  | N/A | DBT.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD | TRS.1.2 TDD |
|  | 2 |  | TRS.1.1 TDD |  |
|  | 3 |  | TRS.1.2 TDD |  |
| DRX configuration | 1~3 |  | Off | Off |
| reportConfigType | 1~3 |  | periodic | periodic |
| reportQuantity | 1~3 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1~3 |  | 2 | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 | 80 |
| T1 | 1~3 | s | 5 | 5 |
| T2 | 1~3 | s | 1 | 1 |
| EPRE ratio of PSS to SSS | 1~3 | 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 |  |  |  |  |
| Propagation condition | 1~3 |  | AWGN | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | | |

Table A.9.9.3.1.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1,2,3 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1,2,3 |  | TBD | TBD | TBD | TBD |
| Note2 | 1,2,3 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2,3 | dBm/SSB SCS | -91.65 | | | |
|  | 1,2,3 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2,3 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2,3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1,2,3 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.9.3.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

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

#### A.9.3.3.2 SSB based L1-RSRP measurement when DRX is used

##### A.9.3.3.2.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.9.3.3.1.1-1.

Table A.9.3.3.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | Without CCA 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  With CCA: 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.9.3.3.2.2 Test parameters

There are two cells in the tests, FR1 Pcell (Cell 1) and FR1 Scell (Cell 2). Cell 2 operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 and Cell 2 are given in Table A.9.3.3.2.2-1 and Table A.9.3.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.9.3.3.2.2-1: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Value |  |
|  |  |  | Cell 1 | Cell 2 |
| Active Pcell/Scell Configuration |  |  | Pcell | Scell |
| RF Channel Number |  |  | 1 | 2 |
| DL CCA model | 1~3 |  | N/A | As specifieed in A.3.20.2.1 |
| UL CCA model | 1~3 |  | N/A | As specified in A.3.20.2.2 |
| Duplex mode | 1 |  | FDD | TDD |
|  | 2 |  | TDD |  |
|  | 3 |  | TDD |  |
| TDD Configuration | 1 |  | N/A | TDDConf.1.1 CCA |
|  | 2 |  | TDDConf.1.1 |  |
|  | 3 |  | TDDConf.2.1 |  |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | 40: NRB,c = 106 |
|  | 2 |  | 10: NRB,c = 52 |  |
|  | 3 |  | 40: NRB,c = 106 |  |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | SR.1.1 CCA |
|  | 2 |  | SR.1.1 TDD |  |
|  | 3 |  | SR.2.1 TDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | CR.1.1 CCA |
|  | 2 |  | CR.1.1 TDD |  |
|  | 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | CCR.1.1 CCA |
|  | 2 |  | CCR.1.1 TDD |  |
|  | 3 |  | CCR.2.1 TDD |  |
| SSB configuration | 1 |  | SSB.3 FR1 | SSB.3 CCA |
|  | 2 |  | SSB.3 FR1 |  |
|  | 3 |  | SSB.4 FR1 |  |
| OCNG Patterns | 1~3 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~3 |  | SMTC.1 | N/A |
| DBT Window Configuration | 1~3 |  | N/A | DBT.1 |
| TRS Configuration | 1 |  | TRS.1.1 FDD | TRS.1.2 TDD |
|  | 2 |  | TRS.1.1 TDD |  |
|  | 3 |  | TRS.1.2 TDD |  |
| DRX configuration | 1~3 |  | DRX.3 | DRX.3 |
| reportConfigType | 1~3 |  | periodic | periodic |
| reportQuantity | 1~3 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1~3 |  | 2 | 2 |
| L1-RSRP reporting period | 1~3 | slot | 80 | 80 |
| T1 | 1~3 | s | 5 | 5 |
| T2 | 1~3 | s | 1 | 1 |
| EPRE ratio of PSS to SSS | 1~3 | 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 |  |  |  |  |
| Propagation condition | 1~3 |  | AWGN | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | | |

Table A.9.9.3.2.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1,2,3 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1,2,3 |  | TBD | TBD | TBD | TBD |
| Note2 | 1,2,3 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2,3 | dBm/SSB SCS | -91.65 | | | |
|  | 1,2,3 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2,3 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2,3 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1,2,3 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.9.3.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

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

------------------------------------------------- Unchanged sections omitted --------------------------------------------------------

A.10.3.4 Beam failure detection and link recovery procedures

A.10.3.4.1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

A.10.3.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5A.

The test parameters are given in Tables A.10.3.4.1.1-1, A.10.3.4.1.1-2, A.10.3.4.1.1-3 and A.10.3.4.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.10.3.4.1.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q0 in the active PSCell to emulate SSB based beam failure. Figure A.10.3.4.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1.

