Annex A (normative): Test Cases

# A.1 Purpose of annex

# A.2 Requirement classification for statistical testing

Requirements in this specification are either expressed as absolute requirements with a single value stating the requirement, or expressed as a success rate. There are no provisions for the statistical variations that will occur when the parameter is tested.

Annex A outlines the tests in more detail and lists the test parameters needed. The test will result in an outcome of a test variable value for the device under test (DUT) inside or outside the test limit. Overall, the probability of a "good" DUT being inside the test limit(s) and the probability of a "bad" DUT being outside the test limit(s) should be as high as possible. For this reason, when selecting the test variable and the test limit(s), the statistical nature of the test is accounted for.

The statistical nature depends on the type of requirement. Some have large statistical variations, while others are not statistical in nature at all. When testing a parameter with a statistical nature, a confidence level is set. This establishes the probability that a DUT passing the test actually meets the requirements and determines how many times a test has to be repeated and what the pass and fail criteria are. Those aspects are not covered by TS 38.133. The details of the tests on how many times to run it and how to establish confidence in the tests are described in TS 38.533 [5]. This Annex establishes the variable to be used in the test and whether it can be viewed as statistical in nature or not.

## A.2.1 Types of requirements in TS 38.133

### A.2.1.1 Time and delay requirements on UE higher layer actions

A very large part of the RRM requirements are delay requirements:

- In RRC\_IDLE state mobility (clause A.6.1 and A.7.1) there is cell re-selection delay.

- In RRC\_CONNECTED state mobility (clauses A.4.3, A.4.6, A.5.3, A.5.6, A.6.3, A.6.6, A.7.3 and A.7.6) there is handover delay, cell search delay and measurement reporting delay.

- In RRC Connection Control (clauses A.4.3.2, A.5.3.2, A.6.3.2 and A.7.3.2) there is RRC re-establishment delay.

All have in common that the UE is required to perform an action observable in higher layers (e.g. camp on the correct cell) within a certain time after a specific event (e.g. when a new strong pilot or reference signal appears). The delay time is statistical in nature for several reasons, among others that several of the measurements are performed by the UE in a fading radio environment.

The variations make a strict limit unsuitable for a test. Instead there is a condition set for a correct action by the UE, e.g. that the UE shall camp on the correct cell within X seconds. Then the rate of correct events is observed during repeated tests and a limit is set on the rate of correct events, usually 90% correct events are required. How the limit is applied in the test depends on the confidence required, further detailed are in TS 38.533 [5].

### A.2.1.2 Measurements of power levels, relative powers and time

A very large number of requirements are on measurements that the UE performs:

- In RRC\_CONNECTED state mobility (clauses A.4.3, A.5.3, A.6.3 and A.7.3) there are measurement reports.

- In Measurement Performance Requirements (clauses A.4.7, A.5.7, A.6.7 and A.7.7) there are requirements for all type of measurements.

The accuracy requirements on measurements are expressed in this specification as a fixed limit (e.g. +/-X dB), but the measurement error will have a distribution that is not easily confined in fixed limits. Assuming a Gaussian distribution of the error, the limits will have to be set at +/-3.29σ if the probability of failing a "good DUT" in a single test is to be kept at 0.1%. It is more reasonable to set the limit tighter and test the DUT by counting the rate of measurements that are within the limits, in a way similar to the requirements on delay.

### A.2.1.3 Implementation requirements

A few requirements are strict actions the UE should take or capabilities the UE should have, without any allowance for deviations. These requirements are absolute and should be tested as such. Examples are:

- "Event triggered report rate" in RRC\_CONNECTED state mobility (clauses A.4.3, A.4.6, A.5.3, A.5.6, A.6.3, A.6.6, A.7.3 and A.7.6)

- "Correct behaviour at time-out" in RRC connection control (clauses A.4.3.2, A.5.3.2, A.6.3.2 and A.7.3.2)

### A.2.1.4 Physical layer timing requirements

There are requirements on Timing (clauses A.4.4, A.5.4, A.6.4 and A.7.4). There are both absolute and relative limits on timing accuracy depending upon the type of requirement. Examples are:

- Initial Transmit Timing (clauses A.4.4.1, A.5.4.1, A.6.4.1 and A.7.4.1) has an absolute limit on timing accuracy.

- Timing Advance (clauses A.4.4.2, A.5.4.2, A.6.4.2 and A.7.4.2) has a relative limit on timing accuracy.

# A.3 RRM test configurations

## A.3.1 Reference measurement channels

### A.3.1.1 PDSCH

#### A.3.1.1.1 FDD

Table A.3.1.1.1-1: PDSCH Reference Measurement Channels for SCS=15kHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | SR.1.1 FDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | Defined in test case |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Allocated resource blocks for PDSCH Note 1 |  | 24 |  |  |  |  |  |  |
| Allocated slots per Radio Frame |  | 10 |  |  |  |  |  |  |
| Radio frame containing SSB | slots | Note 5 |  |  |  |  |  |  |
| Radio frame not containing SSB | slots | 10 |  |  |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |  |  |
| Target Coding Rate |  | 1/3 |  |  |  |  |  |  |
| Number of control symbols |  | 2 |  |  |  |  |  |  |
| PDSCH mapping type |  | Type A |  |  |  |  |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For slots with RMSI Note 2 | bits | 1608 |  |  |  |  |  |  |
| For slots without RMSI | bits | 1864 |  |  |  |  |  |  |
| Number of Code Blocks per slot |  | 1 |  |  |  |  |  |  |
| Binary Channel Bits Per slot |  |  |  |  |  |  |  |  |
| For slots with RMSI Note 2, Note 4 | bits | 5184 |  |  |  |  |  |  |
| For slots without RMSI Note 6 | bits | 6048 |  |  |  |  |  |  |
| Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.  Note 2: PDSCH is scheduled on the slots with RMSI.  Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].  Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.  Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.  Note 6: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms - drx-InactivityTimer) from timing when drx-onDurationTimer starts, unless otherwise specified in the test case | | | | | | | | |

#### A.3.1.1.2 TDD

Table A.3.1.1.2-1: PDSCH Reference Measurement Channels for SCS=15kHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | SR.1.1 TDD | SR.1.2 TDD |  |  |  |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case |  |  |  |  |  |
| Number of transmitter antennas |  | 1 | 1 |  |  |  |  |  |
| Allocated resource blocks for PDSCH Note 1 |  | 24 | 24 |  |  |  |  |  |
| Allocated slots per Radio Frame |  |  |  |  |  |  |  |  |
| Radio frame containing SSB | slots | Note 5 | Note 5 |  |  |  |  |  |
| Radio frame not containing SSB | slots | 4 | 6 |  |  |  |  |  |
| MCS table |  | 64QAM | 64QAM |  |  |  |  |  |
| MCS index |  | 4 | 4 |  |  |  |  |  |
| Modulation |  | QPSK | QPSK |  |  |  |  |  |
| Target Coding Rate |  | 1/3 | 1/3 |  |  |  |  |  |
| Number of control symbols |  | 2 | 2 |  |  |  |  |  |
| PDSCH mapping type |  | Type A | Type A |  |  |  |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For slots with RMSI Note 2 | bits | 1608 | 1608 |  |  |  |  |  |
| For slots without RMSI | bits | 1864 | 1864 |  |  |  |  |  |
| For special slots | bits | N/A | 1128 |  |  |  |  |  |
| Number of Code Blocks per slot |  | 1 | 1 |  |  |  |  |  |
| Binary Channel Bits Per slot |  |  |  |  |  |  |  |  |
| For slots with RMSI Note 2, Note 4 | bits | 5184 | 5184 |  |  |  |  |  |
| For slots without RMSI Note 6 | bits | 6048 | 6048 |  |  |  |  |  |
| For special slots Note 6 | bits | - | 3744 |  |  |  |  |  |
| Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.  Note 2: PDSCH is scheduled on the slots with RMSI.  Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].  Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.  Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.  Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.  Note 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms - drx-InactivityTimer) from timing when drx-onDurationTimer starts, unless otherwise specified in the test case | | | | | | | | |

Table A.3.1.1.2-2: PDSCH Reference Measurement Channels for SCS=30kHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | SR.2.1 TDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | Defined in test case |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Allocated resource blocks for PDSCH Note 1 |  | 24 |  |  |  |  |  |  |
| Allocated slots per Radio Frame |  |  |  |  |  |  |  |  |
| Radio frame containing SSB | slots | Note 5 |  |  |  |  |  |  |
| Radio frame not containing SSB | slots | 10 |  |  |  |  |  |  |
| MCS table |  | 64QAM |  |  |  |  |  |  |
| MCS index |  | 4 |  |  |  |  |  |  |
| Modulation |  | QPSK |  |  |  |  |  |  |
| Target Coding Rate |  | 1/3 |  |  |  |  |  |  |
| Number of control symbols |  | 2 |  |  |  |  |  |  |
| PDSCH mapping type |  | Type A |  |  |  |  |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For slots with RMSI Note 2 | bits | 1608 |  |  |  |  |  |  |
| For slots without RMSI | bits | 1864 |  |  |  |  |  |  |
| Number of Code Blocks per slot |  | 1 |  |  |  |  |  |  |
| Binary Channel Bits Per slot |  |  |  |  |  |  |  |  |
| For slots with RMSI Note 2, Note 4 | bits | 6048 |  |  |  |  |  |  |
| Note 1: Allocated outside the SMTC duration in time and in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block.  Note 2: PDSCH is scheduled on the slots with RMSI.  Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].  Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.  Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.  Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditonalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.  Note 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms - drx-InactivityTimer) from timing when drx-onDurationTimer starts, unless otherwise specified in the test case | | | | | | | | |

Table A.3.1.1.2-3: PDSCH Reference Measurement Channels for SCS=120kHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | SR.3.1 TDD | SR.3.2 TDD | SR.3.3 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 | 100 | 100 |  |  |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 |  |  |  |  |
| Allocated resource blocks for PDSCH |  | 24 Note 1 | 24Note 7 | 48Note 7 |  |  |  |  |
| Allocated slots per Radio Frame |  |  |  |  |  |  |  |  |
| Radio frame containing SSB | slots | Note 5 | Note 5 | Note 5 |  |  |  |  |
| Radio frame not containing SSB | slots | 48 | 48 | 48 |  |  |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |  |  |
| MCS index |  | 4 | 4 | 4 |  |  |  |  |
| Modulation |  | QPSK | QPSK | QPSK |  |  |  |  |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 |  |  |  |  |
| Number of control symbols |  | 2 | 2 | 2 |  |  |  |  |
| PDSCH mapping type |  | Type A | Type A | Type A |  |  |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For slots with RMSI | bits | 1608 | 1608 | 3104 |  |  |  |  |
| For slots without RMSI | bits | 1864 | 1864 | 3624 |  |  |  |  |
| Number of Code Blocks per slot |  | 1 | 1 | 1 |  |  |  |  |
| Binary Channel Bits Per slot |  |  |  |  |  |  |  |  |
| For slots with RMSI Note 4 | bits | 5184 | 5184 | 10368 |  |  |  |  |
| For slots without RMSI Note 6 | bits | 6048 | 6048 | 12096 |  |  |  |  |
| Note 1: Allocated in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block  Note 2: Void  Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].  Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 2.  Note 5: PDSCH is not scheduled in slots containing SSB according to the SSB configuration used in the test. SSB configurations are defined in clause A.3.10.  Note 6: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-AdditionalPositions=2, maxLength=1, Antenna port index: 1000, and Number of PDSCH DMRS CDM group(s) without data: 1.  Note 7: Allocated in the same resource blocks as the CORESET.  Note 8: When DRX is configured, PDSCH is scheduled only while *drx-onDurationTimer* is running, unless otherwise specified in the test case. | | | | | | | | |

### A.3.1.2 CORESET for RMSI scheduling

#### A.3.1.2.1 FDD

Table A.3.1.2.1-1: RMSI CORESET Reference Channel for FDD with SCS=15KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CR.1.1 FDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | Defined in test case |  |  |  |  |  |  |
| Subcarrier spacing for RMSI CORESET | kHz | 15 |  |  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET Note 7 |  | 24 |  |  |  |  |  |  |
| Subcarrier spacing for SSB | kHz | 15 |  |  |  |  |  |  |
| SSB and RMSI CORESET multiplexing configuration Note 7 |  | Pattern 1 |  |  |  |  |  |  |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note8) |  |  |  |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 |  | Index 4 |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Duration of RMSI CORESET Note 7 | symbols | 2 |  |  |  |  |  |  |
| DCI Format Note 1 |  | Note 2 |  |  |  |  |  |  |
| Aggregation level | CCE | 8 |  |  |  |  |  |  |
| DMRS precoder granularity |  | 6 |  |  |  |  |  |  |
| REG bundle size |  | 6 |  |  |  |  |  |  |
| Mapping from REG to CCE |  | Distributed |  |  |  |  |  |  |
| Cell ID |  | Note 5 |  |  |  |  |  |  |
| Payload (without CRC) | bits | Note 6 |  |  |  |  |  |  |
| Note 1: DCI formats are defined in TS 38.212.  Note 2: DCI format shall depend upon the test configuration.  Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.  Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].  Note 5: Cell ID shall depend upon the test configuration.  Note 6: Payload size shall depend upon the test configuration.  Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3]  Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC. | | | | | | | | |

#### A.3.1.2.2 TDD

Table A.3.1.2.2-1: RMSI CORESET Reference Channel for TDD with SCS=15KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CR.1.1 TDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | Defined in test case |  |  |  |  |  |  |
| Subcarrier spacing | kHz | 15 |  |  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET Note 7 |  | 24 |  |  |  |  |  |  |
| SSB and RMSI CORESET multiplexing configuration Note 7 |  | Pattern 1 |  |  |  |  |  |  |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note 8) |  |  |  |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 |  | Index 4 |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Duration of RMSI CORESET Note 7 | symbols | 2 |  |  |  |  |  |  |
| DCI Format Note 1 |  | Note 2 |  |  |  |  |  |  |
| Aggregation level | CCE | 8 |  |  |  |  |  |  |
| DMRS precoder granularity |  | 6 |  |  |  |  |  |  |
| REG bundle size |  | 6 |  |  |  |  |  |  |
| Mapping from REG to CCE |  | Distributed |  |  |  |  |  |  |
| Cell ID |  | Note 5 |  |  |  |  |  |  |
| Payload (without CRC) | bits | Note 6 |  |  |  |  |  |  |
| Note 1: DCI formats are defined in TS 38.212.  Note 2: DCI format shall depend upon the test configuration.  Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.  Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].  Note 5: Cell ID shall depend upon the test configuration.  Note 6: Payload size shall depend upon the test configuration.  Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-1 in TS 38.213 [3].  Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC. | | | | | | | | |

Table A.3.1.2.2-2: RMSI CORESET Reference Channel for TDD with SCS=30KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CR.2.1 TDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | Defined in test case |  |  |  |  |  |  |
| Subcarrier spacing | kHz | 30 |  |  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET Note 7 |  | 24 |  |  |  |  |  |  |
| SSB and RMSI CORESET multiplexing configuration Note 7 |  | Pattern 1 |  |  |  |  |  |  |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note 8) |  |  |  |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 |  | Index 4 |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Duration of RMSI CORESET Note 7 | symbols | 2 |  |  |  |  |  |  |
| DCI Format Note 1 |  | Note 2 |  |  |  |  |  |  |
| Aggregation level | CCE | 8 |  |  |  |  |  |  |
| DMRS precoder granularity |  | 6 |  |  |  |  |  |  |
| REG bundle size |  | 6 |  |  |  |  |  |  |
| Mapping from REG to CCE |  | Distributed |  |  |  |  |  |  |
| Cell ID |  | Note 5 |  |  |  |  |  |  |
| Payload (without CRC) | bits | Note 6 |  |  |  |  |  |  |
| Note 1: DCI formats are defined in TS 38.212.  Note 2: DCI format shall depend upon the test configuration.  Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.  Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-11 in TS 38.213 [3].  Note 5: Cell ID shall depend upon the test configuration.  Note 6: Payload size shall depend upon the test configuration.  Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-6 in TS 38.213 [3].  Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC. | | | | | | | | |

Table A.3.1.2.2-3: RMSI CORESET Reference Channel for TDD with SCS=120KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CR.3.1 TDD | CR.3.2 TDD |  |  |  |  |  |
| Channel bandwidth | MHz | 100 | 100 |  |  |  |  |  |
| Subcarrier spacing | kHz | 120 | 120 |  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET |  | 24 Note 7 | 48 Note 9 |  |  |  |  |  |
| SSB and RMSI CORESET multiplexing configuration |  | Pattern 1 Note 7 | Pattern 1 Note 9 |  |  |  |  |  |
| Offset between SSB and RMSI CORESET Note 3 | RB | 0 (Note 8) Note 7 | 0 (Note 8) Note 9 |  |  |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 |  | Index 4 | Index 4 |  |  |  |  |  |
| Number of transmitter antennas |  | 1 | 1 |  |  |  |  |  |
| Duration of RMSI CORESET | symbols | 2 Note 7 | 2 Note 9 |  |  |  |  |  |
| DCI Format Note 1 |  | Note 2 | Note 2 |  |  |  |  |  |
| Aggregation level | CCE | 8 | 8 |  |  |  |  |  |
| DMRS precoder granularity |  | 6 | 6 |  |  |  |  |  |
| REG bundle size |  | 6 | 6 |  |  |  |  |  |
| Mapping from REG to CCE |  | Distributed | Distributed |  |  |  |  |  |
| Cell ID |  | Note 5 | Note 5 |  |  |  |  |  |
| Payload (without CRC) | bits | Note 6 | Note 6 |  |  |  |  |  |
| Note 1: DCI formats are defined in TS 38.212.  Note 2: DCI format shall depend upon the test configuration.  Note 3: The offset is defined with respect to the subcarrier spacing of the CORESET from the smallest RB index of RMSI CORESET to the smallest RB index of the common RB overlapping with the first RB of the SS/PBCH block.  Note 4: The configuration of PDCCH monitoring occasions for RMSI CORESET is defined in Table 13-12 in TS 38.213 [3].  Note 5: Cell ID shall depend upon the test configuration.  Note 6: Payload size shall depend upon the test configuration.  Note 7: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 0 in Table 13-8 in TS 38.213 [3].  Note 8: Other values can be used to align with GSCN [13] as long as SSB does not overlap the RMC.  Note 9: The configuration of set of resource blocks and slot symbols of control resource set for Type0-PDCCH search space corresponds to index 2 in Table 13-10 in TS 38.213 [3]. | | | | | | | | |

### A.3.1.3 CORESET for RMC scheduling

#### A.3.1.3.1 FDD

Table A.3.1.3.1-1: Control Channel RMC for FDD with SCS=15KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CCR.1.1 FDD | CCR.1.2 FDD | CCR.1.3 FDD | CCR.1.4 FDD |  |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case |  |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 |  |  |  |
| Allocated resource blocks for CORESET Note 3 |  | 24 | 18 | 24 | 18 |  |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 | 1 |  |  |  |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 |  |  |  |
| REG bundle size |  | 6 | 6 | 6 | 6 |  |  |  |
| DMRS precoder granularity |  | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |  |  |  |
| CCE to REG mapping |  | Interleaved | Interleaved | Interleaved | Interleaved |  |  |  |
| Interleave n\_shift |  | 0 | 0 | 0 | 0 |  |  |  |
| Interleave size |  | 2 | 2 | 2 | 2 |  |  |  |
| Beamforming Pre-Coder |  | N/A | N/A | N/A | N/A |  |  |  |
| Aggregation level | CCE | 4 | 2 | 8 | 4 |  |  |  |
| DCI formats |  | Note 1 | Note 1 | Note 1 | Note 1 |  |  |  |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 |  |  |  |
| Note 1: DCI format shall depend upon the test configuration.  Note 2: Payload size shall depend upon the test configuration  Note 3: Allocated in the resource blocks where the associated RMC is scheduled. | | | | | | | | |

#### A.3.1.3.2 TDD

Table A.3.1.3.2-1: Control Channel RMC for TDD with SCS=15KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CCR.1.1 TDD | CCR.1.2 TDD | CCR.1.3 TDD | CCR.1.4 TDD |  |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case |  |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 |  |  |  |
| Allocated resource blocks for CORESET Note 3 |  | 24 | 18 | 24 | 18 |  |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 | 1 |  |  |  |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 |  |  |  |
| REG bundle size |  | 6 | 6 | 6 | 6 |  |  |  |
| DMRS precoder granularity |  | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |  |  |  |
| CCE to REG mapping |  | Interleaved | Interleaved | Interleaved | Interleaved |  |  |  |
| Interleave n\_shift |  | 0 | 0 | 0 | 0 |  |  |  |
| Interleave size |  | 2 | 2 | 2 | 2 |  |  |  |
| Beamforming Pre-Coder |  | N/A | N/A | N/A | N/A |  |  |  |
| Aggregation level | CCE | 4 | 2 | 8 | 4 |  |  |  |
| DCI formats |  | Note 1 | Note 1 | Note 1 | Note 1 |  |  |  |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 |  |  |  |
| Note 1: DCI format shall depend upon the test configuration.  Note 2: Payload size shall depend upon the test configuration  Note 3: Allocated in the resource blocks where the associated RMC is scheduled. | | | | | | | | |

Table A.3.1.3.2-2: Control Channel RMC for TDD with SCS=30KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CCR.2.1 TDD | CCR.2.2 TDD | CCR.2.3 TDD | CCR.2.4 TDD |  |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case |  |  |  |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 |  |  |  |
| Allocated resource blocks for CORESET Note 3 |  | 24 | 24 | 18 | 18 |  |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 | 1 |  |  |  |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 |  |  |  |
| REG bundle size |  | 6 | 6 | 6 | 6 |  |  |  |
| DMRS precoder granularity |  | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |  |  |  |
| CCE to REG mapping |  | Interleaved | Interleaved | Interleaved | Interleaved |  |  |  |
| Interleave n\_shift |  | 0 | 0 | 0 | 0 |  |  |  |
| Interleave size |  | 2 | 2 | 2 | 2 |  |  |  |
| Beamforming Pre-Coder |  | N/A | N/A | N/A | N/A |  |  |  |
| Aggregation level | CCE | 4 | 8 | 4 | 2 |  |  |  |
| DCI formats |  | Note 1 | Note 1 | Note 1 | Note 1 |  |  |  |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 |  |  |  |
| Note 1: DCI format shall depend upon the test configuration.  Note 2: Payload size shall depend upon the test configuration.  Note 3: Allocated in the same resource blocks where the associated RMC is scheduled. | | | | | | | | |

Table A.3.1.3.2-3: Control Channel RMC for TDD with SCS=120KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CCR.3.1 TDD | CCR.3.2 TDD | CCR.3.3 TDD | CCR.3.4 TDD | CCR.3.5 TDD | CCR.3.6 TDD | CCR.3.7 TDD |
| Channel bandwidth | MHz | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| Allocated resource blocks for CORESET Note 3 |  | 24 | 24 | 24 | 24 | 24 | 24 | 48 |
| Number of transmitter antennas |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| monitoringSlotPeriodicityAndOffset Note 4 |  | sl160  0 | sl160  0 | sl160  80 | sl160  0 | sl160  0 | sl160  80 | sl160  0 |
| monitoringSymbolsWithinSlot |  | 1100000  0000000 | 0011000  0000000 | 1100000  0000000 | 1000000  0000000 | 0010000  0000000 | 1000000  0000000 | 1100000  0000000 |
| Duration of CORESET | slot | 1 | 1 | 1 | 2 | 2 | 2 | 1 |
| REG bundle size |  | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| DMRS precoder granularity |  | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |
| CCE to REG mapping |  | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved |
| Interleave n\_shift |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Interleave size |  | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Beamforming Pre-Coder |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Aggregation level | CCE | 4 | 4 | 4 | 8 | 8 | 8 | 4 |
| DCI formats |  | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 | Note 1 |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| Note 1: DCI format shall depend upon the test configuration.  Note 2: Payload size shall depend upon the test configuration.  Note 3: Allocated in the same resource blocks where the associated PDSCH RMC is scheduled.  Note 4: *monitoringSlotPeriodicityAndOffet* is set to “sl1 0” if it is specifically stated that cell(s) configured with one of the control channel RMCs above shall transmit PDCCHs continuously. | | | | | | | | |

### A.3.1.4 TDD UL/DL configuration

Table A.3.1.4-1: TDD UL/DL configuration for SCS=15kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.1.1 |  |  |
| *referenceSubcarrierSpacing* | kHz | 15 |  |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘DSUU’  S=’10DL:2GP:2UL’ |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 4 |  |  |
| *nrofDownlinkSlots* |  | 1 |  |  |
| *nrofDownlinkSymbols* |  | 10 |  |  |
| *nrofUplinkSlot* |  | 2 |  |  |
| *nrofUplinkSymbols* |  | 2 |  |  |
| TDD UL/DL pattern 2 Note 2 |  | ‘D’ |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 1 |  |  |
| *nrofDownlinkSlots* |  | 1 |  |  |
| *nrofDownlinkSymbols* |  | 0 |  |  |
| *nrofUplinkSlot* |  | 0 |  |  |
| *nrofUplinkSymbols* |  | 0 |  |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

Table A.3.1.4-2: TDD UL/DL configuration for SCS=30kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.2.1 |  |  |
| *referenceSubcarrierSpacing* | kHz | 30 |  |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘3D1S4U’  S=’6DL:4GP:4UL’ |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 4 |  |  |
| *nrofDownlinkSlots* |  | 3 |  |  |
| *nrofDownlinkSymbols* |  | 6 |  |  |
| *nrofUplinkSlot* |  | 4 |  |  |
| *nrofUplinkSymbols* |  | 4 |  |  |
| TDD UL/DL pattern 2 Note 2 |  | ‘DD’ |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 1 |  |  |
| *nrofDownlinkSlots* |  | 2 |  |  |
| *nrofDownlinkSymbols* |  | 0 |  |  |
| *nrofUplinkSlot* |  | 0 |  |  |
| *nrofUplinkSymbols* |  | 0 |  |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

Table A.3.1.4-3: TDD UL/DL configuration for SCS=120kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.3.1 |  |  |
| *referenceSubcarrierSpacing* | kHz | 120 |  |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘DDDSU’  S=’10DL:2GP:2UL’ |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | 0.625 |  |  |
| *nrofDownlinkSlots* |  | 3 |  |  |
| *nrofDownlinkSymbols* |  | 10 |  |  |
| *nrofUplinkSlot* |  | 1 |  |  |
| *nrofUplinkSymbols* |  | 2 |  |  |
| TDD UL/DL pattern 2 Note 2 |  | Not configured |  |  |
| *dl-UL-TransmissionPeriodicity* | ms | Not configured |  |  |
| *nrofDownlinkSlots* |  | Not configured |  |  |
| *nrofDownlinkSymbols* |  | Not configured |  |  |
| *nrofUplinkSlot* |  | Not configured |  |  |
| *nrofUplinkSymbols* |  | Not configured |  |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

## A.3.2 OFDMA channel noise generator (OCNG)

### A.3.2.1 Generic OFDMA Channel Noise Generator (OCNG)

The OCNG pattern is used in a test for modelling allocations of unused resources in the channel bandwidth to virtual UEs (which are not under test). The OCNG pattern comprises PDCCH and PDSCH transmissions to the virtual UEs.

#### A.3.2.1.1 OCNG pattern 1: Generic OCNG pattern for all unused REs

**Table A.3.2.1.1-1: OP.1: Generic OCNG pattern for all unused REs**

|  |  |  |
| --- | --- | --- |
| OCNG Parameters | Control Region | Data Region |
| Resource allocation | Unused REs (Note 1) | Unused REs (Note 2) |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.  Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to BWoccupied where specified in the test case. | | |

#### A.3.2.1.2 OCNG pattern 2: Generic OCNG pattern for all unused REs for 2AoA setup

Table A.3.2.1.2-2: OP.2: Generic OCNG pattern for all unused REs for 2AoA setup

|  |  |  |
| --- | --- | --- |
| OCNG Parameters | Control Region | Data Region |
| Probe | Transmitting the serving beam | |
| Resource allocation | Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. | Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test.  Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to BWoccupied where specified in the test case  Note 3: No OCNG is transmitted from the probe transmitting non-serving beam. | | |

#### A.3.2.1.3 OCNG pattern 3: Generic OCNG pattern for unused REs in the same bandwidth as CORESET

**Table A.3.2.1.3-1: OP.3: Generic OCNG pattern for unused REs in the same BW as CORESET**

|  |  |  |
| --- | --- | --- |
| OCNG Parameters | Control Region | Data Region |
| Resource allocation | Unused REs (Note 1) | Unused REs (Note 2) |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.  Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the CORESET of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell. | | |

#### A.3.2.1.4 OCNG pattern 4: Generic OCNG pattern for all unused REs outside SSB slot(s)

**Table A.3.2.1.4-1: OP.4: Generic OCNG pattern for all unused REs** **outside SSB slot(s)**

|  |  |  |
| --- | --- | --- |
| OCNG Parameters | Control Region | Data Region |
| Resource allocation | Unused REs (Note 1) | Unused REs (Note 2) |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated in the slot(s) containing SSB of the respective cell.  Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell. REs for OCNG shall not be allocated in the slot(s) containing SSB of the respective cell. | | |

A.3.2.1.5 OCNG pattern 5: Generic OCNG pattern for unused REs in the same bandwidth as CORESET for 2AoA setup

**Table A.3.2.1.5-1: OP.5: Generic OCNG pattern for unused REs in the same BW as CORESET** **for 2AoA setup**

|  |  |  |
| --- | --- | --- |
| **OCNG Parameters** | **Control Region** | **Data Region** |
| Probe | Transmitting the serving beam | |
| Resource allocation | Unused REs (Note 1) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. | Unused REs (Note 2) in the symbols where SSB/CSI-RS are not transmitted from both the serving beam probe and non-serving beam probe. |
| Channel | PDCCH | PDSCH |
| Contents | Virtual UE IDs | Uncorrelated pseudo random QPSK modulated data |
| Antenna transmission scheme | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Subcarrier spacing | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Aggregation level | Same as used in PDCCH RMC | N/A |
| Code rate | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Transmit Power | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| CP length | Same as used in PDCCH RMC | Same as used in PDSCH RMC |
| Note 1: REs not used in the active CORESETs where PDCCH is scheduled for the UE under test. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.  Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the allocated bandwidth of the CORESET of the serving cell. REs for OCNG shall not be allocated outside the allocated bandwidth of the CORESET of the serving cell.  Note 3: No OCNG is transmitted from the probe transmitting non-serving beam. | | |

### A.3.2.2 Void

## A.3.3 Reference DRX configurations

### A.3.3.1 DRX Configuration 1: DRX cycle = 40 ms and TAT = 500 ms

Table A.3.3.1-1: DRX.1: DRX cycle = 40 ms and time alignment timer (TAT) = 500 ms

|  |  |
| --- | --- |
| **Field** | **Value** |
| drx-onDurationTimer | 1 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| drx-LongCycleStartOffset | 40 ms |
| shortDRX | disable |
| TimeAlignmentTimer | 500 ms |
| Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] | |

### A.3.3.2 DRX Configuration 2: DRX cycle = 640 ms and TAT = 500 ms

Table A.3.3.2-1: DRX.2: DRX cycle = 640 ms and time alignment timer (TAT) = 500 ms

|  |  |
| --- | --- |
| **Field** | **Value** |
| drx-onDurationTimer | 1 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| drx-LongCycleStartOffset | 640 ms |
| shortDRX | disable |
| TimeAlignmentTimer | 500 ms |
| Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] | |

### A.3.3.3 DRX Configuration 3: DRX cycle = 40 ms and TAT = Infinity

Table A.3.3.3-1: DRX.3: DRX cycle = 40 ms and time alignment timer (TAT) = Infinity

|  |  |
| --- | --- |
| **Field** | **Value** |
| drx-onDurationTimer | 6 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| drx-LongCycleStartOffset | 40 ms |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] | |

### A.3.3.4 DRX Configuration 4: DRX cycle = 160 ms and TAT = Infinity

Table A.3.3.4-1: DRX.4: DRX cycle = 160 ms and time alignment timer (TAT) = Infinity

|  |  |
| --- | --- |
| Field | Value |
| drx-onDurationTimer | psf2 |
| drx-InactivityTimer | psf2 |
| drx-RetransmissionTimer | Psf16 |
| longDRX-CycleStartOffset | sf160, 0 |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. | |

### A.3.3.5 DRX Configuration 5: DRX cycle = 320 ms and TAT = Infinity

**Table A.3.3.5-1: DRX.5: DRX cycle = 320 ms and time alignment timer (TAT) = Infinity**

|  |  |
| --- | --- |
| **Field** | **Value** |
| drx-onDurationTimer | psf6 |
| drx-InactivityTimer | psf1920 |
| drx-RetransmissionTimer | psf16 |
| longDRX-CycleStartOffset | sf320, 0 |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. | |

### A.3.3.6 DRX Configuration 6: DRX cycle = 320 ms and TAT = 500 ms

**Table A.3.3.6-1: DRX.6: DRX cycle = 320 ms and time alignment timer (TAT) = 500 ms**

|  |  |
| --- | --- |
| **Field** | **Value** |
| drx-onDurationTimer | 1 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| drx-LongCycleStartOffset | 320 ms |
| shortDRX | disable |
| TimeAlignmentTimer | 500 ms |
| Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] | |

### A.3.3.7 DRX Configuration 7: DRX cycle = 640 ms and TAT = Infinity

Table A.3.3.7-1: DRX.7: DRX cycle = 640 ms and time alignment timer (TAT) = Infinity

|  |  |
| --- | --- |
| Field | Value |
| drx-onDurationTimer | 6 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| drx-LongCycleStartOffset | 640 ms |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] | |

### A.3.3.8 DRX Configuration 8: DRX cycle = 320 ms and TAT = Infinity

Table A.3.3.8-1: DRX.8: DRX cycle = 320 ms and time alignment timer (TAT) = Infinity

|  |  |
| --- | --- |
| Field | Value |
| drx-onDurationTimer | 6 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| drx-LongCycleStartOffset | 320 ms |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] | |

### A.3.3.9 DRX Configuration 9: DRX cycle = 40 ms and TAT = 500 ms

Table A.3.3.9-1: DRX.9: DRX cycle = 40 ms and time alignment timer (TAT) = 500 ms

|  |  |
| --- | --- |
| Field | Value |
| drx-onDurationTimer | psf2 |
| drx-InactivityTimer | psf2 |
| drx-RetransmissionTimer | psf16 |
| longDRX-CycleStartOffset | sf40, 0 |
| shortDRX | disable |
| TimeAlignmentTimer | 500 ms |
| Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. | |

### A.3.3.10 DRX Configuration 10: DRX cycle = 640 ms and TAT = 500 ms

Table A.3.3.10-1: DRX.10: DRX cycle = 640 ms and time alignment timer (TAT) = 500 ms

|  |  |
| --- | --- |
| Field | Value |
| drx-onDurationTimer | psf6 |
| drx-InactivityTimer | psf2 |
| drx-RetransmissionTimer | psf16 |
| longDRX-CycleStartOffset | sf640, 0 |
| shortDRX | disable |
| TimeAlignmentTimer | 500 ms |
| Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. | |

### A.3.3.11 DRX Configuration 11: DRX cycle = 20 ms and TAT = Infinity

Table A.3.3.11-1: DRX.11: DRX cycle = 20 ms and time alignment timer (TAT) = Infinity

|  |  |
| --- | --- |
| **Field** | **Value** |
| drx-onDurationTimer | 6 ms |
| drx-InactivityTimer | 1 ms |
| drx-RetransmissionTimerDL | 1 slot |
| drx-RetransmissionTimerUL | 1 slot |
| drx-LongCycleStartOffset | 20 ms |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| Note: This DRX configuration is applicable for NR serving cell. The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [2] | |

### A.3.3.12 DRX Configuration 12: DRX cycle = 640 ms and TAT = Infinity

Table A.3.3.12-1: DRX.12: DRX cycle = 640 ms and time alignment timer (TAT) = Infinity

|  |  |
| --- | --- |
| Field | Value |
| drx-onDurationTimer | psf6 |
| drx-InactivityTimer | psf2 |
| drx-RetransmissionTimer | psf16 |
| longDRX-CycleStartOffset | sf640, 0 |
| shortDRX | disable |
| TimeAlignmentTimer | Infinity |
| Note: This DRX configuration is applicable for E-UTRA serving cell. For further information see clause 6.3.2 in TS 36.331 [16]. | |

## A.3.4 Test Cases with Different Channel Bandwidths

### A.3.4.1 Test Cases with Different E-UTRA Channel Bandwidths

#### A.3.4.1.1 Introduction

In Annex A test cases involving E-UTRA cell(s) may be defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement.

#### A.3.4.1.2 Principle of testing

If multiple test cases involving E-UTRA cell(s) are defined with different E-UTRA channel bandwidths to verify the same type of RRM requirement that is E-UTRA channel bandwidth independent, then the UE needs to be tested with only one channel bandwidth in each E-UTRA cell and with the same bandwidth in all the E-UTRA cells used in the test case.

## A.3.5 Test Cases for Synchronous and Asynchronous DC Operations

### A.3.5.1 EN-DC Test Cases for Synchronous and Asynchronous EN-DC Operations

#### A.3.5.1.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements for EN-DC operation in synchronous and asynchronous scenarios.

In Annex A test cases may be defined in both synchronous EN-DC and asynchronous EN-DC scenarios to verify the same type of RRM requirement.

#### A.3.5.1.2 Principle of Testing

If EN-DC test cases are defined in both synchronous and asynchronous EN-DC scenarios to verify the same type of RRM requirement then the UE capable of both synchronous and asynchronous EN-DC operations needs to be tested with one of the tests in either synchronous or asynchronous EN-DC scenarios.

## A.3.6 Antenna configurations

### A.3.6.1 Antenna configurations for FR1

Unless otherwise specified, NR FDD or NR TDD cells in all RRM Test cases in AWGN propagation condition are configured with Antenna Configuration 1x2.

#### A.3.6.1.1 Antenna connection for 4 Rx capable UEs

##### A.3.6.1.1.1 Introduction

All tests in clause A.4 and A.6 are specified for UEs supporting 2RX. In this clause, the antenna connection method for applying 2RX tests to UEs supporting 4RX antenna ports is specified. No tests are currently specified in clause A.4 or A.6 which are applicable only to 4RX antenna ports, so 4RX capable UEs are always tested by reusing tests which were originally specified for 2RX UEs.

##### A.3.6.1.1.2 Principle of testing

A.3.6.1.1.2.1 Single carrier tests

For 4RX capable UEs supporting at least one band where 2RX is supported and 4RX is not supported, all single carrier tests specified in clause A.4 and A.6 except those in A.4.7 and A.6.7 shall be tested on any band where 2RX is supported and 4RX is not supported with the antenna connection specified in A.3.6.1.1.2.4. For single carrier tests specified in clause A.4.7 or A.6.7, all tests shall be tested with the antenna connection specified in A.3.6.1.1.2.4 for bands where 2RX is supported and 4RX is not supported, and the antenna connection specified in A.3.6.1.1.2.5 for bands where 4RX is supported.

For 4RX capable UEs which do not support any band where 2RX is supported and 4RX is not supported, all tests specified in clauses A.4 and A.6 shall be tested using the antenna connection specified in clause A.3.6.1.1.2.5. For radio link monitoring tests, the SNR levels are modified according to table A.3.6.1.1.2.1-1 and table A.3.6.1.1.2.1-2.

**Table A.3.6.1.1.2.1-1: Modified parameters for RLM out of sync testing with 4 RX antenna connection**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test case** | **SNR during T3 (dB)** | | | |
| **Test 1** | **Test 2** | **Test 3** | **Test 4** |
| A.4.5.1.1 | -18 | N/A | N/A | N/A |
| A.4.5.1.3 | -18 | N/A | N/A | N/A |
| A.4.5.1.5 | -18 | N/A | N/A | N/A |
| A.4.5.1.7 | -18 | N/A | N/A | N/A |
| A.5.5.1.1 | -18 | N/A | N/A | N/A |
| A.5.5.1.3 | -18 | N/A | N/A | N/A |
| A.5.5.1.5 | -18 | N/A | N/A | N/A |
| A.5.5.1.7 | -18 | N/A | N/A | N/A |
| A.6.5.1.1 | -18 | N/A | N/A | N/A |
| A.6.5.1.3 | -18 | N/A | N/A | N/A |
| A.6.5.1.5 | -18 | N/A | N/A | N/A |
| A.6.5.1.7 | -18 | N/A | N/A | N/A |
| A.7.5.1.1 | -18 | N/A | N/A | N/A |
| A.7.5.1.3 | -18 | N/A | N/A | N/A |
| A.7.5.1.5 | -18 | N/A | N/A | N/A |
| A.7.5.1.7 | -18 | N/A | N/A | N/A |

**Table A.3.6.1.1.2.1-2: Modified parameters for RLM in sync single carrier testing with 4 RX antenna connection**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Test case** | **SNR during T3 (dB)** | | **SNR during T4 (dB)** | |
| **Test 1** | **Test 2** | **Test 1** | **Test 2** |
| A.4.5.1.2 | -18 | N/A | -8 | N/A |
| A.4.5.1.4 | -18 | N/A | -8 | N/A |
| A.4.5.1.6 | -18 | N/A | -8 | N/A |
| A.4.5.1.8 | -18 | N/A | -8 | N/A |
| A.5.5.1.2 | -18 | N/A | -8 | N/A |
| A.5.5.1.4 | -18 | N/A | -8 | N/A |
| A.5.5.1.6 | -18 | N/A | -8 | N/A |
| A.5.5.1.8 | -18 | N/A | -8 | N/A |
| A.6.5.1.2 | -18 | N/A | -8 | N/A |
| A.6.5.1.4 | -18 | N/A | -8 | N/A |
| A.6.5.1.6 | -18 | N/A | -8 | N/A |
| A.6.5.1.8 | -18 | N/A | -8 | N/A |
| A.7.5.1.2 | -18 | N/A | -8 | N/A |
| A.7.5.1.4 | -18 | N/A | -8 | N/A |
| A.7.5.1.6 | -18 | N/A | -8 | N/A |
| A.7.5.1.8 | -18 | N/A | -8 | N/A |

**Table A.3.6.1.1.2.1-3: Modified parameters for Beam Failure Detection and Link Recovery testing with 4 RX antenna connection**

|  |  |
| --- | --- |
| **Test case** | **SNR for RS in set q0 during T3, T4 and T5 (dB)** |
| **Test 1** |
| A.4.5.5.1 | -15 |
| A.4.5.5.2 | -15 |
| A.4.5.5.3 | -15 |
| A.4.5.5.4 | -15 |
| A.5.5.5.1 | -15 |
| A.5.5.5.2 | -15 |
| A.5.5.5.3 | -15 |
| A.5.5.5.4 | -15 |
| A.6.5.5.1 | -15 |
| A.6.5.5.2 | -15 |
| A.6.5.5.3 | -15 |
| A.6.5.5.4 | -15 |
| A.7.5.5.1 | -15 |
| A.7.5.5.2 | -15 |
| A.7.5.5.3 | -15 |
| A.7.5.5.4 | -15 |

A.3.6.1.1.2.2 Carrier aggregation tests

All carrier aggregation tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the PCell antenna connection if the PCell is on a band where 2RX is supported and 4RX is not supported, or using the antenna connection in A.3.6.1.1.2.5 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All carrier aggregation tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the SCell antenna connection if an SCell is on band where 2RX is supported and 4RX is not supported, or using the antenna connection in A.3.6.1.1.2.5 for the SCell antenna connection if an SCell is on a band where 4RX is supported.

A.3.6.1.1.2.3 EN-DC tests

All EN-DC tests are performed using the antenna connection in clause A.3.6.1.1.2.6 for the PCell antenna connection if the PCell is on a band where 2RX is supported and 4RX is not supported, or using the antenna connection in A.3.6.1.1.2.7 for the PCell antenna connection if the PCell is on a band where 4RX is supported.

All EN-DC tests are performed using the antenna connection in clause A.3.6.1.1.2.4 for the PSCell or SCell antenna connection if an SCell is on band where 2RX is supported and 4RX is not supported, or using the antenna connection in A.3.6.1.1.2.5 for the SCell antenna connection if an SCell or PSCell is on a band where 4RX is supported.

A.3.6.1.1.2.4 Antenna connection for bands where 2RX is supported

For bands where 2RX is supported and 4RX is not supported, it is left to the UE declaration and antenna port configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 RX ports shall be connected with zero input**.** No test parameters or requirements are modified.

A.3.6.1.1.2.5 Antenna connection for bands where 4RX is supported

For bands where 4RX is supported, all 4 RX antennas are connected with data source from system simulator**.** The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.6.1.1.2.1 and A.3.6.1.1.2.2, no test parameters or requirements are modified.

A.3.6.1.1.2.6 EN-DC LTE Antenna connection for bands where 2RX is supported

For E-UTRAN bands where 2RX is supported and 4RX is not supported, it is left to the UE declaration and antenna port configuration to decide which 2 of the 4 Rx ports are connected with data source from system simulator. The remaining 2 RX ports shall be connected with zero input**.** No test parameters or requirements are modified.

A.3.6.1.1.2.7 EN-DC LTE Antenna connection for bands where 4RX is supported

For E-UTRAN bands where 4RX is supported, all 4 RX antennas are connected with data source from system simulator**.** The system simulator shall provide independent noise and fading (low correlation) for each antenna port. Except for the modifications to radio link monitoring thresholds described in clauses A.3.8.1.2.1 and A.3.8.1.2.2 of TS 36.133 [15], no test parameters or requirements are modified.