**Table A.10.3.4.1.1-1: Supported test configurations for FR1 PSCell with CCA**

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

**Table A.10.3.4.1.1-2: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | | **Unit** | **Value** |  | **Comment** |
|  | | | | |  | **Test 1** | **Test 2** |  |
| Active E-UTRA PCell | | | | |  | Cell 1 | Cell 1 |  |
| E-UTRA RF Channel Number | | | | |  | 1 | 1 |  |
| Active PSCell | | | | |  | Cell 2 | Cell 2 |  |
| RF Channel Number | | | | |  | 2 | 2 |  |
| DL CCA model | | | | |  | As specifieed in A.3.20.2.1 | As specifieed in A.3.20.2.1 |  |
| UL CCA model | | | | |  | As specified in A.3.20.2.2 | As specified in A.3.20.2.2 |  |
| Duplex mode | | | | Config 1, 2 |  | TDD | TDD |  |
| BWchannel | | | | Config 1, 2 | MHz | 40: NRB,c = 106 | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | | | Config 1, 2 |  | DLBWP.0.1 | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | | | Config 1, 2 |  | DLBWP.1.1 | DLBWP.1.1 |  |
| UL initial BWP configuration | | | | Config 1, 2 |  | ULBWP.0.1 | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | | | Config 1, 2 |  | ULBWP.1.1 | ULBWP.1.1 |  |
| TDD configuration | | | | Config 1, 2 |  | TDDConf.1.1 CCA | TDDConf.1.1 CCA |  |
| CORESET Reference Channel | | | | Config 1, 2 |  | CR.1.1 CCA | CR.1.1 CCA |  |
| SSB Configuration | | | | Config 1, 2 |  | SSB.3 CCA | SSB.3 CCA |  |
| DBT Window Configuration | | | | Config 1, 2 |  | DBT.1 | DBT.1 |  |
| PDSCH/PDCCH subcarrier spacing | | | | Config 1, 2 |  | 30 KHz | 30 KHz |  |
| PRACH Configuration | | | | Config 1, 2 |  | Table A.3.8.2.2-1 | Table A.3.8.2.2-1 |  |
| SSB Index assigned as BFD RS (q0) | | | | |  | 0 | 0 |  |
| SSB Index assigned as CBD RS (q1) | | | | |  | 1 | 1 |  |
| OCNG parameters | | | | |  | OP.1 | OP.1 |  |
| CP length | | | | |  | Normal | Normal |  |
| Correlation Matrix and Antenna Configuration | | | | |  | 2x2 Low | 2x2 Low |  |
| Beam failure | | DCI format | | |  | 1-0 | 1-0 |  |
| detection transmission parameters | | Number of Control OFDM symbols | | |  | 2 | 2 |  |
|  | | Aggregation level | | | CCE | 8 | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 | 0 |  |
|  | | DMRS precoder granularity | | |  | REG bundle size | REG bundle size |  |
|  | | REG bundle size | | |  | 6 | 6 |  |
| DRX | | | | |  | OFF | OFF |  |
| Gap pattern ID | | | | |  | gp0 | gp0 |  |
| gapOffset | | | | |  | 0 | 0 |  |
| rlmInSyncOutOfSyncThreshold | | | | |  | absent | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1, 2 | | | | dBm/SCS kHz | -95 | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | | | |  | db0 | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | | |  | n1 | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | | | |  | pbfd4 | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | | Config 1, 2 | |  | CSI-RS.2.1 TDD | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking | | | Config 1, 2 | |  | TRS.1.2 TDD | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS | | | | |  | 0,1 | 0,1 |  |
| T310 timer | | | | | ms | [1000] | [1000] |  |
| N310 | | | | |  | [2] | [2] |  |
| T1 | | | | | s | [0.2] | [0.2] | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | | s | [0.85] | [0.93] |  |
| T3 | | | | | s | [0.44] | [0.52] |  |
| T4 | | | | | s | [0] | [0] |  |
| T5 | | | | | s | [0.45] | [0.45] |  |
| D1 | | | | | s | [0.41] | [0.41] |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts.  Note 3: E-UTRAN is in non-DRX mode under test. | | | | | | | | |

**Table A.10.3.4.1.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | | | |
|  | | |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| DL CCA probability PCCA,DL | Note 10, 12 | |  | TBD | TBD | TBD | TBD | TBD |
|  | Note 11, 12 | |  | TBD | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA,UL | | |  | TBD | TBD | TBD | TBD | TBD |
| EPRE ratio of PDCCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 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\_SSB of set q0 | | Config 1, 2 | dB | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | | Config 1, 2 | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | | Config 1, 2 | dBm/SCS kHz | -105 | -105 | -85 | -85 | -85 |
|  | | Config 1, 2 | dBm/15 KHz | -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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.  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 transmitted SSS REs during DBT window.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  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 modified as specified in clause [A.3.6A].  Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | |

**Table A.10.3.4.1.1-4: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 2** | | | | |
|  | | |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| DL CCA probability PCCA.DL | | Note 10, 12 |  | TBD | TBD | TBD | TBD | TBD |
|  | | Note 11, 12 |  | TBD | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA.UL | | |  | TBD | TBD | TBD | TBD | TBD |
| EPRE ratio of PDCCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 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\_SSB of set q0 | Config 1, 2 | | dB | 5 | [-1] | [-7] | [-7] | [-7] |
| SNR\_SSB of set q1 | Config 1, 2 | | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1, 2 | | dBm/SCS kHz | -105 | -105 | -85 | -85 | -85 |
|  | Config 1, 2 | | dBm/15 KHz | -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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.  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 transmitted SSS REs during DBT window.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  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 modified as specified in clause [A.3.6A].  Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | |

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**Figure A.10.3.4.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

A.10.3.4.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = [410] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

In Test 1, the UE is verified to meet the beam failure detection for BFD-RS SSB Es/Iot < -7 dB.

In Test 2, the UE is verified to meet the beam failure detection for BFD-RS SSB Es/Iot ≥ -7 dB.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

A.10.3.4.2 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in DRX mode

A.10.3.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the PSCell, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5A.

The test parameters are given in Tables A.10.3.4.2.1-1, A.10.3.4.2.1-2, A.4.5.5.2.1-3 and A.10.3.4.2.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell which operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.10.3.4.2.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the SSB in set q0 in the active PSCell to emulate SSB based beam failure. Figure A.10.3.4.2.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. The UE transmits the reporting according to UL CCA model. In the test, DRX configuration is enabled in PSCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

**Table A.10.3.4.2.1-1: Supported test configurations for FR1 PSCell with CCA**

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

**Table A.10.3.4.2.1-2: General test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | | **Unit** | **Value** |  | **Comment** |
|  | | | | |  | **Test 1** | **Test 2** |  |
| Active E-UTRA PCell | | | | |  | Cell 1 | Cell 1 |  |
| E-UTRA RF Channel Number | | | | |  | 1 | 1 |  |
| Active PSCell | | | | |  | Cell 2 | Cell 2 |  |
| RF Channel Number | | | | |  | 2 | 2 |  |
| DL CCA model | | | | |  | As specifieed in A.3.20.2.1 | As specifieed in A.3.20.2.1 |  |
| UL CCA model | | | | |  | As specified in A.3.20.2.2 | As specified in A.3.20.2.2 |  |
| Duplex mode | | | | Config 1, 2 |  | TDD | TDD |  |
| BWchannel | | | | Config 1, 2 | MHz | 40: NRB,c = 106 | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | | | Config 1, 2 |  | DLBWP.0.1 | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | | | Config 1, 2 |  | DLBWP.1.1 | DLBWP.1.1 |  |
| UL initial BWP configuration | | | | Config 1, 2 |  | ULBWP.0.1 | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | | | Config 1, 2 |  | ULBWP.1.1 | ULBWP.1.1 |  |
| TDD configuration | | | | Config 1, 2 |  | TDDConf.1.1 CCA | TDDConf.1.1 CCA |  |
| CORESET Reference Channel | | | | Config 1, 2 |  | CR.1.1 CCA | CR.1.1 CCA |  |
| SSB Configuration | | | | Config 1, 2 |  | SSB.3 CCA | SSB.3 CCA |  |
| DBT Window Configuration | | | | Config 1, 2 |  | DBT.1 | DBT.1 |  |
| PDSCH/PDCCH subcarrier spacing | | | | Config 1, 2 |  | 30 KHz | 30 KHz |  |
| PRACH Configuration | | | | Config 1, 2 |  | Table A.3.8.2.2-1 | Table A.3.8.2.2-1 |  |
| SSB Index assigned as BFD RS (q0) | | | | |  | 0 | 0 |  |
| SSB Index assigned as CBD RS (q1) | | | | |  | 1 | 1 |  |
| OCNG parameters | | | | |  | OP.1 | OP.1 |  |
| CP length | | | | |  | Normal | Normal |  |
| Correlation Matrix and Antenna Configuration | | | | |  | 2x2 Low | 2x2 Low |  |
| Beam failure | | DCI format | | |  | 1-0 | 1-0 |  |
| detection transmission parameters | | Number of Control OFDM symbols | | |  | 2 | 2 |  |
|  | | Aggregation level | | | CCE | 8 | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 | 0 |  |
|  | | DMRS precoder granularity | | |  | REG bundle size | REG bundle size |  |
|  | | REG bundle size | | |  | 6 | 6 |  |
| DRX | | | | |  | DRX.7 | DRX.7 | A.3.3.7 |
| Gap pattern ID | | | | |  | N.A. | N.A. |  |
| gapOffset | | | | |  | 0 | 0 |  |
| rlmInSyncOutOfSyncThreshold | | | | |  | absent | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1, 2 | | | | dBm/SCS kHz | -95 | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | | | |  | db0 | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | | |  | n1 | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | | | |  | pbfd4 | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | | Config 1, 2 | |  | CSI-RS.2.1 TDD | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking | | | Config 1, 2 | |  | TRS.1.2 TDD | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS | | | | |  | 0,1 | 0,1 |  |
| T310 timer | | | | | ms | [1000] | [1000] |  |
| N310 | | | | |  | [2] | [2] |  |
| T1 | | | | | s | [1] | [1] | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | | s | [8.37] | [9.01] |  |
| T3 | | | | | s | [4.52] | [5.16] |  |
| T4 | | | | | s | [0] | [0] |  |
| T5 | | | | | s | [3.89] | [3.39] |  |
| D1 | | | | | s | [3.85] | [3.85] |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts.  Note 3: E-UTRAN is in non-DRX mode under test. | | | | | | | | |

**Table A.10.3.4.2.1-3: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | | | |
|  | | |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| DL CCA probability PCCA,DL | Note 10, 12 | |  | TBD | TBD | TBD | TBD | TBD |
|  | Note 11, 12 | |  | TBD | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA,UL | | |  | TBD | TBD | TBD | TBD | TBD |
| EPRE ratio of PDCCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 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\_SSB of set q0 | | Config 1, 2 | dB | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | | Config 1, 2 | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | | Config 1, 2 | dBm/SCS kHz | -105 | -105 | -85 | -85 | -85 |
|  | | Config 1, 2 | dBm/15 KHz | -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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.  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 transmitted SSS REs during DBT window.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  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 modified as specified in clause [A.3.6A].  Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | |

**Table A.10.3.4.2.1-4: Cell specific test parameters for FR1 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 2** | | | | |
|  | | |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| DL CCA probability PCCA,DL | | Note 10, 12 |  | TBD | TBD | TBD | TBD | TBD |
|  | | Note 11, 12 |  | TBD | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA,UL | | |  | TBD | TBD | TBD | TBD | TBD |
| EPRE ratio of PDCCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 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\_SSB of set q0 | Config 1, 2 | | dB | 5 | [-1] | [-7] | [-7] | [-7] |
| SNR\_SSB of set q1 | Config 1, 2 | | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1, 2 | | dBm/SCS kHz | -105 | -105 | -85 | -85 | -85 |
|  | Config 1, 2 | | dBm/15 KHz | -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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.  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 transmitted SSS REs during DBT window.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  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 modified as specified in clause [A.3.6A].  Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | |

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**Figure A.10.3.4.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

A.10.3.4.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = [3850] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

In Test 1, the UE is verified to meet the beam failure detection for BFD-RS SSB Es/Iot < -7 dB.

In Test 2, the UE is verified to meet the beam failure detection for BFD-RS SSB Es/Iot ≥ -7 dB.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

------------------------------------------------- Unchanged sections omitted --------------------------------------------------------

### A.10.4.3 L1-RSRP measurements for beam reporting

#### A.10.4.3.1 SSB based L1-RSRP measurement on PSCC when DRX is not used

##### A.10.4.3.1.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.10.4.3.1.1-1.

Table A.10.4.3.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD  With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD  With CCA: 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.10.4.3.1.2 Test parameters