### A.3.6.2 Antenna configurations for FR2

Unless otherwise specified, the default Downlink Antenna Configuration for NR FR2 cells is 1x2.

In case of Downlink Antenna Configuration 2x2 for NR FR2 cells, unless otherwise specified, the downlink signal is transmitted over the two polarizations (V and H) of the dual polarized antenna of the test equipment.

In both cases, the downlink signal is received assuming 2 UE baseband receivers. As the UE is tested following the Blackbox Approach with regard to the UE Rx antennas, the exact UE Rx antenna configuration is not relevant for the test configuration and has no impact on the test implementation.

## A.3.7 EN-DC test setup

### A.3.7.1 Introduction

### A.3.7.2 E-UTRAN Serving Cell Parameters

#### A.3.7.2.1 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR1

Table A.3.7.2.1-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with all NR cells in FR1. Unless otherwise stated within the test, all measurements in Annex A.4 and A.5 are performed only on the NR carrier. The E-UTRA serving cell shall configured to not interfere with NR operation and the E-UTRA serving cell signal power shall not be critical to the test purpose.

Table A.3.7.2.1-1: E-UTRAN cell specific test parameters for tests with all NR cells in FR1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | E-UTRAN Cell |
| Duplex mode |  | FDD or TDD |
| TDD special subframe configurationNote1 |  | 6 |
| TDD uplink-downlink configurationNote1 |  | 1 |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD |
| PBCH\_RA | dB | 0 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote3 | dB |
| OCNG\_RBNote3 | dB |
| NocNote4 | dBm/15 kHz | -104 |
| Ês/Noc | dB | 17 |
| Ês/Iot | dB | 17 |
| RSRP Note5 | dBm/15 kHz | -87 |
| SCH\_RP Note5 | dBm/15 kHz | -87 |
| Io Note5 | dBm/Ch BW | -59.13+10log(NRB,c /50) |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 1x2 |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |

#### A.3.7.2.2 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR2

Table A.3.7.2.2-1 defines cell specific test parameters for E-UTRAN cell which can be used in EN-DC test cases or in any test case comprising at least one E-UTRA serving cell with one or more NR cells in FR2.

Table A.3.7.2.2-1: E-UTRAN cell specific test parameters for tests with one or more NR cells in FR2

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | E-UTRAN Cell |
| Duplex mode |  | FDD or TDD |
| TDD special subframe configurationNote1 |  | 6 |
| TDD uplink-downlink configurationNote1 |  | 1 |
| BWchannel | MHz | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD |
| PBCH\_RA | dB | 0 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| PCFICH\_RB | dB |
| PHICH\_RA | dB |
| PHICH\_RB | dB |
| PDCCH\_RA | dB |
| PDCCH\_RB | dB |
| PDSCH\_RA | dB |
| PDSCH\_RB | dB |
| OCNG\_RANote3 | dB |
| OCNG\_RBNote3 | dB |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: The E-UTRA signal is required only to ensure the E-UTRA link to the DUT in the EN-DC operation. The Test System shall provide a stable and noise-free E-UTRA signal without need of precise propagation modelling, path loss and polarization control. Further details of the E-UTRA signal configuration are not defined as part of the cell specific test parameters, since the E-UTRA link is not under performance verification and shall not affect the test result unless otherwise specifically stated in the test case. | | |

## A.3.7A NR FR1-FR2 test setup

Some Test cases in clause A.7 have NR cells in both FR1 and FR2. Unless otherwise stated within the test, the NR FR1 Cell signal is required only to provide a link to the UE under test. The Test System shall provide a stable and noise-free NR FR1 signal without need of precise propagation modelling, path loss and polarization control. Further details of the NR FR1 signal configuration are not defined as part of the cell specific test parameters, since the NR FR1 link is not under performance verification and shall not affect the test result unless otherwise specifically stated in the test case.

## A.3.7B Void

## A.3.7C LTE-FR1/FR2 test setup

Some Test cases in clause A.5 have LTE and FR2 NR cells. Unless otherwise stated within the test, the LTE Cell signal is required only to provide a link to the UE under test. The Test System shall provide a stable and noise-free LTE signal without need of precise propagation modelling, path loss and polarization control. Further details of the LTE signal configuration are not defined as part of the cell specific test parameters, since the LTE link is not under performance verification and shall not affect the test result unless otherwise specifically stated in the test case.

## A.3.7D NE-DC test setup

### A.3.7D.1 Introduction

### A.3.7D.2 E-UTRAN Serving Cell Parameters

#### A.3.7D.2.1 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR1

The parameters are same as as specified in clause A.3.7.2.1.

#### A.3.7D.2.2 E-UTRAN Serving Cell Parameters for Tests with NR Cell(s) in FR2

The parameters are same as as specified in clause A.3.7.2.2.

## A.3.8 PRACH configurations

### A.3.8.1 Introduction

This clause provides the typical PRACH configurations used for RRM test cases defined in Annex A. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

### A.3.8.2 PRACH configurations in FR1

#### A.3.8.2.1 FR1 PRACH configuration 1

FR1 PRACH configuration 1 in this clause provides the typical PRACH configuration for SSB-based contention based random access in FR1.

Table A.3.8.2.1-1: Parameters for FR1 PRACH configuration 1

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| rsrp-ThresholdSSB | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| ra-ContentionResolutionTimer | sf48 | 48 sub-frames |
| powerRampingStep | dB2 |  |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| ra-ResponseWindow | sl10 | 10 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.8.2.2 FR1 PRACH configuration 2

FR1 PRACH configuration 2 in this clause provides the typical PRACH configuration for SSB based non-contention based random access in FR1.

Table A.3.8.2.2-1: Parameters for FR1 PRACH configuration 2

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| powerRampingStep | dB2 |  |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| ra-ResponseWindow | sl10 | 10 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| *ssb-ResourceList* | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn’t use this field if is transmitting CFRA to convey BFR. |
| *BFR-SSB-Resource* | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | 1 | PRACH occasion index 1 is allowed |
| rsrp-ThresholdSSB | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.8.2.3 FR1 PRACH configuration 3

FR1 PRACH configuration 3 in this clause provides the typical PRACH configuration for CSI-RS based non-contention based random access in FR1.

Table A.3.8.2.3-1: Parameters for FR1 PRACH configuration 3

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| *prach-ConfigurationIndex* | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| powerRampingStep | dB2 |  |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| ra-ResponseWindow | sl10 | 10 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| csirs-ResourceList | ra-PreambleIndex = 50 | Associated with CSI-RS configured |
| ra-OccasionList | 1 | RA occasions allowed corresponding to CSI-RS |
| rsrp-ThresholdCSI-RS | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.8.2.4 FR1 PRACH configuration 4

FR1 PRACH configuration 4 in this clause provides the PRACH configuration for CSI-RS based non-contention based random access in FR1 to convey BFR.

Table A.3.8.2.4-1: Parameters for FR1 PRACH configuration 4

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 102 | 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-2 and table 6.3.3.2-3 in TS 38.211 [6]. |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| powerRampingStep | dB2 |  |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n200 | Max number of RA preamble transmission performed before declaring a failure is 200 |
| ra-ResponseWindow | sl1 | 1 slot |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 93 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| BFR-CSIRS-Resource | ra-PreambleIndex = 50 | Associated with CSI-RS configured |
| ra-OccasionList | 1 | RA occasions allowed corresponding to CSI-RS |
| rsrp-ThresholdSSB | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

### A.3.8.3 PRACH configurations in FR2

#### A.3.8.3.1 FR2 PRACH configuration 1

FR2 PRACH configuration 1 in this clause provides the typical PRACH configuration for SSB-based contention based random access in FR2.

Table A.3.8.3.1-1: Parameters for FR2 PRACH configuration 1

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 190 | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| rsrp-ThresholdSSB | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| ra-ContentionResolutionTimer | sf48 | 48 sub-frames |
| powerRampingStep | dB2 |  |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| ra-ResponseWindow | sl10 | 10 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| Backoff Parameter Index | 2 | 20 ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.8.3.2 FR2 PRACH configuration 2

FR2 PRACH configuration 2 in this clause provides the typical PRACH configuration for SSB based non-contention based random access in FR2.

Table A.3.8.3.2-1: Parameters for FR2 PRACH configuration 2

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 190 | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| powerRampingStep | dB2 |  |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| ra-ResponseWindow | sl10 | 10 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| Backoff Parameter Index | 2 | 20 ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| *ssb-ResourceList* | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn’t use this field if is transmitting CFRA to convey BFR. |
| *BFR-SSB-Resource* | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | 1 | PRACH occasion index 1 is allowed |
| rsrp-ThresholdSSB | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.8.3.3 FR2 PRACH configuration 3

FR2 PRACH configuration 3 in this clause provides the typical PRACH configuration for CSI-RS based non-contention based random access in FR2.

Table A.3.8.3.3-1: Parameters for FR2 PRACH configuration 3

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 190 | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random acces |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| powerRampingStep | dB2 |  |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| ra-ResponseWindow | sl10 | 10 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| Backoff Parameter Index | 2 | 20 ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| csirs-ResourceList | ra-PreambleIndex = 50 | Associated with CSI-RS configured |
| ra-OccasionList | 1 | RA occasions allowed corresponding to CSI-RS |
| rsrp-ThresholdCSI-RS | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.8.3.4 FR2 PRACH configuration 4

FR2 PRACH configuration 4 in this clause provides the PRACH configuration for CSI-RS based non-contention based random access in FR2 to convey BFR.

Table A.3.8.3.4-1: Parameters for FR2 PRACH configuration 4

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| prach-ConfigurationIndex | 190 | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configuration defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msg1-SubcarrierSpacing | Same as UL carrier SCS |  |
| totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| prach-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msg1-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| powerRampingStep | dB2 |  |
| preambleReceivedTargetPower | dBm-120 |  |
| preambleTransMax | n200 | Max number of RA preamble transmission performed before declaring a failure is 200. |
| ra-ResponseWindow | sl40 | 40 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, NCS = 23 |
| Backoff Parameter Index | 2 | 20 ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| BFR-CSIRS-Resource | ra-PreambleIndex = 50 | Associated with CSI-RS configured |
| ra-OccasionList | 1 | RA occasions allowed corresponding to CSI-RS |
| rsrp-ThresholdSSB | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

## A.3.9 BWP configurations

### A.3.9.1 Introduction

This clause provides the typical BWP configurations used for RRM test cases defined in Annex A. For downlink BWP, both initial BWP and dedicated BWP configurations are specified in clause A.3.9.2 and for uplink BWP, both initial BWP and dedicated BWP configurations are specified in clause A.3.9.3. To note that for other parameters not listed in this clause, either it can be derived from the set up of each test or it is subjected to RAN5 specifications.

### A.3.9.2 Downlink BWP configurations

#### A.3.9.2.1 Initial BWP

**Table A.3.9.2.1-1: Downlink BWP patterns for initial BWP configuration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| BWP Parameters | Unit | Values | | |
| Reference BWP |  | DLBWP.0.1 | DLBWP.0.2 |  |
| Starting PRB index |  | 0 | RBc Note 1 |  |
| Bandwidth | RB | Same as RF channel defined in each test | same as RMSI CORESET (CORESET #0) defined in each test |  |
| Note 1: RBc is the lowest PRB index to guarantee the BWP including CORESET #0 which is defined in Clause A.3.1.2. | | | | |

#### A.3.9.2.2 Dedicated BWP

**Table A.3.9.2.2-1: Downlink BWP patterns for dedicated BWP configuration**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| BWP Parameters | Unit | Values | | | |
| Reference BWP |  | DLBWP.1.1 | DLBWP.1.2 | DLBWP.1.3 | DLBWP.1.4 |
| Starting PRB index |  | 0 | RBb Note 1 | RBa Note 2 | 0 |
| Bandwidth | RB | Same as RF channel defined in each test | 25 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  48 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  48 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz  24 for SSB SCS = 240KHz |
| Note 1: RBb is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10.  Note 2: RBa is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10. | | | | | |

### A.3.9.3 Uplink BWP configurations

#### A.3.9.3.1 Initial BWP

**Table A.3.9.3.1-1: Uplink BWP patterns for initial BWP configuration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| BWP Parameters | Unit | Values | | |
| Reference BWP |  | ULBWP.0.1 | ULBWP.0.2 |  |
| Starting PRB index |  | 0 | RBc Note 1 |  |
| Bandwidth | RB | Same as RF channel defined in each test | same as RMSI CORESET (CORESET #0) defined in each test |  |
| Note 1: RBc is same as RBc for DLBWP.0.2 as defined in Table A.3.9.2.1-1. | | | | |

#### A.3.9.3.2 Dedicated BWP

**Table A.3.9.3.2-1: Uplink BWP patterns for dedicated BWP configuration**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| BWP Parameters | Unit | Values | | | |
| Reference BWP |  | ULBWP.1.1 | ULBWP.1.2 | ULBWP.1.3 | ULBWP.1.4 |
| Starting PRB index |  | 0 | RBb Note 1 | RBa Note 2 | 0 |
| Bandwidth | RB | Same as RF channel defined in each test | 25 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  48 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  48 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz  24 for SSB SCS = 240KHz |
| Note 1: RBb is same as RBb for DLBWP.1.2 as defined in Table A.3.9.2.2-1.  Note 2: RBa is same as RBa for DLBWP.1.3 as defined in Table A.3.9.2.2-1. | | | | | |

## A.3.10 SSB Configurations

### A.3.10.1 SSB Configurations for FR1

#### A.3.10.1.1 SSB pattern 1 in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

**Table A.3.10.1.1-1: SSB.1 FR1: SSB Pattern 1 for SSB SCS=15 kHz in 10 MHz channel**

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 10 MHz |
| SSB SCS | 15 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB Note 2 | 2-5 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10.1.2 SSB pattern 2 in FR1: SSB allocation for SSB SCS=30 kHz in 40 MHz

**Table A.3.10.1.2-1: SSB.2 FR1: SSB Pattern 2 for SSB SCS=30 kHz in 40 MHz channel**

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 40 MHz |
| SSB SCS | 30 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB Note 3 | 4-7 or 2-5 Note 2 |
| Slot numbers containing SSB Note 3 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen.  Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10.1.3 SSB pattern 3 in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

**Table A.3.10.1.3-1: SSB.3 FR1: SSB Pattern 3 for SSB SCS=15 kHz in 10 MHz channel**

|  |  |  |
| --- | --- | --- |
| SSB Parameters | Values | |
| Channel bandwidth | 10 MHz | |
| SSB SCS | 15 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 0 | 1 |
| Symbol numbers containing SSB Note 2 | 2-5 | 8-11 |
| Slot numbers containing SSB Note 2 | 0 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104  [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

#### A.3.10.1.4 SSB pattern 4 in FR1: SSB allocation for SSB SCS=30 kHz in 40 MHz

**Table A.3.10.1.4-1: SSB.4 FR1: SSB Pattern 4 for SSB SCS=30 kHz in 40 MHz channel**

|  |  |  |
| --- | --- | --- |
| SSB Parameters | Values | |
| Channel bandwidth | 40 MHz | |
| SSB SCS | 30 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 0 | 1 |
| Symbol numbers containing SSB Note 3 | 4-7 or 2-5 Note 2 | 8-11 |
| Slot numbers containing SSB Note 3 | 0 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen.  Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

#### A.3.10.1.5 SSB pattern 5 in FR1: SSB allocation for SSB SCS=15 kHz starting from odd SFN in 10 MHz

**Table A.3.10.1.5-1: SSB.5 FR1: SSB Pattern 5 for SSB SCS=15 kHz in 10 MHz channel**

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 10 MHz |
| SSB SCS | 15 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB Note 2 | 2-5 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 1 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10.1.6 SSB pattern 6 in FR1: SSB allocation for SSB SCS=30 kHz starting from odd SFN in 40 MHz

**Table A.3.10.1.6-1: SSB.6 FR1: SSB Pattern 6 for SSB SCS=30 kHz in 40 MHz channel**

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 40 MHz |
| SSB SCS | 30 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB Note 3 | 4-7 or 2-5 Note 2 |
| Slot numbers containing SSB Note 3 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 1 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen.  Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

### A.3.10.2 SSB Configurations for FR2

#### A.3.10.2.1 SSB pattern 1 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

**Table A.3.10.2.1-1: SSB.1 FR2: SSB Pattern 1 for SSB SCS = 120 kHz in 100 MHz channel with 2 SSBs per SS-burst**

|  |  |  |
| --- | --- | --- |
| **SSB Parameters** | **Values** | |
| Channel bandwidth | 100 MHz | |
| SSB SCS | 120 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 0 | 1 |
| Symbol numbers containing SSBs Note 2 | 4-7 | 8-11 |
| Slot numbers containing SSB Note 2 | 0 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

#### A.3.10.2.2 SSB pattern 2 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

**Table A.3.10.2.2-1: SSB.2 FR2: SSB Pattern 2 for SSB SCS = 240 kHz in 100 MHz channel with 2 SSBs per SS-burst**

|  |  |  |  |
| --- | --- | --- | --- |
| SSB Parameters | Values | | |
| Channel bandwidth | 100 MHz | | |
| SSB SCS | 240 kHz | | |
| SSB periodicity (TSSB) | 20 ms | | |
| Number of SSBs per SS-burst | 2 | | |
| SS/PBCH block index | 0 | 1 | |
| Symbol numbers containing SSBs Note 2 | 8-11 | 12-13 | 0-1 |
| Slot numbers containing SSB Note 2 | 0 | 0 | 1 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 | | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | | |

#### A.3.10.2.3 SSB pattern 3 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

**Table A.3.10.2.3-1: SSB.3 FR2: SSB Pattern 3 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst**

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 120 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSBs Note 2 | 4-7 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10.2.4 SSB pattern 4 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

**Table A.3.10.2.4-1: SSB.4 FR2: SSB Pattern 4 for SSB SCS = 240 kHz in 100 MHz channel with 1 SSB per SS-burst**

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 240 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSBs Note 2 | 8-11 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10.2.5 SSB pattern 5 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10.2.5-1: SSB.5 FR2: SSB Pattern 5 for SSB SCS = 120 kHz in 100 MHz channel with 2 SSBs per SS-burst

|  |  |  |
| --- | --- | --- |
| SSB Parameters | Values | |
| Channel bandwidth | 100 MHz | |
| SSB SCS | 120 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 2 | 3 |
| Symbol numbers containing SSBs Note 2 | 2-5 | 6-9 |
| Slot numbers containing SSB Note 2 | 1 | 1 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

#### A.3.10.2.6 SSB pattern 6 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

**Table A.3.10.2.6-1: SSB.6 FR2: SSB Pattern 6 for SSB SCS = 240 kHz in 100 MHz channel with 2 SSBs per SS-burst**

|  |  |  |
| --- | --- | --- |
| SSB Parameters | Values | |
| Channel bandwidth | 100 MHz | |
| SSB SCS | 240 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 2 | 3 |
| Symbol numbers containing SSBs Note 2 | 2-5 | 6-9 |
| Slot numbers containing SSB Note 2 | 1 | 1 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

#### A.3.10.2.7 SSB pattern 7 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

**Table A.3.10.2.7-1: SSB.7 FR2: SSB Pattern 7 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst**

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 120 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 1 |
| Symbol numbers containing SSBs Note 2 | 8-11 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10.2.8 SSB pattern 8 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

**Table A.3.10.2.8-1: SSB.8 FR2: SSB Pattern 8 for SSB SCS = 240 kHz in 100 MHz channel with 1 SSB per SS-burst**

|  |  |  |
| --- | --- | --- |
| SSB Parameters | Values | |
| Channel bandwidth | 100 MHz | |
| SSB SCS | 240 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 1 | |
| SS/PBCH block index | 1 | |
| Symbol numbers containing SSBs Note 2 | 12-13 | 0-1 |
| Slot numbers containing SSB Note 2 | 0 | 1 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

## A.3.11 SMTC Configurations

### A.3.11.1 SMTC pattern 1: SMTC period = 20 ms with SMTC duration = 1 ms

**Table A.3.11.1-1: SMTC.1: SMTC Pattern 1 for SMTC period = 20 ms and duration = 1 ms**

|  |  |
| --- | --- |
| **SMTC Parameters** | **Values** |
| SMTC periodicity | 20 ms |
| SMTC offset | 0 ms |
| SMTC duration | 1 ms |

### A.3.11.2 SMTC pattern 2: SMTC period = 20 ms with SMTC duration = 5 ms

**Table A.3.11.2-1: SMTC.2: SMTC Pattern 2 for SMTC period = 20 ms and duration = 5 ms**

|  |  |
| --- | --- |
| **SMTC Parameters** | **Values** |
| SMTC periodicity | 20 ms |
| SMTC offset | 0 ms |
| SMTC duration | 5 ms |

### A.3.11.3 SMTC pattern 3: SMTC period = 160 ms with SMTC duration = 1 ms

Table A.3.11.3-1: SMTC.3: SMTC Pattern 3 for SMTC period = 20 ms and duration = 5 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 160 ms |
| SMTC offset | 0 ms |
| SMTC duration | 1 ms |

### A.3.11.4 SMTC pattern 4: SMTC period = 20 ms with SMTC duration = 1 ms

**Table A.3.11.4-1: SMTC.4: SMTC Pattern 4 for SMTC period = 20 ms and duration = 1 ms**

|  |  |
| --- | --- |
| **SMTC Parameters** | **Values** |
| SMTC periodicity | 20 ms |
| SMTC offset | 10 ms |
| SMTC duration | 1 ms |

### A.3.11.5 SMTC pattern 5: SMTC period = 20 ms with SMTC duration = 5 ms

Table A.3.11.5-1: SMTC.5: SMTC Pattern 5 for SMTC period = 20 ms and duration = 5 ms

|  |  |
| --- | --- |
| **SMTC Parameters** | **Values** |
| SMTC periodicity | 20 ms |
| SMTC offset | 10 ms |
| SMTC duration | 5 ms |

### A.3.11.6 SMTC pattern 6: SMTC period = 20 ms with SMTC duration = 5 ms

Table A.3.11.6-1: SMTC.6: SMTC Pattern 6 for SMTC period = 20 ms and duration = 5 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 20 ms |
| SMTC offset | 17 ms |
| SMTC duration | 5 ms |

A.3.12 Test Cases with Different CC Configurations

### A.3.12.1 EN-DC Test Cases with Different EN-DC Configurations

#### A.3.12.1.1 Introduction

In Annex A EN-DC test cases may be defined for two component carriers (CCs) as well as for more than two CCs to verify the same RRM requirement.

#### A.3.12.1.2 Principle of testing

If multiple EN-DC test cases are defined for two CCs as well as for more than two CCs to verify the same type of RRM requirement, which depends on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with the maximum number of CCs in EN-DC supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the EN-DC test cases with two CCs in EN-DC supported by the UE.