There are two cells in the test, E-UTRAN Pcell (Cell 1) and FR1 PSCell (Cell 2) which operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 are given in Table A.10.4.3.1.2-1 and Table A.10.4.3.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.10.4.3.1.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1,2 |  | freq1 |
| DL CCA model | 1,2 |  | As specifieed in A.3.20.2.1 |
| UL CCA model | 1,2 |  | As specified in A.3.20.2.2 |
| Duplex mode | 1,2 |  | TDD |
| TDD Configuration | 1,2 |  | TDDConf.1.1 CCA |
| BWchannel | 1,2 | MHz | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,2 |  | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 |  | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 |  | CCR.1.1 CCA |
| SSB configuration | 1,2 |  | SSB.3 CCA |
| OCNG Patterns | 1,2 |  | OP.1 |
| Initial BWP Configuration | 1,2 |  | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 |  | DLBWP.1.1 ULBWP.1.1 |
| DBT Window Configuration | 1,2 |  | DBT.1 |
| TRS Configuration | 1,2 |  | TRS.1.2 TDD |
| DRX configuration | 1,2 |  | Off |
| reportConfigType | 1,2 |  | periodic |
| reportQuantity | 1,2 |  | ssb-Index-RSRP |
| Number of reported RS | 1,2 |  | 2 |
| L1-RSRP reporting period | 1,2 | slot | 80 |
| T1 | 1,2 | s | 5 |
| T2 | 1,2 | s | 1 |
| EPRE ratio of PSS to SSS |  |  |  |
| 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 | 1,2 | dB | 0 |
| 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 | 1,2 |  | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

Table A.10.4.3.1.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1,2 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1,2 |  | TBD | TBD | TBD | TBD |
| Note2 | 1,2 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2 | dBm/SSB SCS | -91.65 | | | |
|  | 1,2 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1,2 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS Res when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.10.4.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

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.10.4.3.2 SSB based L1-RSRP measurement on PSCC when DRX is used

##### A.10.4.3.2.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.10.4.3.1.1-1.

Table A.10.4.3.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD  With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD  With CCA: 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.10.4.3.2.2 Test parameters

There are two cells in the test, E-UTRAN Pcell (Cell 1) and FR1 PSCell (Cell 2) which operates on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 are given in Table A.10.4.3.2.2-1 and Table A.10.4.3.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.10.4.3.2.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1,2 |  | freq1 |
| DL CCA model | 1,2 |  | As specifieed in A.3.20.2.1 |
| UL CCA model | 1,2 |  | As specified in A.3.20.2.2 |
| Duplex mode | 1,2 |  | TDD |
| TDD Configuration | 1,2 |  | TDDConf.1.1 CCA |
| BWchannel | 1,2 | MHz | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,2 |  | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 |  | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 |  | CCR.1.1 CCA |
| SSB configuration | 1,2 |  | SSB.3 CCA |
| OCNG Patterns | 1,2 |  | OP.1 |
| Initial BWP Configuration | 1,2 |  | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 |  | DLBWP.1.1 ULBWP.1.1 |
| DBT Window Configuration | 1,2 |  | DBT.1 |
| TRS Configuration | 1,2 |  | TRS.1.2 TDD |
| DRX configuration | 1,2 |  | DRX.3 |
| reportConfigType | 1,2 |  | periodic |
| reportQuantity | 1,2 |  | ssb-Index-RSRP |
| Number of reported RS | 1,2 |  | 2 |
| L1-RSRP reporting period | 1,2 | slot | 80 |
| T1 | 1,2 | s | 5 |
| T2 | 1,2 | s | 1 |
| EPRE ratio of PSS to SSS |  |  |  |
| 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 | 1,2 | dB | 0 |
| 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 | 1,2 |  | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

Table A.10.4.3.2.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1,2 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1,2 |  | TBD | TBD | TBD | TBD |
| Note2 | 1,2 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2 | dBm/SSB SCS | -91.65 | | | |
|  | 1,2 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1,2 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.10.4.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

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.10.4.3.3 SSB based L1-RSRP measurement on SCC when DRX is not used

##### A.10.4.3.3.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.10.4.3.1.1-1.

Table A.10.4.3.3.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD  With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD  With CCA: 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.10.4.3.3.2 Test parameters

There are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2), and FR1 SCell (Cell 3). Cell 2 and Cell 3 operate on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.10.4.3.3.2-1 and Table A.10.4.3.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.10.4.3.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| Active PScell | 1,2 |  | Cell 2 |
| Active Scell | 1,2 |  | Cell 3 |
| RF Channel Number | 1,2 |  | 1: Cell 2  2: Cell 3 |
| DL CCA model | 1,2 |  | As specifieed in A.3.20.2.1 |
| UL CCA model | 1,2 |  | As specified in A.3.20.2.2 |
| Duplex mode | 1,2 |  | TDD |
| TDD Configuration | 1,2 |  | TDDConf.1.1 CCA |
| BWchannel | 1,2 | MHz | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,2 |  | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 |  | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 |  | CCR.1.1 CCA |
| SSB configuration | 1,2 |  | SSB.3 CCA |
| OCNG Patterns | 1,2 |  | OP.1 |
| Initial BWP Configuration | 1,2 |  | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 |  | DLBWP.1.1 ULBWP.1.1 |
| DBT Window Configuration | 1,2 |  | DBT.1 |
| TRS Configuration | 1,2 |  | TRS.1.2 TDD |
| DRX configuration | 1,2 |  | Off |
| reportConfigType | 1,2 |  | periodic |
| reportQuantity | 1,2 |  | ssb-Index-RSRP |
| Number of reported RS | 1,2 |  | 2 |
| L1-RSRP reporting period | 1,2 | slot | 80 |
| T1 | 1,2 | s | 5 |
| T2 | 1,2 | s | 1 |
| EPRE ratio of PSS to SSS |  |  |  |
| 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 | 1,2 | dB | 0 |
| 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 | 1,2 |  | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

Table A.10.4.3.3.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1, 2 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1, 2 |  | TBD | TBD | TBD | TBD |
| Note2 | 1**,** 2 | dBm/15kHz | -94.65 | | | |
| Note2 | 1**,** 2 | dBm/SSB SCS | -91.65 | | | |
|  | 1, 2 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1, 2 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1, 2 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1, 2 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.10.4.3.3.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 3.