*Editor’s: The maximum number of CCs that can be used in FR2 tests in EN-DC would depend on the test equipment capability.*

### A.3.12.2 Carrier Aggregation Test Cases with Different CA Configurations

#### A.3.12.2.1 Introduction

In Annex A carrier aggregation test cases may be defined for two CCs as well as for more than two CCs to verify the same RRM requirement.

#### A.3.12.2.2 Principle of testing

If multiple carrier aggregation test cases are defined for two CCs as well as for more than two CCs to verify the same RRM requirement, which depends on the number of CCs, then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with the maximum number of CCs in CA supported by the UE. Otherwise if the same type of RRM requirement is independent of the number of CCs then from the UE performance point of view the test coverage can be considered fulfilled by executing only the CA test cases with at least two CCs in CA supported by the UE.

*Editor’s: The maximum number of CCs that can be used in FR2 tests in CA would depend on the test equipment capability.*

## A.3.13 Test Cases in SA and EN-DC Operations

### A.3.13.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements in standalone (SA) or EN-DC operations.

In Annex A test cases may be defined in SA and EN-DC operations to verify the same RRM requirement.

*Editor’s note: this clause may need to define further for NE-DC and NR-DC test cases, which subjects to the test cases defined in the future.*

### A.3.13.2 Principle of Testing

If test cases are defined in both SA and EN-DC operations to verify the same RRM requirement then the UE capable of both SA and EN-DC operations needs to verify that RRM requirement by performing test case(s) in either SA operation or in EN-DC operation.

If test cases are defined in both SA and EN-DC operations to verify at least one common RRM requirement then the UE capable of both SA and EN-DC operations needs to verify RRM requirements by performing test case(s) in either SA operation or in EN-DC operation provided that the performed test case(s):

- verifies the largest number of RRM requirements and

- verifies at least all RRM requirements covered in the test case(s), which is not performed.

## A.3.13A Test Cases involving E-UTRA/FR1 and FR2 carriers

### A.3.13A.1 Introduction

The following applies to UE compliant to this version of the specification when undergoing tests with a mix of E-UTRA/NR FR1 and NR FR2 carriers in clauses A.5, A.7 and A.8.

### A.3.13A.2 Principle of Testing in EN-DC

For test cases in clause A.5 listed in Table A.3.13A.2-1, the following applies:

- UE does not have to pass the test case

Table A.3.13A.2-1: Test cases UE does not have to pass in current version of specification (EN-DC)

|  |  |
| --- | --- |
| Clause | Test case slogan |
| A.5.5.3.2 | SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle |
| A.5.5.3.5 | SCell Activation and deactivation of SCell in FR2 |
| A.5.7.1.3 | EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell |

### A.3.13A.3 Principle of Testing in SA

For test cases in clause A.7 listed in Table A.3.13A.3-1, the following applies:

- UE does not have to pass the test case

Table A.3.13A.3-1: Test cases UE does not have to pass in current version of specification (SA)

|  |  |
| --- | --- |
| Clause | Test case slogan |
| A.7.5.3.2 | SCell Activation and deactivation for FR1+FR2 inter-band with target SCell in FR2 |
| A.7.5.6.1.2 | NR FR1- NR FR2 DL active BWP switch of PCell with non-DRX in SA |
| A.7.6.2.5 | SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1) |
| A.7.6.2.6 | SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1) |
| A.7.6.2.7 | SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1) |
| A.7.6.2.8 | SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1) |
| A.7.7.1.3 | SA inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell |

### A.3.13A.4 Principle of Testing in E-UTRA

For test cases in clause A.8 listed in Table A.3.13A.4-1, the following applies:

- UE does not have to pass the test case.

Table A.3.13A.4-1: Test cases UE does not have to pass in current version of specification (E-UTRA)

|  |  |
| --- | --- |
| **Clause** | **Test case slogan** |
| A.8.4.2.5 | NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is not used |
| A.8.4.2.6 | NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is used |
| A.8.4.2.7 | NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is not used |
| A.8.4.2.8 | NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is used |

## A.3.13B Test Cases for EN-DC and NE-DC Operations

### A.3.13B.1 Active BWP switch Test Cases for EN-DC and NE-DC Operations

#### A.3.13B.1.1 Introduction

This clause defines a principle which is applicable to test cases verifying active BWP switch requirements for EN-DC and NE-DC operations.

In Annex A test cases are defined for both EN-DC and NE-DC operations to verify the same type of RRM requirement.

#### A.3.13B.1.2 Principle of Testing

UE capable of both EN-DC and NE-DC operations needs to be tested with one of the tests in either EN-DC or NE-DC operations.

### A.3.13B.2 SFTD accuracy Test Cases for EN-DC and NE-DC Operations

#### A.3.13B.2.1 Introduction

This clause defines a principle which is applicable to test cases verifying SFTD accuracy requirements for EN-DC and NE-DC operations.

In Annex A test cases are defined for both EN-DC and NE-DC operations to verify the same type of RRM requirement.

#### A.3.13B.2.2 Principle of Testing

UE capable of both EN-DC and NE-DC operations needs to be tested with one of the tests in either EN-DC or NE-DC operations.

## A.3.14 CSI-RS configurations

### A.3.14.1 FDD

Table A.3.14.1-1: CSI-RS Reference Measurement Channels for SCS=15kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | CSI-RS.1.1 FDD | CSI-RS.1.2 FDD | CSI-RS.1.3 FDD | CSI-RS.1.4 FDD |
| Resource Type | periodic | periodic | aperiodic | aperiodic |
| Resource Set Config |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 |
| trs-Info | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 1 for resource #1 | 1 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| powerControlOffset | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. |
| Offset | 1 | 1 | n.a. | n.a. |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. |
| TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 |
| nrofPorts | 2 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 4 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 10 for resource #1 | 10 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM |
| density | 1 | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | |

### A.3.14.2 TDD

Table A.3.14.2-1: CSI-RS Reference Measurement Channels for SCS=15kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | CSI-RS.1.1 TDD | CSI-RS.1.2 TDD | CSI-RS.1.3 TDD | CSI-RS.1.4 TDD |
| Resource Type | periodic | periodic | aperiodic | aperiodic |
| Resource Set Config |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 |
| trs-Info | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 1 for resource #1 | 1 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| powerControlOffset | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. |
| Offset | 1 | 1 | n.a. | n.a. |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. |
| TCI.State.1 |  |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 |
| nrofPorts | 2 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 4 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 10 for resource #1 | 10 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM |
| density | 1 | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | |

Table A.3.14.2-2: CSI-RS Reference Measurement Channels for SCS=30kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | CSI-RS.2.1 TDD | CSI-RS.2.2 TDD | CSI-RS.2.3 TDD | CSI-RS.2.4 TDD |
| Resource Type | periodic | periodic | aperiodic | aperiodic |
| Resource Set Config |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 |
| trs-Info | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 1 for resource #1 | 1 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| powerControlOffset | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 |
| Period (slots) | slot10 | slot20 | n.a. | n.a. |
| Offset | 2 | 2 | n.a. | n.a. |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. |
| TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 |
| nrofPorts | 2 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 10 for resource #1 | 10 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM |
| density | 1 | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | |

Table A.3.14.2-3: CSI-RS Reference Measurement Channels for SCS=120kHz

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | CSI-RS.3.1 TDD | CSI-RS.3.2 TDD | CSI-RS.3.3 TDD | CSI-RS.3.4 TDD |
| Resource Type | periodic | periodic | aperiodic | aperiodic |
| Resource Set Config |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on |
| aperiodicTriggeringOffset | n.a. | n.a. | 4 | 4 |
| trs-Info | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 1 for resource #1 | 1 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| powerControlOffset | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 |
| Period (slots) | slot40 | slot80 | n.a. | n.a. |
| Offset | 8 | 16 | n.a. | n.a. |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. |
| TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 |
| nrofPorts | 2 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 |
| 1 for resource #1 |
| 2 for resource #2 |
| 3 for resource #3 |
| 10 for resource #1 | 10 for resource #1 | 4 for resource #4 |
| 5 for resource #5 |
| 6 for resource #6 |
| 7 for resource #7 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM |
| density | 1 | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | |

## A.3.15 Angle of Arrival (AoA) for FR2 RRM test cases

This clause specifies the AoA setups for FR2 RRM test cases in clause A.5 and A.7. The applicable AoA setup is defined in each test case in clause A.5 and A.7.

### A.3.15.1 Setup 1: Single AoA in Rx beam peak direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, are aligned to the UE Rx beam peak direction (as defined in TS 38.101-2 [19]).

### A.3.15.2 Setup 2: Single AoA in non Rx beam peak direction

#### A.3.15.2.1 Setup 2a: Single AoA in non Rx beam peak direction without change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The direction (AoA) of the signals shall not be changed between test iterations.

#### A.3.15.2.2 Setup 2b: Single AoA in non Rx beam peak direction with change in direction

There is only one active probe in the test. The DL signals, and noise if applicable, transmitted from the probe, align to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. For UE power class 3, the direction (AoA) of the signals shall be changed for each test iteration (for UE power classes other than 3, this is FFS).

### A.3.15.3 Setup 3: 2 AoAs

There are 2 active probes in the test. The DL signals, and noise if applicable, transmitted from the two active probes, align to directions (AoAs) which are from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The relative angular offset between the directions (AoAs) of the 2 active probes, shall be changed for each test iteration. The applicable set of relative angular offsets between the 2 active probes is given in Table 3.15.3-1 for each UE power class.

Editor Note: If RAN5 finds the changing of angular offset between the directions (AoAs) of the 2 active probes per test iteration to be infeasible from the perspectives of EIS spherical coverage and other impacts, e.g.: testing time, then the test setup will be revised.

Table 3.15.3-1: Set of relative angular offsets between active probes for each power class

|  |  |
| --- | --- |
| UE Power class | Relative angular offset between active probes |
| 1 | FFS |
| 2 | FFS |
| 3 | 30°, 60°, 90°, 120° and 150° |
| 4 | FFS |

### A.3.15.4 Setup 4: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak

#### A.3.15.4.1 Setup 4a: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak without change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [19]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class. The direction (AoA) of the non Rx beam peak signal shall not be changed between test iterations.

#### A.3.15.4.2 Setup 4b: 2 AoAs, 1 AoA in Rx beam peak direction, 1 in non Rx beam peak with change in direction

There are 2 active probes in the test. The DL signals, and noise if applicable, are transmitted from the two active probes. One probe is aligned to the UE Rx beam peak direction as defined in TS 38.101-2 [19]. The second is aligned to a direction (AoA) which is from the set of directions corresponding to the EIS spherical coverage percentile of the DUT as defined in clause 7.3.4 of TS 38.101-2 [19] for each UE power class.

For UE power class 3, the relative angular offset between the directions (AoAs) of the 2 active probes shall be changed for each test iteration, within the probe alignment described above. The applicable set of relative angular offsets between the 2 active probes is given in Table 3.15.3-1 for each UE power class.

## A.3.16 TCI State Configuration

### A.3.16.1 Introduction

This clause provides the configurations for TCI states towards either SSB or CSI-RS. The TCI states defined in this clause are configured in each test when applicable to indicate that certain DL signals are QCL’ed with the referenceSignal configured in the TCI states.

### A.3.16.2 TCI states

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

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

Table A.3.16.2-2: Void

## A.3.17 Configurations of CSI-RS for tracking

### A.3.17.1 Configuration of CSI-RS for tracking for FR1

#### A.3.17.1.1 FDD

Table A.3.17.1.1-1: CSI-RS for tracking for SCS=15kHz

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **Reference channel** |  | TRS.1.1 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 2  11 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case | | |

**Table A.3.17.1.1-2: CSI-RS for tracking for SCS=30kHz**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **Reference channel** |  | TRS.1.2 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 20 for CSI-RS resource 1 and 2  21 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case | | |

#### A.3.17.1.2 TDD

**Table A.3.17.1.2-1: CSI-RS for tracking for SCS=15kHz**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **Reference channel** |  | TRS.1.1 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 2  11 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1 BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case | | |

**Table A.3.17.1.2-2: CSI-RS for tracking for SCS=30kHz**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **Reference channel** |  | TRS.1.2 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 20 for CSI-RS resource 1 and 2  21 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case | | |

### A.3.17.2 Configuration of CSI-RS for tracking for FR2

#### A.3.17.2.1 TDD

**Table A.3.17.2.1-1: CSI-RS for tracking for SCS=120kHz Set 1**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **Reference channel** |  | TRS.2.1 TDD |
| Bandwidth |  | BW of Active BWPNote 1, 3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 1 for CSI-RS resource 1 and 3  l0 = 5 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 80 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 40 for CSI-RS resource 1 and 2  41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case  Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

**Table A.3.17.2.1-2: CSI-RS for tracking for SCS=120kHz Set 2**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| **Reference channel** |  | TRS.2.2 TDD |
| Bandwidth |  | BW of Active BWPNote 1, 3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 2 for CSI-RS resource 1 and 3  l0 = 6 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 80 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 40 for CSI-RS resource 1 and 2  41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.1 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case  Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

## A.3.18 Additional definitions related to OTA testing for FR2 RRM test cases

### A.3.18.1 Introduction

FR2 RRM test cases are performed over the air (OTA). This clause provides additional definitions and clarifications on the OTA measurements and metrics defined or refered in the test cases.

### A.3.18.2 PRACH Power Measurement

PRACH power is measured as EIRP(Link=Link angle, Meas=Link angle) as defined in clause 3.1 of TS 38.101-2 [19].

# A.4 EN-DC tests with all NR cells in FR1

## A.4.1 Void

## A.4.2 Void

## A.4.3 RRC\_CONNECTED state mobility

### A.4.3.1 Void

### A.4.3.2 RRC Connection Mobility Control

#### A.4.3.2.1 Void

#### A.4.3.2.2 Random Access

##### A.4.3.2.2.1 Contention based random access test in FR1 for PSCell in EN-DC

##### A.4.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.1.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.1.1-2.

**Table A.4.3.2.2.1.1-1: Supported test configurations for contention based random access test in FR1 for PSCell in EN-DC**

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

Table A.4.3.2.2.1.1-2: General test parameters for contention based random access test in FR1 for PSCell in EN-DC

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test-1** | **Comments** |
| SSB Configuration | | Config 1,2 |  | SSB pattern 3 in FR1 | As defined in A.3.10 |
| Config 3,4 | SSB pattern 4 in FR1 |
| Duplex Mode for Cell 2 | | Config 1,2 |  | FDD |  |
| Config 3,4 | TDD |
| TDD Configuration | | Config 3,4 |  | TDDConf.2.1 |  |
| OCNG Pattern Note 1 | | |  | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 4 | | Config 1,2 |  | SR.1.1 FDD | As defined in A.3.1.1. |
| Config 3,4 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | Config 1,2 |  |  | CR.1.1 FDD |
|  | | Config 3,4 |  |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1,2 |  |  | CCR.1.1 FDD |
|  | | Config 3,4 |  |  | CCR.2.1 TDD |
| NR RF Channel Number | | |  | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | Power of SSB with index 0 is setto be above configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 |
| Config 3,4 | -101 |
|  | | dB | 3 |
| SS-RSRP Note 3 | | dBm/ SCS | -95 |
| SSB with index 1 |  | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 |
| Config 3,4 | -101 |
|  | | dB | -17 |
| SS-RSRP Note 3 | | dBm/ SCS | -115 |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 3,4 | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | |  | FR1 PRACH configuration 1 | As defined in A.3.8.2. |
| Propagation Condition | | | - | AWGN |  |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | |

A.4.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

A.4.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.4.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.4.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.4.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4, the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission..

A.4.3.2.2.1.2.5 void

A.4.3.2.2.1.2.6 void

A.4.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

##### A.4.3.2.2.2 Non-contention based random access test in FR1 for PSCell in EN-DC

A.4.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell in FR1. Supported test parameters are shown in Table A.4.3.2.2.2.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.2.1-2 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2). Test 2 is only applicable to UE which supports csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

**Table A.4.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR1 for PSCell in EN-DC**

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

**Table A.4.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR1 for PSCell in EN-DC**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test-1** | **Test-2** | **Comments** |
| SSB Configuration | | Config 1,2 |  | SSB pattern 3 in FR1 | SSB pattern 3 in FR1 | As defined in A.3.10 |
| Config 3,4 | SSB pattern 4 in FR1 | SSB pattern 4 in FR1 |
| CSI-RS Configuration | | Config 1,2 |  | N/A | CSI-RS.1.1 FDD | As defined in A.3.1.4 |
| Config 3,4 | CSI-RS.2.1 TDD |
| Duplex Mode for Cell 2 | | Config 1,2 |  | FDD | FDD |  |
| Config 3,4 | TDD | TDD |
| TDD Configuration | | Config 3,4 |  | TDDConf.2.1 | TDDConf.2.1 |  |
| OCNG Pattern Note 1 | | |  | OCNG pattern 1 | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH parameters Note 4 | | Config 1,2 |  | SR.1.1 FDD | SR.1.1 FDD | As defined in A.3.1.1. |
| Config 3,4 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | Config 1,2 |  | CR.1.1 TDD | CR.1.1 TDD |  |
|  | | Config 3,4 |  | CR.2.1 TDD | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | | Config 1,2 |  | CCR.1.1 TDD | CCR.1.1 TDD |  |
|  | | Config 3,4 |  | CCR.2.1 TDD | CCR.2.1 TDD |  |
| NR RF Channel Number | | |  | 1 | 1 |  |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | | dB |  |
| SSB with index 0 |  | | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 | -98 |
| Config 3,4 | -101 | -101 |
|  | | dB | 3 | 3 |
| SS-RSRP Note 3 | | dBm/ SCS | -95 | -95 |
| SSB with index 1 |  | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
|  | Config 1,2 | dBm/15kHz | -98 | -98 |
| Config 3,4 | -101 | -101 |
|  | | dB | -17 | -17 |
| SS-RSRP Note 3 | | dBm/ SCS | -115 | -115 |
| Io Note 2 | | Config 1,2 | dBm | -65.3/9.36MHz | -65.3/9.36MHz | For symbols without SSB index 1 |
| Config 3,4 | -62.2/38.16MHz | -62.2/38.16MHz |
| ss-PBCH-BlockPower | | | dBm/ SCS | -5 | -5 | As defined in clause 6.3.2 in TS 38.331 [2]. |
| Configured UE transmitted power () | | | dBm | 23 | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| PRACH Configuration | | |  | FR1 PRACH configuration 2 | FR1 PRACH configuration 3 | As defined in A.3.8.2. |
| Propagation Condition | | | - | AWGN | AWGN |  |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.  Note 3: Void  Note 4: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required. | | | | | | |

A.4.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

A.4.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2.. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.4.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.4.3.2.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.4.3.2.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.4.3.2.3 Void

## A.4.4 Timing

### A.4.4.1 UE transmit timing

#### A.4.4.1.1 NR UE Transmit Timing Test for FR1

##### A.4.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2. Supported test configurations are shown in Table 4.4.1.1.1-1.

Table A.4.4.1.1.1-1: Supported test configurations for FR1 PSCell

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

The test consists of E-UTRA PCell and NR PSCell. The configuration for E-UTRA is given in A.3.7.2.1. Table A.4.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.4.4.1.1.1-3.

Table A.4.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test1 | | | Test2 | | Band Group |
| SSB ARFCN |  | 1,2,3,4,5,6 | Freq1 | | | Freq1 | |  |
| Duplex Mode |  | 1,4 | FDD | | | | |  |
| 2,3,5,6 | TDD | | | | |  |
| TDD configuration |  | 1,4 | Not Applicable | | | | |  |
| 2,5 | TDDConf.1.1 | | | | |
| 3,6 | TDDConf.2.1 | | | | |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 | | | | |  |
| 2,5 | 10: NRB,c = 52 | | | | |
| 3,6 | 40: NRB,c = 106 | | | | |
| Initial BWP Configuration |  | 1,2,3,4,5,6 | DLBWP.0.1  ULBWP.0.1 | | | | |  |
| Dedicated BWP Configuration |  | 1,2,3,4,5,6 | DLBWP.1.1  ULBWP.1.1 | | | | |  |
| DRx Cycle | ms | 1,2,3,4,5,6 | N/A | | | DRX.8Note5 |  | |
| PDSCH Reference measurement channel |  | 1,4 | SR.1.1 FDD | | | |  | |
| 2,5 | SR.1.1 TDD | | | |
| 3,6 | SR.2.1 TDD | | | |
| RMSI CORESET Reference Channel |  | 1,4 | CR.1.1 FDD | | | |  | |
| 2,5 | CR.1.1 TDD | | | |
| 3,6 | CR.2.1 TDD | | | |
|  |  | 1,4 | CCR.1.1 FDD | | | |  | |
| Dedicated CORESET Reference Channel |  | 2,5 | CCR.1.1 TDD | | | |  | |
|  |  | 3,6 | CCR.2.1 TDD | | | |  | |
| OCNG Patterns |  | 1,2,3,4,5,6 | OP.1 | | | |  | |
| SSB configuration |  | 1,4 | SSB.1 FR1 | | | |  | |
|  | 2,5 | SSB.1 FR1 | | | |  | |
|  | 3,6 | SSB.2 FR1 | | | |  | |
| SMTC configuration |  | 1,2,3,4,5,6 | SMTC.2 | | | |  | |
| TRS configuration |  | 1,4 | TRS.1.1 FDD | | | |  | |
|  | 2,5 | TRS.1.1 TDD | | | |  | |
|  | 3,6 | TRS.1.2 TDD | | | |  | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2,4,5 | 15 | | | |  | |
| 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 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 |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  | |
| Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -98 | | -98 | |  | |
| Note2 | dBm/SCS | 1,2,4,5 | -98 | | -98 | |  | |
| 3,6 | -95 | | -95 | |
|  |  | 1,2,3,4,5,6 | 3 | | 3 | |  | |
|  |  | 1,2,3,4,5,6 | 3 | | 3 | |  | |
| SS-RSRPNote3 | dBm/SCS | 1,2,4,5 | -95 | | -95 | |  | |
| 3,6 | -92 | | -92 | |
| IoNote3 | dBm/9.36MHz | 1,2,4,5 | -65.2 | | -65.2 | |  | |
| dBm/38.1MHz | 3,6 | -59.2 | | -59.2 | |
| Propagation condition |  | 1,2,3,4,5,6 | AWGN | | | |  | |
| SRS Config |  | 1,2,4,5 | SRSConf.1Note6 | SRSConf.3Note6 | | |  | |
|  | 3, 6 | SRSConf.1Note6 | SRSConf.2Note6 | | |  | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: DRx related parameters are given in Table A.3.3.8-1  Note 6: SRS configs are given in Table A.4.4.1.1.1-3 | | | | | | | | |

**Table A.4.4.1.1.1-3: SRS Configuration for Timing Accuracy Test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Field | SRSConf.1 | SRSConf.2 | SRSConf.3 | Comments |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | 0 |  |
| srs-ResourceIdList | 0 | 0 | 0 |  |
| resourceType | Periodic | Periodic | Periodic |  |
| Usage | Codebook | Codebook | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 | 0 | 0 |  |
| nrofSRS-Ports | Port1 | Port1 | Port1 |  |
| transmissionComb | n2 | n2 | n2 |  |
| combOffset-n2 | 0 | 0 | 0 |  |
| cyclicShift-n2 | 0 | 0 | 0 |  |
| resourceMapping  startPosition | 0 | 0 | 0 |  |
| resourceMapping  nrofSymbols | n1 | n1 | n1 |  |
| resourceMapping  repetitionFactor | n1 | n1 | n1 |  |
| freqDomainPosition | 0 | 0 | 0 |  |
| freqDomainShift | 0 | 0 | 0 |  |
| freqHopping  c-SRS | 14 for test configuration 1,2,4,5  25 for test configuration 3,6 | 25 | 14 | Matches NRB,c |
| freqHopping  b-SRS | 0 | 0 | 0 |  |
| freqHopping  b-hop | 0 | 0 | 0 |  |
| groupOrSequenceHopping | Neither | Neither | Neither |  |
| resourceType | Periodic | Periodic | Periodic |  |
| periodicityAndOffset-p | sl1, 0 | sl640, 5 | sl320, 3 | Offset to align with DRx periodicity |
| sequenceId | 0 | 0 | 0 | Any 10 bit number |

##### A.4.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.1-1 and setup NR PSCell according to parameters given in Table A.4.4.1.1.1-1.

2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within (NTA + NTA\_offset)×Tc ± Te of the first detected path of DL SSB.

a. The NTA offset value (in Tc units) is 25600

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1

3) The test system shall adjust the timing of the DL path by values given in Table A.4.4.1.1.2-1

Table A.4.4.1.1.2-1: Adjustment Value for DL Timing

|  |  |  |
| --- | --- | --- |
| SCS of SSB signals (kHz) | Adjustment Value | |
|  | Test1 | Test2 |
| 15 | +64\*64Tc | +32\*64Tc |
| 30 | +32\*64Tc | +16\*64Tc |

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within (NTA + NTA\_offset) ×Tc ± Te respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.

5) The test system shall verify that the UE transmit timing offset stays within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

### A.4.4.2 UE timer accuracy

### A.4.4.3 Timing advance

#### A.4.4.3.1 EN-DC FR1 timing advance adjustment accuracy

##### A.4.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

##### A.4.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.4.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.4.4.3.1.2-2, A.4.4.3.1.2-3 and A.4.4.3.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in clause A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.4.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.4.4.3.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in clause 7.3.2.1, the UE adjusts its uplink timing at slot n+k for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Table A.4.4.3.1.2-1: Timing advance supported test configurations

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

Table A.4.4.3.1.2-2: General test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF channel number |  | Cell 1: 1  Cell 2: 2 | 1 for E-UTRAN PCell  2 for NR PSCell |
| Initial DL BWP |  | DLBWP.0.1 | As specified in Table A.3.9.2.1-1 |
| Dedicated DL BWP |  | DLBWP.1.1 | As specified in Table A.3.9.2.2-1 |
| Initial UL BWP |  | ULBWP.0.1 | As specified in Table A.3.9.3.1-1 |
| Dedicated UL BWP |  | ULBWP.1.1 | As specified in Table A.3.9.3.2-1 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA\_new = NTA\_old* for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | *For 15 kHz SCS NTA\_new = NTA\_old + 8192\*Tc*  *For 30 kHz SCS NTA\_new = NTA\_old + 4096\*Tc*  (based on equation in clause 4.2 of TS 38.213 [3]) |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

Table A.4.4.3.1.2-3: Cell specific test parameters for timing advance

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test1 | |
| T1 | T2 |
| Duplex mode | | Config 1,4 |  | FDD | |
| Config 2,3,5,6 | TDD | |
| TDD configuration | | Config 1,4 |  | Not Applicable | |
| Config 2,5 | TDDConf.1.1 | |
| Config 3,6 | TDDConf.2.1 | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | |
| Config 2,5 | 10: NRB,c = 52 | |
| Config 3,6 | 40: NRB,c = 106 | |
| BWP BW | | Config 1,4 | MHz | 10: NRB,c = 52 | |
| Config 2,5 | 10: NRB,c = 52 | |
| Config 3,6 | 40: NRB,c = 106 | |
| DRx Cycle | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | |
| Config 2,5 | SR.1.1 TDD | |
| Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | |
| Config 2,5 | CR.1.1 TDD | |
| Config 3,6 | CR2.1 TDD | |
|  | | Config 1,4 |  | CCR.1.1 FDD | |
| Dedicated CORESET Reference Channel | | Config 2,5 |  | CCR.1.1 TDD | |
|  | | Config 3,6 |  | CCR.2.1 TDD | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | |
| Config 2,5 | TRS.1.1 TDD | |
| Config 3,6 | TRS.1.2 TDD | |
| OCNG Patterns | | |  | OCNG pattern 1 | |
| SSB Configuration | | Config 1,2,4,5 |  | SSB.1 FR1 | |
| Config 3,6 |  | SSB.2 FR1 | |
| SMTC configuration | | Config 1,2,4,5 |  | SMTC.1 FR1 | |
| Config 3,6 | SMTC.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | |
| Config 3,6 | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | |
| Config 3,6 | 30 kHz | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |
| EPRE ratio of PBCH to PBCH DMRS | | |
| EPRE ratio of PDCCH DMRS to SSS | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |
| EPRE ratio of PDSCH DMRS to SSS | | |
| EPRE ratio of PDSCH to PDSCH | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | | | dBm/15kHz | -98 | |
| Note2 | Config 1,2,4,5 | | dBm/SCS | -98 | |
| Config 3,6 | | -95 | |
|  | | | dB | 3 | |
|  | | | dB | 3 | |
| IoNote3 | Config 1,2,4,5 | | dBm/  9.36MHz | -67.57 | |
| Config 3,6 | | dBm/  38.16MHz | -62.58 | |
| Propagation condition | | | - | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | |

Table A.4.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Field | | Value | Comment |
| c-SRS | Config 1,2,4,5 | 12 | Frequency hopping is disabled |
| Config 3,6 | 24 |
| b-SRS | | 0 |
| b-hop | | 0 |
| freqDomainPosition | | 0 | Frequency domain position of SRS |
| freqDomainShift | | 0 |
| groupOrSequenceHopping | | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | | sl5=2 for SCS 15kHz sl5=4 for SCS 30kHz | Once every 5 slots |
| pathlossReferenceRS | | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | | Codebook | Codebook based UL transmission |
| startPosition | | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | | n1 |
| repetitionFactor | | n1 |
| combOffset-n2 | | 0 | transmissionComb setting |
| cyclicShift-n2 | | 0 |
| nrofSRS-Ports | | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | | |

##### A.4.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where k=5.

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in clause 7.3.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

## A.4.5 Signaling characteristics

### A.4.5.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [20]) means uplink signal

- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [20]) means no uplink signal.

#### A.4.5.1.1 Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

##### A.4.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.4.5.1.1.1-1. The test parameters are given in Tables A.4.5.1.1.1-2, A.4.5.1.1.1-3, and A.4.5.1.1.1-4 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.1.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

**Table A.4.5.1.1.1-1: Supported test configurations for FR1 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.4.5.1.1.1-2: General test parameters for FR1 out-of-sync testing in non-DRX mode**

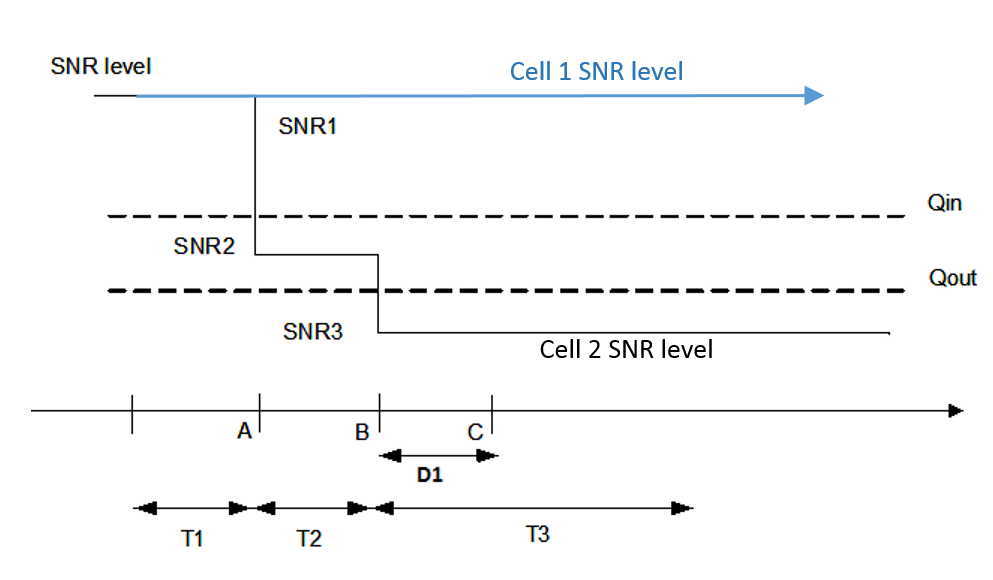
|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | |  | Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| Active PSCell | |  | Cell 2 |
| RF Channel Number | |  | 2 |
| Duplex mode | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 |
| Config 2, 5 | 10: NRB,c = 52 |
| Config 3, 6 | 40: NRB,c = 106 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 |  | Not Applicable |
| Config 2, 5 |  | TDDConf.1.1 |
| Config 3, 6 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 |  | CR.1.1 TDD |
| Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 |  | CCR.1.3 FDD |
|  | Config 2, 5 |  | CCR.1.3 TDD |
|  | Config 3, 6 |  | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 |  | SSB.1 FR1 |
| Config 3, 6 |  | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 |  | 15 kHz |
| Config 3, 6 |  | 30 kHz |
| PRACH Configuration | Config 1, 2, 4, 5 |  | Table A.3.8.2.1-1 |
| Config 3, 6 |  | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | |  | 0 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | *OFF* |
| Gap pattern ID | |  | *gp0* |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for CSI reporting | Config 1, 4 |  | CSI-RS.1.1 FDD |
| Config 2, 5 |  | CSI-RS.1.1 TDD |
| Config 3, 6 |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| 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.4.5.1.1.1-3: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
| T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| 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 on RLM-RS | Config 1, 4 | dB | 1 | -7 | -15 |
| Config 2, 5 | 1 | -7 | -15 |
| Config 3, 6 | 1 | -7 | -15 |
|  | Config 1, 4 | dBm/15 kHz | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -98 | | |
|  | Config 1, 4 | dBm/SCS | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -95 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs. | | | | | |

**Table A.4.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode**

|  |  |
| --- | --- |
| **Field** | **Test 1** |
| **Value** |
| gapOffset | 0 |
| Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap). | |

****

**Figure A.4.5.1.1.1-1: SNR variation for out-of-sync testing**

##### A.4.5.1.1.2 Test Requirements

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

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

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

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

#### A.4.5.1.2 Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in non-DRX mode

A.4.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR1 PSCell radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.4.5.1.2.1-1. The test parameters are given in Tables A.4.5.1.2.1-2, and A.4.5.1.2.1-3 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.2.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

**Table A.4.5.1.2.1-1: Supported test configurations for FR1 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

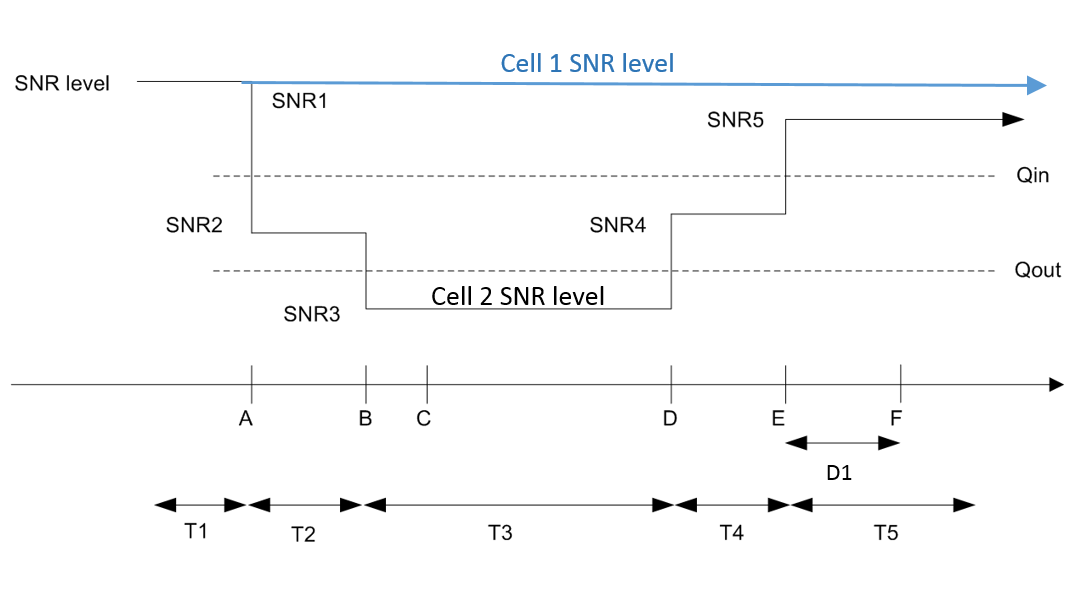
**Table A.4.5.1.2.1-2: General test parameters for FR1 in-sync testing in non-DRX mode**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | |  | Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| Active PSCell | |  | Cell 2 |
| RF Channel Number | |  | 2 |
| Duplex mode | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 |
| Config 2, 5 | 10: NRB,c = 52 |
| Config 3, 6 | 40: NRB,c = 106 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 |  | Not Applicable |
| Config 2, 5 |  | TDDConf.1.1 |
| Config 3, 6 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 |  | CR.1.1 TDD |
| Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 |  | CCR.1.1 FDD |
|  | Config 2, 5 |  | CCR.1.1 TDD |
|  | Config 3, 6 |  | CCR.2.1 TDD |
| SSB Configuration | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 |  | SSB.1 FR1 |
| Config 3, 6 |  | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 |  | 15 kHz |
| Config 3, 6 |  | 30 kHz |
| PRACH Configuration | Config 1, 2, 4, 5 |  | Table A.3.8.2.1-1 |
| Config 3, 6 |  | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | |  | 0 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| In sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | *OFF* |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for CSI reporting | Config 1, 4 |  | CSI-RS.1.1 FDD |
| Config 2, 5 |  | CSI-RS.1.1 TDD |
| Config 3, 6 |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| 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.4.5.1.2.1-3: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | | | |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| 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 on RLM-RS | Config 1, 4 | dB | 1 | -7 | -15 | -4.5 | 1 |
| Config 2, 5 | 1 | -7 | -15 | -4.5 | 1 |
| Config 3, 6 | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
|  | Config 1, 4 | dBm/SCS | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -95 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.2.1-1.  Note 5: 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 and T4 is modified as specified in clause A.3.6. | | | | | | | |

**Table A.4.5.1.2.1-4: Void**

****

**Figure A.4.5.1.2.1-1: SNR variation for in-sync testing**

##### A.4.5.1.2.2 Test Requirements

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

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

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

#### A.4.5.1.3 Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

##### A.4.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.4.5.1.3.1-1. The test parameters are given in Tables A.4.5.1.3.1-2 and A.4.5.1.3.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.3.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI 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.4.5.1.3.1-1: Supported test configurations for FR1 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.4.5.1.3.1-2: General test parameters for FR1 out-of-sync testing in DRX mode**

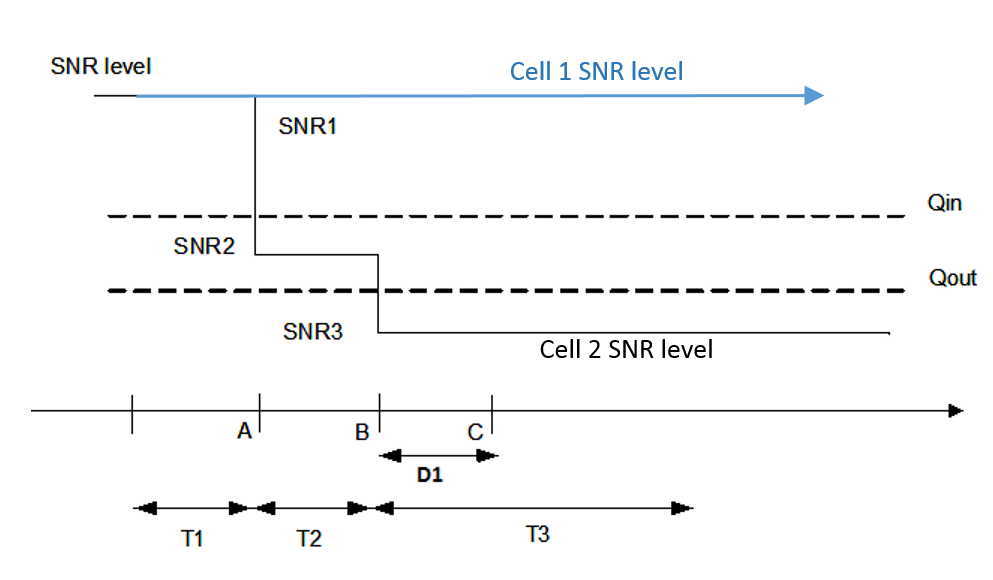
|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | |  | Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| Active PSCell | |  | Cell 2 |
| RF Channel Number | |  | 2 |
| Duplex mode | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| BWchannel | Config 1, 4 | MHz | 10: NRB,c = 52 |
| Config 2, 5 | 10: NRB,c = 52 |
| Config 3, 6 | 40: NRB,c = 106 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD Configuration | Config 1, 4 |  | Not Applicable |
| Config 2, 5 |  | TDDConf.1.1 |
| Config 3, 6 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 |  | CR.1.1 TDD |
| Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 |  | CCR.1.3 FDD |
|  | Config 2, 5 |  | CCR.1.3 TDD |
|  | Config 3, 6 |  | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 |  | SSB.1 FR1 |
| Config 3, 6 |  | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 |  | 15 kHz |
| Config 3, 6 |  | 30 kHz |
| PRACH Configuration | Config 1, 2, 4, 5 |  | Table A.3.8.2.1-1 |
| Config 3, 6 |  | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | |  | 0 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX Configuration | |  | DRX.3 |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for CSI reporting | Config 1, 4 |  | CSI-RS.1.1 FDD |
| Config 2, 5 |  | CSI-RS.1.1 TDD |
| Config 3, 6 |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.68 |
| T3 | | s | 0.68 |
| D1 | | s | 0.64 |
| 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.4.5.1.3.1-3: Cell specific test parameters for FR1 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | |
| **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| 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 on RLM-RS | Config 1, 4 | dB | 1 | -7 | -15 |
| Config 2, 5 | 1 | -7 | -15 |
| Config 3, 6 | 1 | -7 | -15 |
|  | Config 1, 4 | dBm/15kHz | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -98 | | |
|  | Config 1, 4 | dBm/SCS | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -95 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.4.5.1.3.1-1.  Note 5: 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 A.3.6. | | | | | |

**Table A.4.5.1.3.1-4: Void**

**Table A.4.5.1.3.1-5: Void**

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**Figure A.4.5.1.3.1-1: SNR variation for out-of-sync testing**

##### A.4.5.1.3.2 Test Requirements

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

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

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

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

#### A.4.5.1.4 Radio Link Monitoring In-sync Test for FR1 PSCell configured with SSB-based RLM RS in DRX mode

##### A.4.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.4.5.1.4.1-1. The test parameters are given in Tables A.4.5.1.4.1-2, and A.4.5.1.4.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-1. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.4.1-1 shows the variation of the downlink SNR in the active Cell 2 to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI 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.4.5.1.4.1-1: Supported test configurations for FR1 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.4.5.1.4.1-2: General test parameters for FR1 in-sync testing in DRX mode**

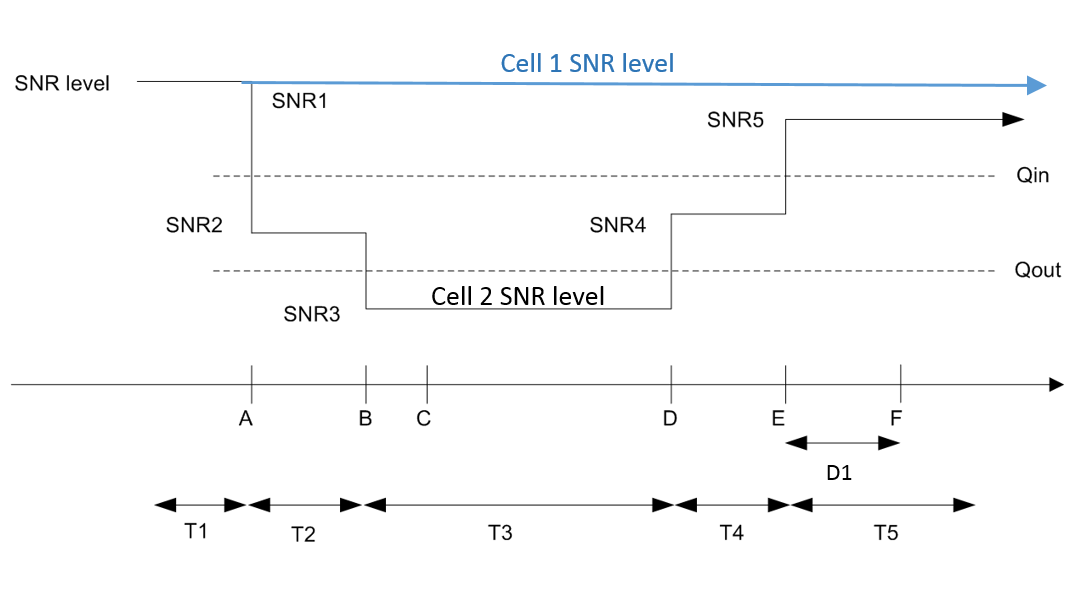
|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 |  | TDD |
| BWchannel | | Config 1, 4 | MHz | 10: NRB,c = 52 |
| Config 2, 5 | 10: NRB,c = 52 |
| Config 3, 6 | 40: NRB,c = 106 |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 |  | TDDConf.1.1 |
| Config 3, 6 |  | TDDConf.2.1 |
| RMSI CORESET Reference Channel | | Config 1, 4 |  | CR.1.1 FDD |
| Config 2, 5 |  | CR.1.1 TDD |
| Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 4 |  | CCR.1.1 FDD |
|  | | Config 2, 5 |  | CCR.1.1 TDD |
|  | | Config 3, 6 |  | CCR.2.1 TDD |
| SSB Configuration | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 |  | SSB.1 FR1 |
| Config 3, 6 |  | SSB.2 FR1 |
| SMTC Configuration | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2, 4, 5 |  | 15 kHz |
| Config 3, 6 |  | 30 kHz |
| PRACH Configuration | | Config 1, 2, 4, 5 |  | Table A.3.8.2.1-1 |
| Config 3, 6 |  | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |
| In sync transmission parameters | | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| Out of sync transmission parameters | | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX Configuration | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 1000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | Config 1, 4 | |  | CSI-RS.1.1 FDD |
| Config 2, 5 | |  | CSI-RS.1.1 TDD |
| Config 3, 6 | |  | CSI-RS.2.1 TDD |
| CSI-RS for tracking | Config 1, 4 | |  | TRS.1.1 FDD |
| Config 2, 5 | |  | TRS.1.1 TDD |
| Config 3, 6 | |  | TRS.1.2 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 0.64 |
| T4 | | | s | 0.2 |
| T5 | | | s | 0.88 |
| D1 | | | s | 0.84 |
| 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.4.5.1.4.1-3: Cell specific test parameters for FR1 (Cell 2) for in-sync radio link monitoring tests in DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | | | |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| 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 on RLM-RS | Config 1, 4 | dB | 1 | -7 | -15 | -4.5 | 1 |
| Config 2, 5 | 1 | -7 | -15 | -4.5 | 1 |
| Config 3, 6 | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
|  | Config 1, 4 | dBm/SCS | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -95 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.4.5.1.4.1-1.  Note 5: 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 and T4 is modified as specified in clause A.3.6. | | | | | | | |

**Table A.4.5.1.4.1-4: Void**

**Table A.4.5.1.4.1-5: Void**

****

**Figure A.4.5.1.4.1-1: SNR variation for in-sync testing**

##### A.4.5.1.4.2 Test Requirements

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

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

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

#### A.4.5.1.5 EN-DC Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode

##### A.4.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.4.5.1.5.1-1, A.4.5.1.5.1-2, A.4.5.1.5.1-3, and A.4.5.1.5.1-3A below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.5.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 is configured as the BFD-RS.