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.10.4.3.4 SSB based L1-RSRP measurement on SCC when DRX is used

##### A.10.4.3.4.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.10.4.3.4.1-1.

Table A.10.4.3.4.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD  With CCA: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD  With CCA: 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.10.4.3.4.2 Test parameters

There are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2), and FR1 SCell (Cell 3). Cell 2 and Cell 3 operate on a carrier frequency with CCA and transmits SSBs in DBT window according to DL CCA model. The test parameters and applicability for Cell 1 are defined in A.3.7A.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.10.4.3.4.2-1 and Table A.10.4.3.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.10.4.3.4.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| Active PScell | 1,2 |  | Cell 2 |
| Active Scell | 1,2 |  | Cell 3 |
| RF Channel Number | 1,2 |  | 1: Cell 2  2: Cell 3 |
| DL CCA model | 1,2 |  | As specifieed in A.3.20.2.1 |
| UL CCA model | 1,2 |  | As specified in A.3.20.2.2 |
| Duplex mode | 1,2 |  | TDD |
| TDD Configuration | 1,2 |  | TDDConf.1.1 CCA |
| BWchannel | 1,2 | MHz | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,2 |  | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1,2 |  | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1,2 |  | CCR.1.1 CCA |
| SSB configuration | 1,2 |  | SSB.3 CCA |
| OCNG Patterns | 1,2 |  | OP.1 |
| Initial BWP Configuration | 1,2 |  | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | 1,2 |  | DLBWP.1.1 ULBWP.1.1 |
| DBT Window Configuration | 1,2 |  | DBT.1 |
| TRS Configuration | 1,2 |  | TRS.1.2 TDD |
| DRX configuration | 1,2 |  | DRX.3 |
| reportConfigType | 1,2 |  | periodic |
| reportQuantity | 1,2 |  | ssb-Index-RSRP |
| Number of reported RS | 1,2 |  | 2 |
| L1-RSRP reporting period | 1,2 | slot | 80 |
| T1 | 1,2 | s | 5 |
| T2 | 1,2 | s | 1 |
| EPRE ratio of PSS to SSS |  |  |  |
| 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 | 1,2 | dB | 0 |
| 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 | 1,2 |  | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

Table A.10.4.3.4.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1, 2 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1, 2 |  | TBD | TBD | TBD | TBD |
| Note2 | 1, 2 | dBm/15kHz | -94.65 | | | |
| Note2 | 1, 2 | dBm/SSB SCS | -91.65 | | | |
|  | 1, 2 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1, 2 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1, 2 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1, 2 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.10.4.3.4.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 3.

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.

------------------------------------------------- Unchanged sections omitted --------------------------------------------------------

### A.11.4.4 Beam failure detection and link recovery procedures

#### A.11.4.4.1 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode

##### A.11.4.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5A.

The test parameters are given in Tables A.11.4.4.1.1-1, A.11.4.4.1.1-2, A.11.4.4.1.1-3 and A.11.4.4.1.1-4 below. There is one cell, cell 1 which is the active cell, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.11.4.4.1.1-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure A.11.4.4.1.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery. 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 2 ms. The UE transmits the reporting according to UL CCA mode. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40 ms) in test 1.

Table A.11.4.4.1.1-1: Supported test configurations for FR1 PCell with CCA

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

Table A.11.4.4.1.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Value |  | Comment |
|  | | | | |  | Test 1 | Test 2 |  |
| Active PSCell | | | | |  | Cell 1 | Cell 1 |  |
| RF Channel Number | | | | |  | 1 | 1 |  |
| DL CCA model | | | | |  | As specifieed in A.3.20.2.1 | As specifieed in A.3.20.2.1 |  |
| UL CCA model | | | | |  | As specified in A.3.20.2.2 | As specified in A.3.20.2.2 |  |
| Duplex mode | | | | Config 1 |  | TDD | TDD |  |
| BWchannel | | | | Config 1 | MHz | 40: NRB,c = 106 | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | | | Config 1 |  | DLBWP.0.1 | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | | | Config |  | DLBWP.1.1 | DLBWP.1.1 |  |
| UL initial BWP configuration | | | | Config 1 |  | ULBWP.0.1 | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | | | Config 1 |  | ULBWP.1.1 | ULBWP.1.1 |  |
| TDD Configuration | | | | Config 1 |  | TDDConf.1.1 CCA | TDDConf.1.1 CCA |  |
| CORESET Reference Channel | | | | Config 1 |  | CR.1.1 CCA | CR.1.1 CCA |  |
| SSB Configuration | | | | Config 1 |  | SSB.3 CCA | SSB.3 CCA |  |
| DBT Window Configuration | | | | Config 1 |  | DBT.1 | DBT.1 |  |
| PDSCH/PDCCH subcarrier spacing | | | | Config 1 |  | 30 KHz | 30 KHz |  |
| PRACH Configuration | | | | Config 1 |  | Table A.3.8.2.2-1 | Table A.3.8.2.2-1 |  |
| SSB Index assigned as BFD RS (q0) | | | | |  | 0 | 0 |  |
| SSB Index assigned as CBD RS (q1) | | | | |  | 1 | 1 |  |
| OCNG parameters | | | | |  | OP.1 | OP.1 |  |
| CP length | | | | |  | Normal | Normal |  |
| Correlation Matrix and Antenna Configuration | | | | |  | 2x2 Low | 2x2 Low |  |
| Beam failure detection transmission parameters | | DCI format | | |  | 1-0 | 1-0 |  |
|  | | Number of Control OFDM symbols | | |  | 2 | 2 |  |
|  | | Aggregation level | | | CCE | 8 | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 | 0 |  |
|  | | DMRS precoder granularity | | |  | REG bundle size | REG bundle size |  |
|  | | REG bundle size | | |  | 6 | 6 |  |
| DRX | | | | |  | OFF | OFF |  |
| Gap pattern ID | | | | |  | gp0 | gp0 |  |
| gapOffset | | | | |  | 0 | 0 |  |
| rlmInSyncOutOfSyncThreshold | | | | |  | absent | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1 | | | | dBm/SCS kHz | -95 | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | | | |  | db0 | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | | |  | n1 | n1 | see clause 5.17 of TS 38.321 [7] |
| beamFailureDetectionTimer | | | | |  | pbfd4 | pbfd4 | see clause 5.17 of TS 38.321 [7] |
| CSI-RS configuration for CSI reporting | | | Config 1 | |  | CSI-RS.2.1 TDD | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking | | | Config 1 | |  | TRS.1.2 TDD | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS | | |  | |  | 0, 1 | 0, 1 |  |
| T310 Timer | | |  | | ms | [1000] | [1000] |  |
| N310 | | |  | |  | [2] | [2] |  |
| T1 | | | | | s | [0.2] | [0.2] | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | | s | [0.85] | [0.93] |  |
| T3 | | | | | s | [0.44] | [0.52] |  |
| T4 | | | | | s | [0] | [0] |  |
| T5 | | | | | s | [0.45] | [0.45] |  |
| D1 | | | | | s | [0.41] | [0.41] |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | | | | |

Table A.11.4.4.1.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | | | |
|  | | |  | T1 | T2 | T3 | T4 | T5 |
| DL CCA probability PCCA,DL | | Note 10, 12 |  | TBD | TBD | TBD | TBD | TBD |
|  | | Note 11, 12 |  | TBD | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA,UL | | |  | TBD | TBD | TBD | TBD | TBD |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 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\_SSB of set q0 | Config 1 | | dB | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1 | | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | | dBm/SCS kHz | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | | dBm/15 KHz | -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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.  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 the transmitted SSS REs during DBT window.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  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 modified as specified in clause [A.3.6A].  Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | |

Table A.11.4.4.1.1-4: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 2 | | | | |
|  | | |  | T1 | T2 | T3 | T4 | T5 |
| DL CCA probability PCCA | | Note 10, 12 |  | TBD | TBD | TBD | TBD | TBD |
|  | | Note 11, 12 |  | TBD | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA | | |  | TBD | TBD | TBD | TBD | TBD |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 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\_SSB of set q0 | Config 1 | | dB | 5 | [-1] | [-7] | [-7] | [-7] |
| SNR\_SSB of set q1 | Config 1 | | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | | dBm/SCS kHz | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | | dBm/15 KHz | -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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.  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 the transmitted SSS REs during DBT window.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  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 modified as specified in clause [A.3.6A].  Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | |



**Figure A.6.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

##### A.11.4.4.1.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = [410] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

In Test 1, the UE is verified to meet the beam failure detection for BFD-RS SSB Es/Iot < -7 dB.

In Test 2, the UE is verified to meet the beam failure detection for BFD-RS SSB Es/Iot ≥ -7 dB.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

#### A.11.4.4.2 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in DRX mode

##### A.11.4.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set q0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5A.

The test parameters are given in Tables A.11.4.4.2.1-1, A.11.4.4.2.1-2, A.11.4.4.2.1-3 and A.11.4.4.2.1-4 below. There is one cell, cell 1 which is the active cell, in the test. Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.11.4.4.2.1-1 shows the variation of the downlink SNR of the SSB in set q0 in the active cell to emulate SSB based beam failure. Figure A.11.4.4.2.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery. 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 2 ms. The UE transmits the reporting according to UL CCA mode. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.11.4.4.2.1-1: Supported test configurations for FR1 PCell with CCA

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

Table A.11.4.4.2.1-2: General test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Value |  | Comment |
|  | | | | |  | Test 1 | Test 2 |  |
| Active PSCell | | | | |  | Cell 1 | Cell 1 |  |
| RF Channel Number | | | | |  | 1 | 1 |  |
| DL CCA model | | | | |  | As specifieed in A.3.20.2.1 | As specifieed in A.3.20.2.1 |  |
| UL CCA model | | | | |  | As specified in A.3.20.2.2 | As specified in A.3.20.2.2 |  |
| Duplex mode | | | | Config 1 |  | TDD | TDD |  |
| BWchannel | | | | Config 1 | MHz | 40: NRB,c = 106 | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | | | Config 1 |  | DLBWP.0.1 | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | | | Config |  | DLBWP.1.1 | DLBWP.1.1 |  |
| UL initial BWP configuration | | | | Config 1 |  | ULBWP.0.1 | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | | | Config 1 |  | ULBWP.1.1 | ULBWP.1.1 |  |
| TDD Configuration | | | | Config 1 |  | TDDConf.1.1 CCA | TDDConf.1.1 CCA |  |
| CORESET Reference Channel | | | | Config 1 |  | CR.1.1 CCA | CR.1.1 CCA |  |
| SSB Configuration | | | | Config 1 |  | SSB.3 CCA | SSB.3 CCA |  |
| DBT Window Configuration | | | | Config 1 |  | DBT.1 | DBT.1 |  |
| PDSCH/PDCCH subcarrier spacing | | | | Config 1 |  | 30 KHz | 30 KHz |  |
| PRACH Configuration | | | | Config 1 |  | Table A.3.8.2.2-1 | Table A.3.8.2.2-1 |  |
| SSB Index assigned as BFD RS (q0) | | | | |  | 0 | 0 |  |
| SSB Index assigned as CBD RS (q1) | | | | |  | 1 | 1 |  |
| OCNG parameters | | | | |  | OP.1 | OP.1 |  |
| CP length | | | | |  | Normal | Normal |  |
| Correlation Matrix and Antenna Configuration | | | | |  | 2x2 Low | 2x2 Low |  |
| Beam failure detection transmission parameters | | DCI format | | |  | 1-0 | 1-0 |  |
|  | | Number of Control OFDM symbols | | |  | 2 | 2 |  |
|  | | Aggregation level | | | CCE | 8 | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 | 0 |  |
|  | | DMRS precoder granularity | | |  | REG bundle size | REG bundle size |  |
|  | | REG bundle size | | |  | 6 | 6 |  |
| DRX | | | | |  | DRX.7 | DRX.7 | A.3.3.7 |
| Gap pattern ID | | | | |  | N.A. | N.A. |  |
| gapOffset | | | | |  | 0 | 0 |  |
| rlmInSyncOutOfSyncThreshold | | | | |  | absent | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1 | | | | dBm/SCS kHz | -95 | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | | | |  | db0 | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | | |  | n1 | n1 | see clause 5.17 of TS 38.321 [7] |
| beamFailureDetectionTimer | | | | |  | pbfd4 | pbfd4 | see clause 5.17 of TS 38.321 [7] |
| CSI-RS configuration for CSI reporting | | | Config 1 | |  | CSI-RS.2.1 TDD | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking | | | Config 1 | |  | TRS.1.2 TDD | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS | | |  | |  | 0, 1 | 0, 1 |  |
| T310 Timer | | |  | | ms | [1000] | [1000] |  |
| N310 | | |  | |  | [2] | [2] |  |
| T1 | | | | | s | [1] | [1] | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | | s | [8.37] | [9.01] |  |
| T3 | | | | | s | [4.52] | [5.16] |  |
| T4 | | | | | s | [0] | [0] |  |
| T5 | | | | | s | [3.89] | [3.89] |  |
| D1 | | | | | s | [3.85] | [3.85] |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | | | | | |

Table A.11.4.4.2.1-3: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | | | |
|  | | |  | T1 | T2 | T3 | T4 | T5 |
| DL CCA probability PCCA | | Note 10, 12 |  | TBD | TBD | TBD | TBD | TBD |
|  | | Note 11, 12 |  | TBD | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA | | |  | TBD | TBD | TBD | TBD | TBD |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 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\_SSB of set q0 | Config 1 | | dB | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1 | | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | | dBm/SCS kHz | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | | dBm/15 KHz | -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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.  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 the transmitted SSS REs during DBT window.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  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 modified as specified in clause [A.3.6A].  Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | |

Table A.11.4.4.2.1-4: Cell specific test parameters for FR1 PCell for SSB-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 2 | | | | |
|  | | |  | T1 | T2 | T3 | T4 | T5 |
| DL CCA probability PCCA | | Note 10, 12 |  | TBD | TBD | TBD | TBD | TBD |
|  | | Note 11, 12 |  | TBD | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA | | |  | TBD | TBD | TBD | TBD | TBD |
| EPRE ratio of PDCCH DMRS to SSS | | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | dB |  | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | 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\_SSB of set q0 | Config 1 | | dB | 5 | [-1] | [-7] | [-7] | [-7] |
| SNR\_SSB of set q1 | Config 1 | | dB | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | | dBm/SCS kHz | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | | dBm/15 KHz | -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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window.  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 the transmitted SSS REs during DBT window.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  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 modified as specified in clause [A.3.6A].  Note 10: For UE supporting semi-static channel access and network configuring semi-static channel occupancy.  Note 11: For UE supporting dynamic channel access and network configuring dynamic channel occupancy.  Note 12: For UE supporting both semi-static and dynamic cannel access, the UE can be tested under dynamic channel occupancy only. | | | | | | | | |

****

**Figure A.11.4.4.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

##### A.11.4.4.2.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = [3850] ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set q1. The UE shall not transmit preamble on a beam associated with the candidate beam set q1 earlier than time point B.

In Test 1, the UE is verified to meet the beam failure detection for BFD-RS SSB Es/Iot < -7 dB.

In Test 2, the UE is verified to meet the beam failure detection for BFD-RS SSB Es/Iot ≥ -7 dB.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

------------------------------------------------- Unchanged sections omitted --------------------------------------------------------

### A.11.5.4 L1-RSRP measurements for beam reporting

#### A.11.5.4.1 SSB based L1-RSRP measurement when DRX is not used

##### A.11.5.4.1.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.11.5.4.1.1-1.

Table A.11.5.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | With CCA: 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.11.5.4.1.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test parameters for the Cell 1 are given in Table A.11.5.4.1.2-1 and Table A.11.5.4.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.11.5.4.1.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1 |  | freq1 |
| DL CCA model | 1 |  | As specifieed in A.3.20.2.1 |
| UL CCA model | 1 |  | As specified in A.3.20.2.2 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.1.1 CCA |
| BWchannel | 1 | MHz | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 CCA |
| SSB configuration | 1 |  | SSB.3 CCA |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 |
| DBT Window Configuration | 1 |  | DBT.1 |
| TRS Configuration | 1 |  | TRS.1.2 TDD |
| DRX configuration | 1 |  | Off |
| reportConfigType | 1 |  | periodic |
| reportQuantity | 1 |  | ssb-Index-RSRP |
| Number of reported RS | 1 |  | 2 |
| L1-RSRP reporting period | 1 | slot | 80 |
| T1 | 1 | s | 5 |
| T2 | 1 | s | 1 |
| EPRE ratio of PSS to SSS | 1 | 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 |  | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

Table A.11.5.4.1.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1 |  | TBD | TBD | TBD | TBD |
| Note2 | 1 | dBm/15kHz | -94.65 | | | |
| Note2 | 1 | dBm/SSB SCS | -91.65 | | | |
|  | 1 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.11.5.4.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. 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.11.5.4.2 SSB based L1-RSRP measurement when DRX is used

##### A.11.5.4.2.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.11.5.4.2.1-1.

Table A.11.5.4.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | With CCA: 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.11.5.4.2.2 Test parameters

There is one cell in the test, the FR1 PCell (Cell 1). Cell 1 operates on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test parameters for the Cell 1 are given in Table A.11.5.4.2.2-1 and Table A.11.5.4.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.11.5.4.2.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1 |  | freq1 |
| DL CCA model | 1 |  | As specifieed in A.3.20.2.1 |
| UL CCA model | 1 |  | As specified in A.3.20.2.2 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.1.1 CCA |
| BWchannel | 1 | MHz | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 CCA |
| SSB configuration | 1 |  | SSB.3 CCA |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 |
| DBT Window Configuration | 1 |  | DBT.1 |
| TRS Configuration | 1 |  | TRS.1.2 TDD |
| DRX configuration | 1 |  | DRX.3 |
| reportConfigType | 1 |  | periodic |
| reportQuantity | 1 |  | ssb-Index-RSRP |
| Number of reported RS | 1 |  | 2 |
| L1-RSRP reporting period | 1 | slot | 80 |
| T1 | 1 | s | 5 |
| T2 | 1 | s | 1 |
| EPRE ratio of PSS to SSS | 1 | 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 |  | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