**Table A.4.5.1.5.1-1: Supported test configurations for FR1 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.4.5.1.5.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in non-DRX mode**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | |  | Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| Active PSCell | |  | Cell 2 |
| RF Channel Number | |  | 2 |
| Duplex mode | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 | TDD |
| TDD Configuration | Config 1, 4 |  | Not Applicable |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 |  | CR.1.1 FDD |
|  | Config 2, 5 |  | CR.1.1 TDD |
|  | Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 |  | CCR.1.3 FDD |
| Config 2, 5 | CCR.1.3 TDD |
| Config 3, 6 | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 | 30 KHz |
| TRS configuration | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 |  | Resource #4 in TRS.1.1 FDD |
| Config 2, 5 |  | Resource #4 in TRS.1.1 TDD |
| Config 3, 6 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State.2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | OFF |
| Gap pattern ID | |  | gp0 |
| Layer 3 filtering | |  | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for reporting | Config 1, 4 |  | CSI-RS1.1 FDD |
| Config 2, 5 | CSI-RS.1.1 TDD |
| Config 3, 6 | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 0.48 |
| T3 | | s | 0.48 |
| D1 | | s | 0.44 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test. | | | |

**Table A.4.5.1.5.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in non-DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | |
| **T1** | **T2** | **T3** |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB | 0 | | |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PBCH DMRS to SSS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1 | -7 | -15 |
| Config 2, 5 | 1 | -7 | -15 |
| Config 3, 6 | 1 | -7 | -15 |
|  | Config 1, 4 | dBm/15KHz | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -98 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.1.5.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in section A.3.6.1.1. | | | | | |

**Table A.4.5.1.5.1-3A: Measurement gap configuration for FR1 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

|  |  |
| --- | --- |
| **Field** | **Test 1** |
| **Value** |
| gapOffset | 0 |
| Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. | |

**Table A.4.5.1.5.1-4: Void**

****

**Figure A.4.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing**

##### A.4.5.1.5.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C (D1 after the start of the time duration T3) on the PSCell.

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

#### A.4.5.1.6 EN-DC Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in non-DRX mode

##### A.4.5.1.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.4.5.1.6.1-1, A.4.5.1.6.1-2, and A.4.5.1.6.1-3 below. There are two cells, cell 1which is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.6.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. In the test, SSB0 is configured as the BFD-RS.

**Table A.4.5.1.6.1-1: Supported test configurations for FR1 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.4.5.1.6.1-2: General test parameters for FR1 PSCell for CSI-RS in-sync testing in non-DRX mode**

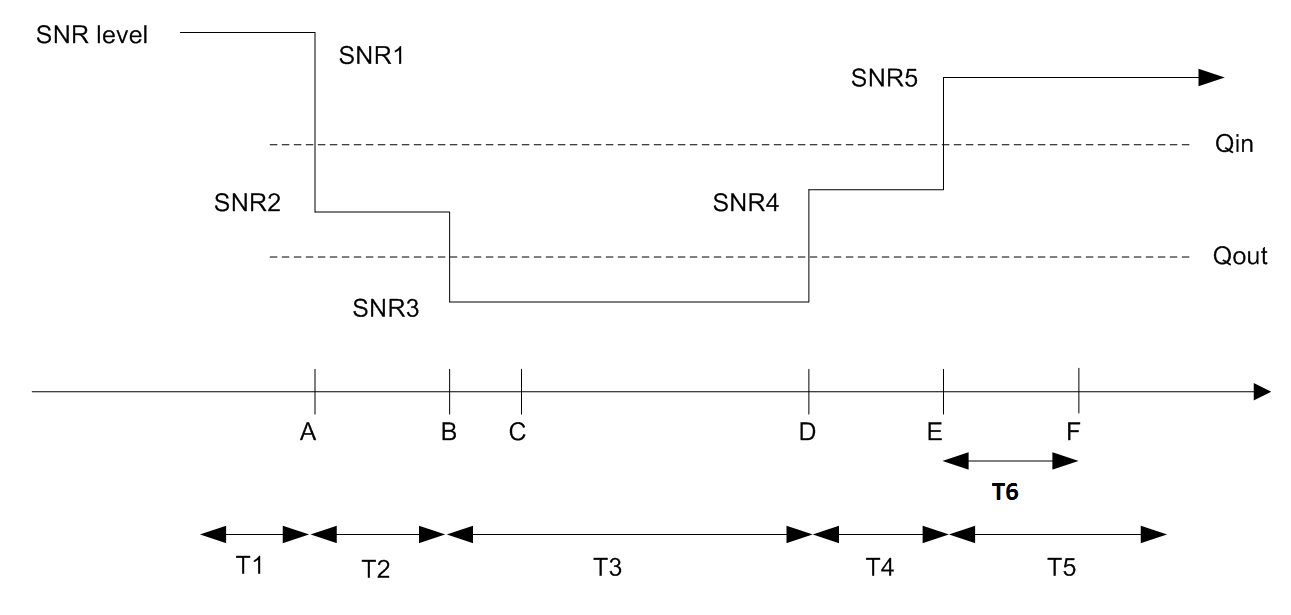
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | | | |  | Cell 1 |
| E-UTRA RF Channel Number | | | |  | 1 |
| Active PSCell | | | |  | Cell 2 |
| RF Channel Number | | | |  | 2 |
| Duplex mode | | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 | TDD |
| TDD Configuration | | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf.2.1 |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | | Config 1, 4 |  | CR.1.1 FDD |
|  | | | Config 2, 5 |  | CR.1.1 TDD |
|  | | | Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | | Config 1, 4 |  | CCR.1.1 FDD |
| Config 2, 5 | CCR.1.1 TDD |
| Config 3, 6 | CCR.2.1 TDD |
| SSB Configuration | | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| SMTC Configuration | | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 | 30 KHz |
| TRS configuration | | | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| CSI-RS for RLM | | | Config 1, 4 |  | Resource #4 in TRS.1.1 FDD |
| Config 2, 5 |  | Resource #4 in TRS.1.1 TDD |
| Config 3, 6 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | |  | TCI.State.2 |
| OCNG parameters | | | |  | OP.1 |
| CP length | | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 4 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| In sync transmission parameters | DCI format | | |  | 1-0 |
| Number of Control OFDM symbols | | |  | 2 |
| Aggregation level | | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | | dB | 0 |
| DMRS precoder granularity | | |  | REG bundle size |
| REG bundle size | | |  | 6 |
| DRX | | | |  | OFF |
| Gap pattern ID | | | |  | N.A. |
| Layer 3 filtering | | | |  | Enabled |
| T310 timer | | | | ms | 1000 |
| T311 timer | | | | ms | 1000 |
| N310 | | | |  | 1 |
| N311 | | | |  | 1 |
| CSI-RS for reporting | | Config 1, 4 | |  | CSI-RS.1.1 FDD |
| Config 2, 5 | | CSI-RS.1.1 TDD |
| Config 3, 6 | | CSI-RS.2.1 TDD |
| T1 | | | | s | 0.2 |
| T2 | | | | s | 0.2 |
| T3 | | | | s | 0.44 |
| T4 | | | | s | 0.2 |
| T5 | | | | s | 0.88 |
| T6 | | | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test. | | | | | |

**Table A.4.5.1.6.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in non-DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PSS to SSS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |
| EPRE ratio of PDSCH DMRS to SSS | | dB |
| EPRE ratio of OCNG DMRS to SSS | | dB |
| EPRE ratio of OCNG to OCNG DMRS | | dB |
| SNR on RLM-RS | Config 1, 4 | dB | 1 | -7 | -15 | -4.5 | 1 |
| Config 2, 5 | 1 | -7 | -15 | -4.5 | 1 |
| Config 3, 6 | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 1, 4 | dBm/15KHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.4.5.1.6.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in section A.3.6.1.1. | | | | | | | |

**Table A.4.5.1.6.1-3A: Void**

**Table A.4.5.1.6.1-4: Void**

****

**Figure A.4.5.1.6.1-1: SNR variation for CSI-RS in-sync testing**

##### A.4.5.1.6.2 Test Requirements

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

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

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

#### A.4.5.1.7 EN-DC Radio Link Monitoring Out-of-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode

##### A.4.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.4.5.1.7.1-1, A.4.5.1.7.1-2, and A.4.5.1.7.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.4.5.1.7.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. 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. In the test, SSB0 is configured as the BFD-RS.

**Table A.4.5.1.7.1-1: Supported test configurations for FR1 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.4.5.1.7.1-2: General test parameters for FR1 PSCell for CSI-RS out-of-sync testing in DRX mode**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | |  | Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| Active PSCell | |  | Cell 2 |
| RF Channel Number | |  | 2 |
| Duplex mode | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 | TDD |
| TDD Configuration | Config 1, 4 |  | Not Applicable |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf.2.1 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1, 4 |  | CR.1.1 FDD |
|  | Config 2, 5 |  | CR.1.1 TDD |
|  | Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1, 4 |  | CCR.1.3 FDD |
| Config 2, 5 | CCR.1.3 TDD |
| Config 3, 6 | CCR.2.2 TDD |
| SSB Configuration | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 | 30 KHz |
| TRS configuration | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| CSI-RS for RLM | Config 1, 4 |  | Resource #4 in TRS.1.1 FDD |
| Config 2, 5 |  | Resource #4 in TRS.1.1 TDD |
| Config 3, 6 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | |  | TCI.State.2 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Correlation Matrix and Antenna Configuration | |  | 2x2 Low |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | Enabled |
| T310 timer | | ms | 0 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for reporting | Config 1, 4 |  | CSI-RS.1.1 FDD |
| Config 2, 5 | CSI-RS.1.1 TDD |
| Config 3, 6 | CSI-RS.2.1 TDD |
| T1 | | s | 0.2 |
| T2 | | s | 1.28 |
| T3 | | s | 1.28 |
| D1 | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test. | | | |

**Table A.4.5.1.7.1-3: Cell specific test parameters for FR1 for CSI-RS out-of-sync radio link monitoring in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
| T1 | T2 | T3 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |
| EPRE ratio of PBCH to PBCH DMRS | | 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 | Config 1, 4 | dB | 1 | -7 | -15 |
| Config 2, 5 | 1 | -7 | -15 |
| Config 3, 6 | 1 | -7 | -15 |
|  | Config 1, 4 | dBm/15KHz | -98 | | |
| Config 2, 5 | -98 | | |
| Config 3, 6 | -98 | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.1.7.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in section A.3.6.1.1. | | | | | |

**Table A.4.5.1.7.1-3A: Void**

**Table A.4.5.1.7.1-4: Void**

**Table A.4.5.1.7.1-5: Void**

**Table A.4.5.1.7.1-6: Void**

****

**Figure A.4.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing**

##### A.4.5.1.7.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C (D1 after the start of the time duration T3) on the PSCell.

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

#### A.4.5.1.8 EN-DC Radio Link Monitoring In-sync Test for FR1 PSCell configured with CSI-RS-based RLM in DRX mode

##### A.4.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR1 PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.4.5.1.8.1-1, A.4.5.1.8.1-2, A.4.5.1.8.1-3 and A.4.5.1.8.1-3A below. There are two cells, cell 1which is the E-UTRAN PCell, and cell 2 is the NR PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.1.8.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity defined in CSI-RS configuration. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 is configured as the BFD-RS.

**Table A.4.5.1.8.1-1: Supported test configurations for FR1 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.4.5.1.8.1-2: General test parameters for FR1 PSCell for CSI-RS in-sync testing in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | | | |  | Cell 1 |
| E-UTRA RF Channel Number | | | |  | 1 |
| Active PSCell | | | |  | Cell 2 |
| RF Channel Number | | | |  | 2 |
| Duplex mode | | | Config 1, 4 |  | FDD |
| Config 2, 3, 5, 6 | TDD |
| TDD Configuration | | | Config 1, 4 |  | Not Applicable |
| Config 2, 5 | TDDConf.1.1 |
| Config 3, 6 | TDDConf.2.1 |
| DL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | | Config 1, 4 |  | CR.1.1 FDD |
|  | | | Config 2, 5 |  | CR.1.1 TDD |
|  | | | Config 3, 6 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | | Config 1, 4 |  | CCR.1.1 FDD |
| Config 2, 5 | CCR.1.1 TDD |
| Config 3, 6 | CCR.2.1 TDD |
| SSB Configuration | | | Config 1, 4 |  | SSB.1 FR1 |
| Config 2, 5 | SSB.1 FR1 |
| Config 3, 6 | SSB.2 FR1 |
| SMTC Configuration | | | Config 1, 2, 4, 5 |  | SMTC.1 |
| Config 3, 6 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | | Config 1, 2, 4, 5 |  | 15 KHz |
| Config 3, 6 | 30 KHz |
| TRS configuration | | | Config 1, 4 |  | TRS.1.1 FDD |
| Config 2, 5 |  | TRS.1.1 TDD |
| Config 3, 6 |  | TRS.1.2 TDD |
| CSI-RS for RLM | | | Config 1, 4 |  | Resource #4 in TRS.1.1 FDD |
| Config 2, 5 |  | Resource #4 in TRS.1.1 TDD |
| Config 3, 6 |  | Resource #4 in TRS.1.2 TDD |
| TCI configuration for PDCCH/PDSCH | | | |  | TCI.State.2 |
| OCNG parameters | | | |  | OP.1 |
| CP length | | | |  | Normal |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |
| Out of sync transmission parameters | | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| In sync transmission parameters | | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | | |  | DRX.3 |
| Gap pattern ID | | | |  | gp0 |
| Layer 3 filtering | | | |  | Enabled |
| T310 timer | | | | ms | 2000 |
| T311 timer | | | | ms | 1000 |
| N310 | | | |  | 1 |
| N311 | | | |  | 1 |
| CSI-RS for reporting | Config 1, 4 | | |  | CSI-RS.1.1 FDD |
| Config 2, 5 | | | CSI-RS.1.1 TDD |
| Config 3, 6 | | | CSI-RS.2.1 TDD |
| T1 | | | | s | 0.2 |
| T2 | | | | s | 0.2 |
| T3 | | | | s | 1.24 |
| T4 | | | | s | 0.2 |
| T5 | | | | s | 1.88 |
| T6 | | | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test. | | | | | |

**Table A.4.5.1.8.1-3: Cell specific test parameters for FR1 for CSI-RS in-sync radio link monitoring in DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | | | |
| **T1** | **T2** | **T3** | **T4** | **T5** |
| 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 | 0 | | | | |
| 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 on RLM-RS | Config 1, 4 | dB | 1 | -7 | -15 | -4.5 | 1 |
| Config 2, 5 | 1 | -7 | -15 | -4.5 | 1 |
| Config 3, 6 | 1 | -7 | -15 | -4.5 | 1 |
|  | Config 1, 4 | dBm/15KHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.4.5.1.8.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in section A.3.6.1.1. | | | | | | | |

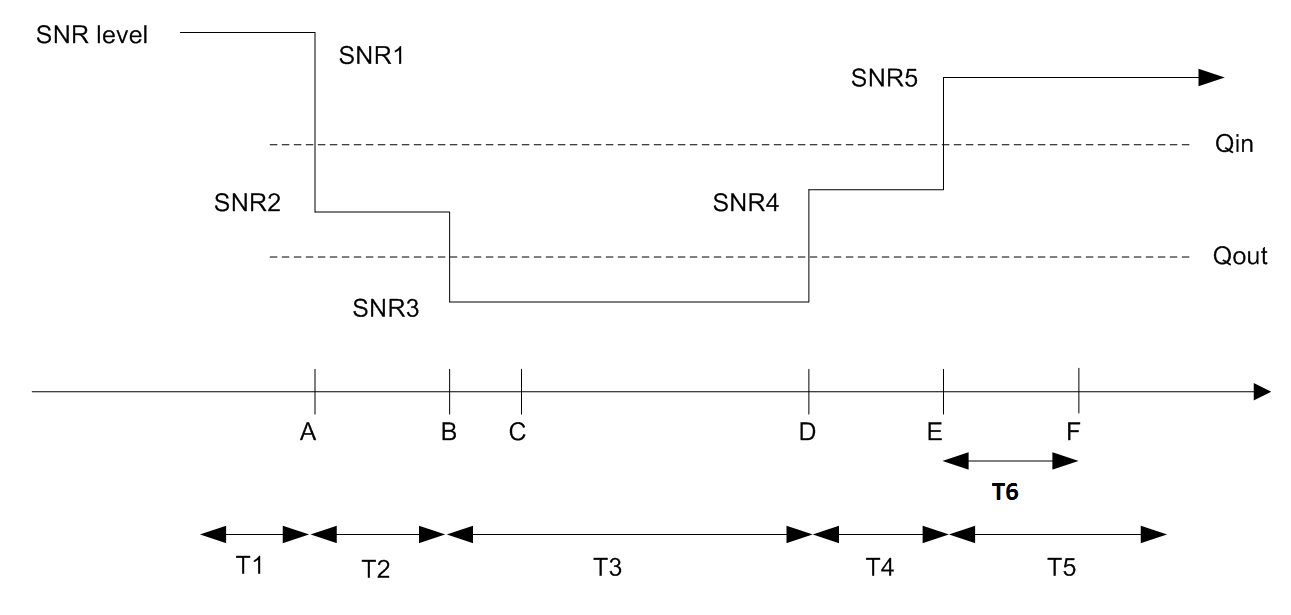
**Table A.4.5.1.8.1-3A: Measurement gap configuration for FR1 CSI-RS in-sync radio link monitoring in DRX mode**

|  |  |
| --- | --- |
| **Field** | **Test 1** |
| **Value** |
| gapOffset | 0 |
| Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. | |

**Table A.4.5.1.8.1-4: Void**

**Table A.4.5.1.8.1-5: Void**

**Table A.4.5.1.8.1-6: Void**

****

**Figure A.4.5.1.8.1-1: SNR variation for CSI-RS in-sync testing**

##### A.4.5.1.8.2 Test Requirements

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

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

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

### A.4.5.2 Interruption

#### A.4.5.2.1 E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

##### A.4.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in TS38.133 clause 8. 2.1.2. Supported test configurations are shown in table A.4.5.2.1.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.1.1-2 and A.4.5.2.1.1-3. The E-UTRAN PCell DRX configuration parameters are given in Table A.4.5.2.1.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell1 and Cell2. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. CORESET indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

Table A.4.5.2.1.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

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

Table A.4.5.2.1.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to Cell1 and Cell2 |
| DRX |  | DRX.4 | DRX related parameters are defined in Table A.3.3.4-1 |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 10 |  |

Table A.4.5.2.1.1-3: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell2** | |
| Frequency Range | |  | FR1 | |
| Duplex mode | Config 1,4 |  | FDD | |
| Config 2,3,5,6 | TDD | |
| TDD configuration | Config 1,4 |  | Not Applicable | |
| Config 2,5 | TDDConf.1.1 | |
| Config 3,6 | TDDConf.2.1 | |
| BWchannel | Config 1,4 |  | 10: NRB,c = 52 | |
| Config 2,5 | 10: NRB,c = 52 | |
| Config 3,6 | 40: NRB,c = 106 | |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0.1 | |
| Config 2,5 | DLBWP.0.1 | |
| Config 3,6 | DLBWP.0.1 | |
| Dedicated DL BWP Configuration | Config 1,4 |  | DLBWP.1.1 |
| Config 2,5 |  | DLBWP.1.1 |
| Config 3,6 |  | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.1 |
| Config 2,5 |  | ULBWP.0.1 |
| Config 3,6 |  | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 |  | ULBWP.1.1 |
| Config 2,5 |  | ULBWP.1.1 |
| Config 3,6 |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD | |
| Config 2,5 | SR.1.1 TDD | |
| Config 3,6 | SR.2.1 TDD | |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD | |
| Config 2,5 | CR.1.1 TDD | |
| Config 3,6 | CR.2.1 TDD | |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD | |
| Config 2,5 | CCR.1.1 TDD | |
| Config 3,6 | CCR.2.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| SMTC Configuration | |  | SMTC.1 | |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | |
| Config 2,5 |  | TRS.1.1 TDD | |
| Config 3,6 |  | TRS.1.2 TDD | |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 | |
| Config 3,6 | SSB.2 FR1 | |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| NocNote 2 | | dBm/15 kHz | -104 | |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 | |
| Ês/Iot | | dB | 17 | |
| Ês/Noc | | dB | 17 | |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 | |
| Config 3,6 | dBm/  38.16MHz | -52.86 | |
| Time offset to Cell1 Note 4 | | μs | 3 for intra-band EN-DC,  33 for inter-band EN-DC | |
| Propagation Condition | |  | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells | | | | |

Table A.4.5.2.1.1-4: Void

##### A.4.5.2.1.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table A.4.5.2.1.2**-**1.

Table A.4.5.2.1.2-1: Interruption length X at transition between active and non-active during DRX

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length X** |
| **Sync** |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

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

#### A.4.5.2.2 E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

##### A.4.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1.2. Supported test configurations are shown in table A.4.5.2.2.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.2.1-2 and A.4.5.2.2.1-3. The E-UTRAN PCell DRX configuration parameters are given in Table A.4.5.2.2.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR FR1 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