Table A.11.5.4.2.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1 |  | TBD | TBD | TBD | TBD |
| Note2 | 1 | dBm/15kHz | -94.65 | | | |
| Note2 | 1 | dBm/SSB SCS | -91.65 | | | |
|  | 1 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.11.5.4.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. 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.11.5.4.3 SSB based L1-RSRP measurement on SCC when DRX is not used

##### A.11.5.4.3.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.11.5.4.1.1-1.

Table A.11.5.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | With CCA: 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.11.5.4.3.2 Test parameters

There are two cells in the test, the FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Both Cell 1 and Cell 2 operate on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test parameters for the Cell 1 are given in Table A.11.5.4.3.2-1 and Table A.11.5.4.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.11.5.4.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| Active PCell | 1 |  | Cell 1 |
| Active SCell | 1 |  | Cell 2 |
| RF Channel Number | 1 |  | 1: Cell 1  2: Cell 2 |
| DL CCA model | 1 |  | As specifieed in A.3.20.2.1 |
| UL CCA model | 1 |  | As specified in A.3.20.2.2 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.1.1 CCA |
| BWchannel | 1 | MHz | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 CCA |
| SSB configuration | 1 |  | SSB.3 CCA |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 |
| DBT Window Configuration | 1 |  | DBT.1 |
| TRS Configuration | 1 |  | TRS.1.2 TDD |
| DRX configuration | 1 |  | Off |
| reportConfigType | 1 |  | periodic |
| reportQuantity | 1 |  | ssb-Index-RSRP |
| Number of reported RS | 1 |  | 2 |
| L1-RSRP reporting period | 1 | slot | 80 |
| T1 | 1 | s | 5 |
| T2 | 1 | s | 1 |
| EPRE ratio of PSS to SSS | 1 | 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 |  | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

Table A.11.5.4.3.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1 |  | TBD | TBD | TBD | TBD |
| Note2 | 1 | dBm/15kHz | -94.65 | | | |
| Note2 | 1 | dBm/SSB SCS | -91.65 | | | |
|  | 1 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.11.5.4.3.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

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.11.5.4.4 SSB based L1-RSRP measurement on SCC when DRX is used

##### A.11.5.4.4.1 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 9.5A.4.1, with the testing configurations for NR cells in Table A.11.5.4.4.1-1.

Table A.11.5.4.4.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | With CCA: 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.11.5.4.3.2 Test parameters

There are two cells in the test, the FR1 PCell (Cell 1) and FR1 SCell (Cell 2). Both Cell 1 and Cell 2 operate on a carrier frequency with CCA and transmits SSBs in DBT windows according to DL CCA model. The test parameters for the Cell 1 are given in Table A.11.5.4.4.2-1 and Table A.11.5.4.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the SSBs and report periodically. The UE transmits the reporting according to UL CCA model. The test consists of two successive time periods, with time duration of T1 and T2 respectively. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured*.*

The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM, BFD and L1-RSRP measurement based on the SSBs.

Table A.11.5.4.4.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| Active PCell | 1 |  | Cell 1 |
| Active SCell | 1 |  | Cell 2 |
| RF Channel Number | 1 |  | 1: Cell 1  2: Cell 2 |
| DL CCA model | 1 |  | As specifieed in A.3.20.2.1 |
| UL CCA model | 1 |  | As specified in A.3.20.2.2 |
| Duplex mode | 1 |  | TDD |
| TDD Configuration | 1 |  | TDDConf.1.1 CCA |
| BWchannel | 1 | MHz | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 CCA |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 CCA |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 CCA |
| SSB configuration | 1 |  | SSB.3 CCA |
| OCNG Patterns | 1 |  | OP.1 |
| Initial BWP Configuration | 1 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1 |  | DLBWP.1.1  ULBWP.1.1 |
| DBT Window Configuration | 1 |  | DBT.1 |
| TRS Configuration | 1 |  | TRS.1.2 TDD |
| DRX configuration | 1 |  | DRX.3 |
| reportConfigType | 1 |  | periodic |
| reportQuantity | 1 |  | ssb-Index-RSRP |
| Number of reported RS | 1 |  | 2 |
| L1-RSRP reporting period | 1 | slot | 80 |
| T1 | 1 | s | 5 |
| T2 | 1 | s | 1 |
| EPRE ratio of PSS to SSS | 1 | 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 |  | 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. For cells with CCA model, OCNG is transmitted only in the slots with downlink transmission burst and is not transmitted during the muted slots or during DBT window. | | | |

Table A.11.5.4.4.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| DL CCA Probability PCCA\_DL | 1 |  | TBD | TBD | TBD | TBD |
| UL CCA probability PCCA\_UL | 1 |  | TBD | TBD | TBD | TBD |
| Note2 | 1 | dBm/15kHz | -94.65 | | | |
| Note2 | 1 | dBm/SSB SCS | -91.65 | | | |
|  | 1 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1 | dBm/SSB SCS | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1 | dB | 0 | 0 | -Infinity | 3 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  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: DL and UL CCA probabilities apply for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.  Note 5: The signal levels apply for SSS REs when the discovery burst is transmitted during DBT windows. | | | | | | |

##### A.11.5.4.4.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640 ms plus 80 slots from the beginning of time period T2, UE shall send L1-RSRP report including results of both SSB0 and SSB1 while meeting the absolute accuracy requirement in clause 10.1.19.1.1 and relative accuracy requirement in clause 10.1.19.1.2. The rate of correct events observed during repeated tests shall be at least 90%.

The UE shall send L1-RSRP report of both SSB0 and SSB1 in Cell 2.

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 ------------------------------------------------------------