Table A.4.5.2.2.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

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

Table A.4.5.2.2.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to Cell1 and Cell2 |
| DRX |  | DRX.4 | DRX related parameters are defined in Table A.3.3.4-1 |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 10 |  |

Table A.4.5.2.2.1-3: NR cell specific test parameters for E-UTRAN – NR FR1 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell2** | |
| Frequency Range | |  | FR1 | |
| Duplex mode | Config 1,4 |  | FDD | |
| Config 2,3,5,6 | TDD | |
| TDD configuration | Config 1,4 |  | Not Applicable | |
| Config 2,5 | TDDConf.1.1 | |
| Config 3,6 | TDDConf.2.1 | |
| BWchannel | Config 1,4 |  | 10: NRB,c = 52 | |
| Config 2,5 | 10: NRB,c = 52 | |
| Config 3,6 | 40: NRB,c = 106 | |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0.1 | |
| Config 2,5 | DLBWP.0.1 | |
| Config 3,6 | DLBWP.0.1 | |
| Dedicated DL BWP Configuration | Config 1,4 |  | DLBWP.1.1 |
| Config 2,5 |  | DLBWP.1.1 |
| Config 3,6 |  | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.1 |
| Config 2,5 |  | ULBWP.0.1 |
| Config 3,6 |  | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 |  | ULBWP.1.1 |
| Config 2,5 |  | ULBWP.1.1 |
| Config 3,6 |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD | |
| Config 2,5 | SR.1.1 TDD | |
| Config 3,6 | SR.2.1 TDD | |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD | |
| Config 2,5 | CR.1.1 TDD | |
| Config 3,6 | CR.2.1 TDD | |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD | |
| Config 2,5 | CCR.1.1 TDD | |
| Config 3,6 | CCR.2.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| SMTC Configuration | |  | SMTC.1 | |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | |
| Config 2,5 |  | TRS.1.1 TDD | |
| Config 3,6 |  | TRS.1.2 TDD | |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 | |
| Config 3,6 | SSB.2 FR1 | |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| NocNote 2 | | dBm/15 kHz | -104 | |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 | |
| Ês/Iot | | dB | 17 | |
| Ês/Noc | | dB | 17 | |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 | |
| Config 3,6 | dBm/  38.16MHz | -52.86 | |
| Time offset to Cell1 Note 4 | Config 1,2,4,5 | μs | 500 | |
|  | Config 3,6 |  | 250 | |
| Propagation Condition | |  | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells | | | | |

Table A.4.5.2.2.1-4: Void

##### A.4.5.2.2.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed X as defined in Table A.4.5.2.2.2**-**1.

Table A.4.5.2.2.2-1: Interruption length X at transition between active and non-active during DRX

|  |  |  |
| --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length X** |
| **Async** |
| 0 | 1 | 2 |
| 1 | 0.5 | 2 |

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

#### A.4.5.2.3 E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

##### A.4.5.2.3.1 Test Purpose and Environment

T The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1.2. Supported test configurations for LTE PCell and NR PSCell are shown in table A.4.5.2.3.1-1. Supported test configurations for NR SCell are shown in table A.4.5.2.3.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.3.1-2, A.4.5.2.3.1-3 and A.4.5.2.3.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell3 is NR PSCell and NR deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. During T1, LTE PCell and NR PSCell are continuously scheduled in DL

Table A.4.5.2.3.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.4.5.2.3.1-1A: Interruptions during measurements on deactivated NR SCC supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration | |

Table A.4.5.2.3.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.4.5.2.3.1-3: NR cell specific test parameters for NR PSCell for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell2** |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,4 |  | Note 8 |
| Config 2,5 | Note 8 |
| Config 3,6 | Note 8 |
| BWoccupied | Config 1,4 | RB | 52 Note 6 |
|  | Config 2,5 |  | 52 Note 6 |
|  | Config 3,6 |  | 106 Note 7 |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0.1 |
| Config 2,5 | DLBWP.0.1 |
| Config 3,6 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 |  | DLBWP.1.1 |
| Config 2,5 | DLBWP.1.1 |
| Config 3,6 | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.1 |
| Config 2,5 | ULBWP.0.1 |
| Config 3,6 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 |  | ULBWP.1.1 |
| Config 2,5 | ULBWP.1.1 |
| Config 3,6 | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD |
| Config 2,5 | CCR.1.1 TDD |
| Config 3,6 | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 | TRS.1.1 TDD |
| Config 3,6 | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 6 |
|  | Config 3,6 |  | OP.1 Note 7 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | μs | 3 for intra-band EN-DC,  33 for inter-band EN-DC |
| Time offset to Cell2 Note 5 | | μs | - |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

Table A.4.5.2.3.1-4: NR cell specific test parameters for NR SCell for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell3** |
| Frequency Range | |  | FR1 |
| Duplex mode | ConfigSCell 1 |  | FDD |
| ConfigSCell 2,3 | TDD |
| TDD configuration | ConfigSCell 1 |  | Not Applicable |
| ConfigSCell 2 | TDDConf.1.1 |
| ConfigSCell 3 | TDDConf.2.1 |
| BWchannel | ConfigSCell 1 |  | Note 8 |
| ConfigSCell 2 | Note 8 |
| ConfigSCell 3 | Note 8 |
| BWoccupied | ConfigSCell 1 | RB | 52 Note 6 |
|  | ConfigSCell 2 |  | 52 Note 6 |
|  | ConfigSCell 3 |  | 106 Note 7 |
| Initial DL BWP Configuration | ConfigSCell 1 |  | DLBWP.0.1 |
| ConfigSCell 2 | DLBWP.0.1 |
| ConfigSCell 3 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | ConfigSCell 1 |  | DLBWP.1.1 |
| ConfigSCell 2 | DLBWP.1.1 |
| ConfigSCell 3 | DLBWP.1.1 |
| Initial UL BWP Configuration | ConfigSCell 1 |  | ULBWP.0.1 |
| ConfigSCell 2 | ULBWP.0.1 |
| ConfigSCell 3 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | ConfigSCell 1 |  | ULBWP.1.1 |
| ConfigSCell 2 | ULBWP.1.1 |
| ConfigSCell 3 | ULBWP.1.1 |
| PDSCH Reference measurement channel | ConfigSCell 1 |  | - |
| ConfigSCell 2 | - |
| ConfigSCell 3 | - |
| RMSI CORESET parameters | ConfigSCell 1 |  | CR.1.1 FDD |
| ConfigSCell 2 | CR.1.1 TDD |
| ConfigSCell 3 | CR.2.1 TDD |
| PDCCH CORESET parameters | ConfigSCell 1 |  | CCR.1.1 FDD |
| ConfigSCell 2 | CCR.1.1 TDD |
| ConfigSCell 3 | CCR.2.1 TDD |
| TRS configuration | ConfigSCell 1 |  | TRS.1.1 FDD |
| ConfigSCell 2 | TRS.1.1 TDD |
| ConfigSCell 3 | TRS.1.2 TDD |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 6 |
|  | ConfigSCell 3 |  | OP.1 Note 7 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.1 FR1 |
| ConfigSCell 3 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | ConfigSCell 1,2 | dBm/9.36MHz | -58.96 |
| ConfigSCell 3 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | μs | 3 + Time offset to Cell2 for intra-band EN-DC,  33 + Time offset to Cell2 for inter-band EN-DC |
| Time offset to Cell2 Note 5 | | μs | 3 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

##### A.4.5.2.3.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.3.2-1.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.3.2-2.

Table A.4.5.2.3.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

Table A.4.5.2.3.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 2 + SMTC duration |
| 1 | 0.5 | 2 + SMTC duration |

For synchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 1 subframe.

For synchronous intra-band EN-DC, the UE is only allowed to cause an interruption on E-UTRA PCell no earlier than 1 subframe before an SMTC and no later than 1 subframe after the SMTC. The interruption on E-UTRA PCell shall not exceed SMTC duration + 2 subframes.

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

#### A.4.5.2.4 E-UTRAN – NR FR1 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

##### A.4.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1. Supported test configurations for LTE PCell and NR PSCell are shown in table A.4.5.2.4.1-1. Supported test configurations for NR SCell are shown in table A.4.5.2.4.1-1. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.4.1-2, A.4.5.2.4.1-3 and A.4.5.2.4.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell3 is NR PSCell and NR deactivated SCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.4.1-1: Interruptions during measurements on deactivated NR SCC supported test configurations for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.4.5.2.4.1-1A: Interruptions during measurements on deactivated NR SCC supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration | |

Table A.4.5.2.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.4.5.2.4.1-3: NR cell specific test parameters for NR PSCell for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell2 |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,4 |  | Note 8 |
| Config 2,5 | Note 8 |
| Config 3,6 | Note 8 |
| BWoccupied | Config 1,4 | RB | 52 Note 6 |
|  | Config 2,5 |  | 52 Note 6 |
|  | Config 3,6 |  | 106 Note 7 |
| Initial BWP Configuration | Config 1,4 |  | DLBWP.0.1 |
| Config 2,5 | DLBWP.0.1 |
| Config 3,6 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 |  | DLBWP.1.1 |
| Config 2,5 | DLBWP.1.1 |
| Config 3,6 | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.1 |
| Config 2,5 | ULBWP.0.1 |
| Config 3,6 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 |  | ULBWP.1.1 |
| Config 2,5 | ULBWP.1.1 |
| Config 3,6 | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD |
| Config 2,5 | CCR.1.1 TDD |
| Config 3,6 | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 | TRS.1.1 TDD |
| Config 3,6 | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 6 |
|  | Config 3,6 |  | OP.1 Note 7 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| SMTC Configuration |  |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 Hz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | Config 1,2,4,5 | μs | 500 |
|  | Config 3,6 |  | 250 |
| Time offset to Cell2 Note 5 | | μs | - |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

Table A.4.5.2.4.1-4: NR cell specific test parameters for NR SCell for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell3 |
| Frequency Range | |  | FR1 |
| Duplex mode | ConfigSCell 1 |  | FDD |
| ConfigSCell 2,3 | TDD |
| TDD configuration | ConfigSCell 1 |  | Not Applicable |
| ConfigSCell 2 | TDDConf.1.1 |
| ConfigSCell 3 | TDDConf.2.1 |
| BWchannel | ConfigSCell 1 |  | Note 8 |
| ConfigSCell 2 | Note 8 |
| ConfigSCell 3 | Note 8 |
| BWoccupied | ConfigSCell 1 | RB | 52 Note 6 |
|  | ConfigSCell 2 |  | 52 Note 6 |
|  | ConfigSCell 3 |  | 106 Note 7 |
| Initial BWP Configuration | ConfigSCell 1 |  | DLBWP.0.1 |
| ConfigSCell 2 | DLBWP.0.1 |
| ConfigSCell 3 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | ConfigSCell 1 |  | DLBWP.1.1 |
| ConfigSCell 2 | DLBWP.1.1 |
| ConfigSCell 3 | DLBWP.1.1 |
| Initial UL BWP Configuration | ConfigSCell 1 |  | ULBWP.0.1 |
| ConfigSCell 2 | ULBWP.0.1 |
| ConfigSCell 3 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | ConfigSCell 1 |  | ULBWP.1.1 |
| ConfigSCell 2 | ULBWP.1.1 |
| ConfigSCell 3 | ULBWP.1.1 |
| PDSCH Reference measurement channel | ConfigSCell 1 |  | - |
| ConfigSCell 2 | - |
| ConfigSCell 3 | - |
| RMSI CORESET parameters | ConfigSCell 1 |  | CR.1.1 FDD |
| ConfigSCell 2 | CR.1.1 TDD |
| ConfigSCell 3 | CR.2.1 TDD |
| PDCCH CORESET parameters | ConfigSCell 1 |  | CCR.1.1 FDD |
| ConfigSCell 2 | CCR.1.1 TDD |
| ConfigSCell 3 | CCR.2.1 TDD |
| TRS configuration | ConfigSCell 1 |  | TRS.1.1 FDD |
| ConfigSCell 2 | TRS.1.1 TDD |
| ConfigSCell 3 | TRS.1.2 TDD |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 6 |
|  | ConfigSCell 3 |  | OP.1 Note 7 |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.1 FR1 |
| ConfigSCell 3 | SSB.2 FR1 |
| SMTC Configuration |  |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | ConfigSCell 1,2 | dBm/ 9.36MHz | -58.96 |
| ConfigSCell 3 | dBm/ 38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | ConfigSCell 1,2 | μs | 500 + Time offset to Cell2 |
|  | ConfigSCell 3 |  | 250 + Time offset to Cell2 |
| Time offset to Cell2 Note 5 | | μs | 3 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells  Note 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 8: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

##### A.4.5.2.4.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-1.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-2.

Table A.4.5.2.4.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 1 |
| 1 | 0.5 | 1 |

**Table A.4.5.2.4.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell**

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 2 + SMTC duration |
| 1 | 0.5 | 2 + SMTC duration |

For asynchronous inter-band EN-DC, the UE is only allowed to cause interruptions on E-UTRA PCell immediately before and immediately after an SMTC. Each interruption on E-UTRA PCell shall not exceed 2 subframe.

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

#### A.4.5.2.5 E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

##### A.4.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS38.133 clause 8. 2.1.2. Supported test configurations are shown in table A.4.5.2.5.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.5.1-2 and A.4.5.2.5.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRAN SCells is received at the UE antenna connector. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.5.1-1: Interruptions during measurements on deactivated E-UTRAN SCC supported test configurations

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

Table A.4.5.2.5.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on E-UTRAN RF channel number 1. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.4.5.2.5.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell2 |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,4 | MHz | 10: NRB,c = 52 |
| Config 2,5 | 10: NRB,c = 52 |
| Config 3,6 | 40: NRB,c = 106 |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0.1 |
| Config 2,5 | DLBWP.0.1 |
| Config 3,6 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 |  | DLBWP.1.1 |
| Config 2,5 | DLBWP.1.1 |
| Config 3,6 | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.1 |
| Config 2,5 | ULBWP.0.1 |
| Config 3,6 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 |  | ULBWP.1.1 |
| Config 2,5 | ULBWP.1.1 |
| Config 3,6 | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD |
| Config 2,5 | CCR.1.1 TDD |
| Config 3,6 | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 | TRS.1.1 TDD |
| Config 3,6 | TRS.1.2 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | μs | 3 for intra-band EN-DC,  33 for inter-band EN-DC |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells | | | |

##### A.4.5.2.5.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell. Each interruption on NR PSCell shall not exceed X defined in Table A.4.5.2.5.2-1 if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell or Y in Table A.4.5.2.3.2-1 if the NR PSCell is in the same band as the E-UTRAN deactivated SCell.

**Table A.4.5.2.5.2-1: Interruption length X and Y at measurements on deactivated E-UTRA SCC**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **NR Slot length (ms)** | **Interruption length X slot** | **Interruption length Y slot** |
| **Sync** |
| 0 | 1 | 1 | 1+SMTC duration |
| 1 | 0.5 | 1 | 1+SMTC duration |

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

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

#### A.4.5.2.6 E-UTRAN – NR FR1 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

##### A.4.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify E-UTRAN PCell and NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for E-UTRAN PCell and NR PSCell in EN-DC specified in TS 38.133 clause 8.2.1. Supported test configurations are shown in table A.4.5.2.6.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.6.1-1 and A.4.5.2.6.1-2 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 is E-UTRAN PCell and E-UTRAN deactivated SCell, Cell2 is NR FR1 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.4.5.2.6.1-1: Interruptions during measurements on deactivated E-UTRAN SCC supported test configurations

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

Table A.4.5.2.6.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on E-UTRAN RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.4.5.2.6.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell2 |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,4 |  | 10: NRB,c = 52 |
| Config 2,5 | 10: NRB,c = 52 |
| Config 3,6 | 40: NRB,c = 106 |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0.1 |
| Config 2,5 | DLBWP.0.1 |
| Config 3,6 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 |  | DLBWP.1.1 |
| Config 2,5 | DLBWP.1.1 |
| Config 3,6 | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.1 |
| Config 2,5 | ULBWP.0.1 |
| Config 3,6 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 |  | ULBWP.1.1 |
| Config 2,5 | ULBWP.1.1 |
| Config 3,6 | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| PDCCH CORESET parameters | Config 1,4 |  | CCR.1.1 FDD |
| Config 2,5 | CCR.1.1 TDD |
| Config 3,6 | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 | TRS.1.1 TDD |
| Config 3,6 | TRS.1.2 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | Config 1,2,4,5 | μs | 500 |
|  | Config 3,6 |  | 250 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells | | | |

##### A.4.5.2.6.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on E-UTRAN PCell and NR PSCell. The UE is only allowed to cause one interruption on PCell and one interruption on PSCell. Each interruption on NR PSCell shall not exceed the value defined in Table A.4.5.2.4.2-1 and Table A.4.5.2.4.2-2.

Table A.4.5.2.6.2-1: Interruption duration if the NR PSCell is not in the same band as the E-UTRAN deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 2 |
| 1 | 0.5 | 2 |

Table A.4.5.2.6.2-2: Interruption duration if the NR PSCell is in the same band as the E-UTRAN deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length |
| 0 | 1 | 2 + SMTC duration |
| 1 | 0.5 | 2 + SMTC duration |

Each interruption on E-UTRAN PCell shall not exceed 1 subframe if the PCell is not in the same band as the deactivated SCell, or 5 subframes if the PCell is in the same band as the deactivated SCell.

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

#### A.4.5.2.7 Void

A.4.5.3 SCell Activation and Deactivation Delay

#### A.4.5.3.1 SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle

##### A.4.5.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations for LTE PCell and NR PSCell are shown in table A.4.5.3.1.1-1 below. Supported test configurations for NR SCell are shown in table A.4.5.3.1.1-1A below. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently. The test parameters are given in Tables A.4.5.3.1.1-2 and cell-specific parameters in A.4.5.3.1.1-3 and A.4.5.3.1.1-4 below. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. The UE now starts monitoring the SCell. The test equipment sends a MAC message for activation of the SCell.

The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2. The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot , as defined in clause 8.3. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot to slot , as defined in clause 8.3, where is the interruption length given in section 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe to subframe , where and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and is the interruption length given in TS 36.133 [14] section 7.32.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot , as defined in clause 8.3. The starting point of any PSCell interruption due to the deactivation shall occur in the slot to , as defined in clause 8.3. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe to subframe , where and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation and deactivation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for SCell is discontinued.

Table A.4.5.3.1.1-1: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.4.5.3.1.1-1A: known FR1 SCell activation in non-DRX for 160ms SCell measurement cycle supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | |

Table A.4.5.3.1.1-2: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell |  | Cell 1 | Primary cell on E-UTRAN RF channel number 1.  As specified in clause A.3.7.2.1 |
| Active PSCell |  | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| SCell measurement cycle (measCycleSCell) | ms | 160 |  |
| Cell3 timing offset to cell2 | μs | 0 |  |
| Time alignment error between cell3 and cell2 | μs | ≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| T3 | s | 1 | During this time the UE shall deactivate the SCell. |
| THARQ | ms | k1NR slot length | k1 is a number of slots indicated by the PDSCH-to-HARQ\_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3] |
| TCSI\_Reporting | ms |  | The delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing timefor CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2] |
| k | slot |  | As specified in clause 4.3 of TS 38.213 [3] |

Table A.4.5.3.1.1-3: Cell specific test parameters for NR PSCell for known FR1 SCell activation case, 160ms SCell measurement cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | | |
| T1 | T2 | T3 |
| SSB ARFCN | |  | freq1 | | |
| Duplex mode | Config 1,4 |  | FDD | | |
| Config 2,3,5,6 | TDD | | |
| TDD configuration | Config 1,4 |  | Not Applicable | | |
| Config 2,5 | TDDConf.1.1 | | |
| Config 3,6 | TDDConf.2.1 | | |
| BWchannel | Config 1,4 | MHz | Note 7 | | |
| Config 2,5 | Note 7 | | |
| Config 3,6 | Note 7 | | |
| BWoccupied | Config 1,4 | RB | 52 Note 5 | | |
|  | Config 2,5 |  | 52 Note 5 | | |
|  | Config 3,6 |  | 106 Note 6 | | |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 | | |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 | | |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 | | |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 | | |
| DRX Cycle | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD | | |
| Config 2,5 | SR.1.1 TDD | | |
| Config 3,6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1,4 |  | CR.1.1 FDD | | |
| Config 2,5 | CR.1.1 TDD | | |
| Config 3,6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | Config 1,4 |  | CCR.1.1 FDD | | |
| Config 2,5 |  | CCR.1.1 TDD | | |
| Config 3,6 |  | CCR.2.1 TDD | | |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | | |
| Config 2,5 |  | TRS.1.1 TDD | | |
| Config 3,6 |  | TRS.1.2 TDD | | |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 5 | | |
|  | Config 3,6 |  | OP.1 Note 6 | | |
| SMTC configuration | |  | SMTC.1 | | |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR1 | | |
| Config 3,6 | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting | Config 1,4 |  | CSI-RS.1.1 FDD | | |
| Config 2,5 |  | CSI-RS.1.1 TDD | | |
| Config 3,6 |  | CSI-RS.2.1 TDD | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | | |
| Config 3,6 | 30 | | |
| reportConfigType | Config 1-6 |  | periodic | | |
| reportQuantity | Config 1-6 |  | cri-RI-PMI-CQI | | |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 | | |
|  | Config 3,6 |  | 10 | | |
| CSI reporting offset | Config 1,2,4,5 | slot | 2 | | |
|  | Config 3,6 |  | 4 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | | dBm/15kHz | -104 | | |
| Note2 | Config 1,2,4,5 | dBm/SCS | -104 | | |
| Config 3,6 | -101 | | |
|  | | dB | 17 | | |
|  | | dB | 17 | | |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | | |
| Config 3,6 | -84 | | |
| SCH\_RP Note 3 | | dBm/15 kHz | -87 | | |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 | | |
| Config 3,6 | dBm/38.16MHz | -52.87 | | |
| Propagation condition | | - | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  Note 3: SS-RSRP, Io and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]  Note 5: All UL/DL transmission shall be confined within BWchannel\_actual-occupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWchannel\_actual-occupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | |

Table A.4.5.3.1.1-4: Cell specific test parameters for NR SCell for known FR1 SCell activation case, 160ms SCell measurement cycle

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 3 | | |
| T1 | T2 | T3 |
| SSB ARFCN | |  | freq2 | | |
| Duplex mode | ConfigSCell 1 |  | FDD | | |
| ConfigSCell 2,3 | TDD | | |
| TDD configuration | ConfigSCell 1 |  | Not Applicable | | |
| ConfigSCell 2 | TDDConf.1.1 | | |
| ConfigSCell 3 | TDDConf.2.1 | | |
| BWchannel | ConfigSCell 1 | MHz | Note 7 | | |
| ConfigSCell 2 | Note 7 | | |
| ConfigSCell 3 | Note 7 | | |
| BWoccupied | ConfigSCell 1 | RB | 52 Note 5 | | |
|  | ConfigSCell 2 |  | 52 Note 5 | | |
|  | ConfigSCell 3 |  | 106 Note 6 | | |
| DL initial BWP configuration | ConfigSCell 1-3 |  | DLBWP.0.1 | | |
| DL dedicated BWP configuration | ConfigSCell 1-3 |  | DLBWP.1.1 | | |
| UL initial BWP configuration | ConfigSCell 1-3 |  | ULBWP.0.1 | | |
| UL dedicated BWP configuration | ConfigSCell 1-3 |  | ULBWP.1.1 | | |
| DRX Cycle | | ms | Not Applicable | | |
| PDSCH Reference measurement channel | ConfigSCell 1 |  | SR.1.1 FDD | | |
| ConfigSCell 2 | SR.1.1 TDD | | |
| ConfigSCell 3 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | ConfigSCell 1 |  | CR.1.1 FDD | | |
| ConfigSCell 2 | CR.1.1 TDD | | |
| ConfigSCell 3 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | ConfigSCell 1 |  | CCR.1.1 FDD | | |
| ConfigSCell 2 |  | CCR.1.1 TDD | | |
| ConfigSCell 3 |  | CCR.2.1 TDD | | |
| TRS configuration | ConfigSCell 1 |  | TRS.1.1 FDD | | |
| ConfigSCell 2 |  | TRS.1.1 TDD | | |
| ConfigSCell 3 |  | TRS.1.2 TDD | | |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 5 | | |
|  | ConfigSCell 3 |  | OP.1 Note 6 | | |
| SMTC configuration | |  | SMTC.1 | | |
| SSB configuration | ConfigSCell 1,2 |  | SSB.1 FR1 | | |
| ConfigSCell 3 | SSB.2 FR1 | | |
| CSI-RS configuration for CSI reporting | ConfigSCell 1 |  | CSI-RS.1.1 FDD | | |
| ConfigSCell 2 |  | CSI-RS.1.1 TDD | | |
| ConfigSCell 3 |  | CSI-RS.2.1 TDD | | |
| PDSCH/PDCCH subcarrier spacing | ConfigSCell 1,2 | kHz | 15 | | |
| ConfigSCell 3 | 30 | | |
| reportConfigType | ConfigSCell 1-3 |  | periodic | | |
| reportQuantity | ConfigSCell 1-3 |  | cri-RI-PMI-CQI | | |
| CSI reporting periodicity | ConfigSCell 1,2 | slot | 5 | | |
|  | ConfigSCell 3 |  | 10 | | |
| CSI reporting offset | ConfigSCell 1,2 | slot | 2 | | |
|  | ConfigSCell 3 |  | 4 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | | dBm/15kHz | -104 | | |
| Note2 | ConfigSCell 1,2 | dBm/SCS | -104 | | |
| ConfigSCell 3 | -101 | | |
|  | | dB | 17 | | |
|  | | dB | 17 | | |
| SS-RSRPNote3 | ConfigSCell 1,2 | dBm/SCS | -87 | | |
| ConfigSCell 3 | -84 | | |
| SCH\_RP Note 3 | | dBm/15 kHz | -87 | | |
| IoNote3 | ConfigSCell 1,2 | dBm/9.36MHz | -58.96 | | |
| ConfigSCell 3 | dBm/38.16MHz | -52.87 | | |
| Propagation condition | | - | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  Note 3: SS-RSRP, Io and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]  Note 5: All UL/DL transmission shall be confined within BWchannel\_actual-occupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWchannel\_actual-occupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | |

##### A.4.5.3.1.2 Test Requirements

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot , Tactivation\_time = TFirstSSB+ 5ms, as defined in clause 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot , as defined in clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot to , and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe to subframe, as defined in clause 8.3.

During T3 the starting point of interruption of PSCell during SCell deactivation shall not happen outside the slot to , as defined in clause 8.3 and the starting point of interruption of E-UTRA PCell during SCell deactivation shall not happen outside the subframe to subframe .

The interruption of PSCell shall not be more than the values specified for EN-DC in Clause 8.2.1.2.4.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

#### A.4.5.3.2 SCell Activation and deactivation of known SCell in FR1 for 640ms SCell measurement cycle

##### A.4.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1. The supported test configurations are the same as defined in clause A.4.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.4.5.3.2.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2.

Table A.4.5.3.2.1-1: General test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |

##### A.4.5.3.2.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, except Tactivation\_time will be replaced with the value TFirstSSB\_MAX + Trs + 5ms.

#### A.4.5.3.3 SCell Activation and deactivation of unknown SCell in FR1

##### A.4.5.3.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

The supported test configurations are defined in clause A.4.5.3.1.1. The test parameters are the same except those described in the following clause. The listed parameter values in Tables A.4.5.3.3.1-1 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2. The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment 100ms after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2. The UE shall be able to report valid CSI for the activated SCell at latest in slot as defined in clause 8.3 provided the SCell can be successfully detected on the first attempt. The UE shall start reporting CSI after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in the slot to slot, as defined in clause 8.3, where is the interruption length given in section 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe to subframe, where and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and is the interruption length given in TS 36.133 [14] section 7.32.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell at latest in slot as defined in clause 8.3. The starting point of any PSCell interruption due to the deactivation shall occur in the slot to , as defined in clause 8.3. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe to subframe , where and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

Table A.4.5.3.3.1-1: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| T1 | ms | 100 | During this time the PSCell shall be known and the SCell configured, but not detected. |

##### A.4.5.3.3.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, except Tactivation\_time will be replaced with the value TFirstSSB\_MAX + TSMTC\_MAX + 2\*Trs + 5ms as defined in clause 8.3.

### A.4.5.4 UE UL carrier RRC reconfiguration Delay

#### A.4.5.4.1 UE UL carrier RRC reconfiguration Delay

Table A.4.5.4.1-1 - Table A.4.5.4.1-4 : Void

##### A.4.5.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in clause 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

There are three cells: E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and FR1 SCell (Cell 3). For SCell, both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB.* The test parameters for PSCell and SCell are given in Table A. 4.5.4.1.1-1, Table A. 4.5.4.1.1-2, Table A. 4.5.4.1.1-3 and Table A. 4.5.4.1.1-4 below. The test parameters and applicability for E-UTRAN PCell are defined in A.3.7.2. The test consists two tests. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 3 is configured to UE*.* At the start of T2, a supplementary uplink of cell3 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementray uplink on cell 3 is configured to UE*.* At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

Table A.4.5.4.1.1-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | PSCell (Cell2) | SCell (Cell3) |
| 1 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 2 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 3 | 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| 4 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 5 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 6 | 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| 7 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode;  SUL: 15kHz SCS, 10 MHz bandwidth, SUL duplex mode |
| 8 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 15kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode;  SUL: 15kHz SCS, ≥10 MHz bandwidth, SUL duplex mode |
| 9 | 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode | DL and UL: 30kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode;  SUL: 30kHz SCS, ≥40 MHz bandwidth, SUL duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2 The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, | | |

Table A.4.5.4.1.1-2: General test parameters for EN-DC UE UL carrier RRC reconfiguration Delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| RF Channel Number |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 1, 2, 3 | Three radio channels are used for these two tests. |
| Active cell |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Cell 1: E-UTRAN PCell  Cell 2: FR1 PSCell  Cell 3: FR1 SCell | E-UTRAN PCell on RF channel number 1  FR1 PSCell on RF channel number 2  FR1 SCell on RF channel number 3 |
| CP length |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | Normal |  |
| DRX |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF |  |
| Measurement gap pattern Id |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | OFF |  |
| Filter coefficient |  | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 0 | L3 filtering is not used |
| T1 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 |  |
| T2 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 |  |
| T3 | s | Config 1,2,3, 4, 5, 6, 7, 8, 9 | 5 |  |

Table A.4.5.4.1.1-3: NR Cell specific test parameters for EN-DC UE UL carrier RRC reconfiguration Delay on PSCell (Cell 2)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test Configuration | Test 1 | | | Test 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Channel number |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 2 | | | 2 | | |
| TDD configuration |  | Conf 1, 2, 3 | N/A | | | N/A | | |
| Conf 4, 5, 6 | TDD Conf.1.1 | | | TDD Conf.1.1 | | |
| Conf 7, 8, 9 | TDD Conf.2.1 | | | TDD Conf.2.1 | | |
| BWchannel | MHz | Conf 1, 2, 3 | Note 6 | | | Note 6 | | |
| Conf 4, 5, 6 | Note 6 | | | Note 6 | | |
| Conf 7, 8, 9 | Note 6 | | | Note 6 | | |
| BWoccupied | RB | Conf 1, 2, 3 | 52 Note 4 | | | 52 Note 4 | | |
|  |  | Conf 4, 5, 6 | 52 Note 4 | | | 52 Note 4 | | |
|  |  | Conf 7, 8, 9 | 106 Note 5 | | | 106 Note 5 | | |
| PDSCH reference measurement channel as defined in A.3.1.1 |  | Conf 1, 2, 3 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| Conf 4, 5, 6 | SR.1.1 TDD | | | SR.1.1 TDD | | |
| Conf 7, 8, 9 | SR 2.1 TDD | | | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |  | Conf 1, 2, 3 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Conf 4, 5, 6 | CR.1.1 TDD | | | CR.1.1 TDD | | |
| Conf 7, 8, 9 | CR.2.1 TDD | | | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in A.3.1.3 |  | Conf 1, 2, 3 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| Conf 4, 5, 6 | CCR.1.1 TDD | | | CCR.1.1 TDD | | |
| Conf 7, 8, 9 | CCR.2.1 TDD | | | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 |  | Conf 1, 2, 3, 4, 5, 6 | OP.1 Note 4 | | | OP.1 Note 4 | | |
|  |  | Config 7, 8, 9 | OP.1 Note 5 | | | OP.1 Note 5 | | |
| SSB configuration |  | Conf 1, 2, 3, 4, 5, 6 | SSB.1 FR1 | | | SSB.1 FR1 | | |
| Conf 7, 8, 9 | SSB.2 FR1 | | | SSB.2 FR1 | | |
| SMTC configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | | SMTC.1 | | |
| CSI-RS for tracking |  | Conf 1 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
|  | Conf 2 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
|  | Conf 3 | TRS.1.1 FDD | | | TRS.1.1 FDD | | |
|  | Conf 4 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
|  | Conf 5 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
|  | Conf 6 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
|  | Conf 7 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
|  | Conf 8 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
|  | Conf 9 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| DL initial BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| DL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | | DLBWP.1.1 | | |
| UL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 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 SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| Note 2 | dBm / 15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | | -102 | | |
| dBm/ SCS | Conf 1,2,3,4,5,6 | -102 | | | -102 | | |
| Conf 7,8,9 | -99 | | | -99 | | |
|  | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 | 16 | 16 | 16 |
| Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/ SCS | Conf 1,2,3,4,5,6 | -86 | -86 | -86 | -86 | -86 | -86 |
| Conf 7,8,9 | -83 | -83 | -83 | -83 | -83 | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1,2,3,4,5,6 | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 | -57.9 |
| dBm/ 38.16MHz | Conf 7,8,9 | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 | -51.8 |
| Propagation Condition |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | | AWGN | | |
| Antenna configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | | 1 x 2 | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  NOTE 3: , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 6: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | | | | |

Table A.4.5.4.1.1-4: NR Cell specific test parameters for EN-DC UE UL carrier RRC reconfiguration Delay on SCell (Cell 3)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test Configuration | Test 1 | | | | Test 2 | | |
| T1 | T2 | | T3 | T1 | T2 | T3 |
| Channel number |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 3 | | | | 3 | | |
| TDD configuration |  | Conf 1, 4, 7 | N/A | | | | N/A | | |
| Conf 2, 5, 8 | TDDConf.1.1 | | | | TDDConf.1.1 | | |
| Conf 3, 6, 9 | TDDConf.2.1 | | | | TDDConf.2.1 | | |
| BWchannel | MHz | Conf 1, 4, 7 | Note 6 | | | | Note 6 | | |
| Conf 2, 5, 8 | Note 6 | | | | Note 6 | | |
| Conf 3, 6, 9 | Note 6 | | | | Note 6 | | |
| BWoccupied | RB | Conf 1, 4, 7 | 52 Note 4 | | | | 52 Note 4 | | |
|  |  | Conf 2, 5, 8 | 52 Note 4 | | | | 52 Note 4 | | |
|  |  | Conf 3, 6, 9 | 106 Note 5 | | | | 106 Note 5 | | |
| PUSCH parameters for NR UL carrier |  | Conf 1, 4, 7 | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | | N/A | G-FR1-A3-10 in [13] | N/A |
| Conf 2, 5, 8 | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | | N/A | G-FR1-A3-10 in [13] | N/A |
| Conf 3, 6, 9 | G-FR1-A3-14 in [13] | G-FR1-A3-14 in [13] | G-FR1-A3-14 in [13] | | N/A | G-FR1-A3-14 in [13] | N/A |
| PUCCH parameters  For NR UL carrier |  | Conf 1, 4, 7 | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | | N/A | N/A | N/A |
| Conf 2, 5, 8 | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | | N/A | N/A | N/A |
| Conf 3, 6, 9 | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | | N/A | N/A | N/A |
| PUSCH parameters for supplementary UL |  | Conf 1, 4, 7 | N/A | G-FR1-A3-10 in [13] | N/A | | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] |
| Conf 2, 5, 8 | N/A | G-FR1-A3-10 in [13] | N/A | | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] | G-FR1-A3-10 in [13] |
| Conf 3, 6, 9 | N/A | G-FR1-A3-14 in [13] | N/A | | G-FR1-A3-14 in [13] | G-FR1-A3-14 in [13] | G-FR1-A3-14 in [13] |
| PUCCH parameters for supplementary UL |  | Conf 1, 4, 7 | N/A | N/A | N/A | | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] |
| Conf 2, 5, 8 | N/A | N/A | N/A | | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] | Table 8.3.3.1.2-1 in [13] |
| Conf 3, 6, 9 | N/A | N/A | N/A | | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] | Table 8.3.3.1.2-2 in [13] |
| PDSCH reference measurement channel as defined in A.3.1.1 |  | Conf 1, 4, 7 | SR.1.1 FDD | | | | SR.1.1 FDD | | |
| Conf 2, 5, 8 | SR.1.1 TDD | | | | SR.1.1 TDD | | |
| Conf 3, 6, 9 | SR 2.1 TDD | | | | SR 2.1 TDD | | |
| RMSI CORESET reference measurement channel as defined in A.3.1.2 |  | Conf 1, 4, 7 | CR.1.1 FDD | | | | CR.1.1 FDD | | |
| Conf 2, 5, 8 | CR.1.1 TDD | | | | CR.1.1 TDD | | |
| Conf 3, 6, 9 | CR.2.1 TDD | | | | CR.2.1 TDD | | |
| RMC CORESET reference measurement channel as defined in A.3.1.3 |  | Conf 1, 4, 7 | CCR.1.1 FDD | | | | CCR.1.1 FDD | | |
| Conf 2, 5, 8 | CCR.1.1 TDD | | | | CCR.1.1 TDD | | |
| Conf 3, 6, 9 | CCR.2.1 TDD | | | | CCR.2.1 TDD | | |
| OCNG Pattern Note 1 |  | Conf 1, 2, 4, 5, 7, 8 | OP.1 Note 4 | | | | OP.1 Note 4 | | |
|  |  | Conf 3, 6, 9 | OP.1 Note 5 | | | | OP.1 Note 5 | | |
| SSB configuration |  | Conf 1, 2, 4, 5, 7,8 | SSB.1 FR1 | | | | SSB.1 FR1 | | |
| Conf 3, 6, 9 | SSB.2 FR1 | | | | SSB.2 FR1 | | |
| SMTC configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | SMTC.1 | | | | SMTC.1 | | |
| CSI-RS for tracking |  | Conf 1 | TRS.1.1 FDD | | | | TRS.1.1 FDD | | |
|  | Conf 2 | TRS.1.1 TDD | | | | TRS.1.1 TDD | | |
|  | Conf 3 | TRS.1.2 TDD | | | | TRS.1.2 TDD | | |
|  | Conf 4 | TRS.1.1 FDD | | | | TRS.1.1 FDD | | |
|  | Conf 5 | TRS.1.1 TDD | | | | TRS.1.1 TDD | | |
|  | Conf 6 | TRS.1.2 TDD | | | | TRS.1.2 TDD | | |
|  | Conf 7 | TRS.1.1 FDD | | | | TRS.1.1 FDD | | |
|  | Conf 8 | TRS.1.1 TDD | | | | TRS.1.1 TDD | | |
|  | Conf 9 | TRS.1.2 TDD | | | | TRS.1.2 TDD | | |
| DL initial BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.0.1 | | | | DLBWP.0.1 | | |
| DL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | DLBWP.1.1 | | | | DLBWP.1.1 | | |
| UL dedicated BWP configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | ULBWP.1.1 | | | | ULBWP.1.1 | | |
| EPRE ratio of PSS to SSS | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 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 SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| Note 2 | dBm / 15kHz | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | -102 | | | | -102 | | |
| dBm/ SCS | Conf 1, 2, 4, 5, 7,8 | -102 | | | | -102 | | |
| Conf 3, 6, 9 | -99 | | | | -99 | | |
|  | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | | 16 | 16 | 16 | 16 |
| Note 3 | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | | 16 | 16 | 16 | 16 |
| SS-RSRP Note 3 | dBm/ SCS | Conf 1, 2, 4, 5, 7,8 | -86 | -86 | | -86 | -86 | -86 | -86 |
| Conf 3, 6, 9 | -83 | -83 | | -83 | -83 | -83 | -83 |
| Io Note 3 | dBm/ 9.36 MHz | Conf 1, 2, 4, 5, 7,8 | -57.9 | -57.9 | | -57.9 | -57.9 | -57.9 | -57.9 |
| dBm/ 38.16MHz | Conf 3, 6, 9 | -51.8 | -51.8 | | -51.8 | -51.8 | -51.8 | -51.8 |
| Propagation Condition |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | AWGN | | | | AWGN | | |
| Antenna configuration |  | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 1 x 2 | | | | 1 x 2 | | |
| NOTE 1: OCNG shall be used such that both cells are fully allocated, and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.  NOTE 3: , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  NOTE 6: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | | | | | | | |

##### A.4.5.4.1.2 Test Requirements

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

### A.4.5.5 Beam Failure Detection and Link recovery procedures

#### A.4.5.5.1 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with SSB-based BFD and LR in non-DRX mode

##### A.4.5.5.1.1 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 8.5.

The test parameters are given in Tables A.4.5.5.1.1-1, A.4.5.5.1.1-2, A.4.5.5.1.1-3 and A.4.5.5.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.1.1-1 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.4.5.5.1.1-1 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 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

Table A.4.5.5.1.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.4.5.5.1.1-2: 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 |  |
| Active E-UTRA PCell | | | |  | Cell 1 |  |
| E-UTRA RF Channel Number | | | |  | 1 |  |
| Active PSCell | | | |  | Cell 2 |  |
| RF Channel Number | | | |  | 2 |  |
| Duplex mode | Config 1, 4 | | |  | FDD |  |
|  | Config 2, 3, 5, 6 | | | TDD |  |
| BWchannel | Config 1, 4 | | | MHz | 10: NRB,c = 52 |  |
|  | Config 2, 5 | | |  | 10: NRB,c = 52 |  |
|  | Config 3, 6 | | |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | |  | DLBWP.1.1 |  |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | | |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | | |  | ULBWP.1.1 |  |
| TDD Configuration | Config 1, 4 | | |  | Not Applicable |  |
|  | Config 2, 5 | | |  | TDDConf.1.1 |  |
|  | Config 3, 6 | | |  | TDDConf.2.1 |  |
| RMSI CORESET Reference Channel | Config 1, 4 | | |  | CR.1.1 FDD |  |
|  | Config 2, 5 | | |  | CR.1.1 TDD |  |
|  | Config 3, 6 | | |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | Config 1, 4 | | |  | CCR.1.1 FDD |  |
|  | Config 2, 5 | | |  | CCR.1.1 TDD |  |
|  | Config 3, 6 | | |  | CCR.2.1 TDD |  |
| SSB Configuration | Config 1, 4 | | |  | SSB.3 FR1 |  |
|  | Config 2, 5 | | |  | SSB.3 FR1 |  |
|  | Config 3, 6 | | |  | SSB.4 FR1 |  |
| SMTC Configuration | Config 1, 2, 4, 5 | | |  | SMTC.1 |  |
|  | Config 3, 6 | | |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | | |  | 15 KHz |  |
|  | Config 3, 6 | | |  | 30 KHz |  |
| PRACH Configuration | Config 1, 2, 4, 5 | | |  | Table A.3.8.2.2-1 |  |
|  | Config 3, 6 | | |  | Table A.3.8.2.2-1 |  |
| SSB Index assigned as BFD RS (q0) | | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | | |  | 1 |  |
| OCNG parameters | | | |  | OP.1 |  |
| CP length | | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | | |  | 2x2 Low |  |
| Beam failure | | DCI format | |  | 1-0 |  |
| detection transmission parameters | | Number of Control OFDM symbols | |  | 2 |  |
|  | | Aggregation level | | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |  |
|  | | DMRS precoder granularity | |  | REG bundle size |  |
|  | | REG bundle size | |  | 6 |  |
| DRX | | | |  | OFF |  |
| Gap pattern ID | | | |  | gp0 |  |
| gapOffset | | | |  | 0 |  |
| rlmInSyncOutOfSyncThreshold | | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  | Config 3, 6 | | |  | -95 |
| powerControlOffsetSS | | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | | |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | | Config 1, 4 |  | CSI-RS.1.1 FDD |  |
|  | | | Config 2, 5 |  | CSI-RS.1.1 TDD |  |
|  | | | Config 3, 6 |  | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking | | | Config 1, 4 |  | TRS.1.1 FDD |  |
|  | | | Config 2, 5 |  | TRS.1.1 TDD |  |
|  | | | Config 3, 6 |  | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS | | | |  | 0,1 |  |
| T310 timer | | | | ms | 1000 |  |
| N310 | | | |  | 2 |  |
| T1 | | | | s | 0.2 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | s | 0.37 |  |
| T3 | | | | s | 0.24 |  |
| T4 | | | | s | 0 |  |
| T5 | | | | s | 0.17 |  |
| D1 | | | | s | 0.13 |  |
| 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.4.5.5.1.1-3: 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 |
| 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, 4 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2, 5 |  | 5 | -3 | -12 | -12 | -12 |
|  | Config 3, 6 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1, 4 | dB | -10 | -10 | 10 | 10 | 10 |
|  | Config 2, 5 |  | -10 | -10 | 10 | 10 | 10 |
|  | Config 3, 6 |  | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1, 4 | dBm/ | -108 | -108 | -88 | -88 | -88 |
|  | Config 2, 5 | SCS kHz | -108 | -108 | -88 | -88 | -88 |
|  | Config 3, 6 |  | -105 | -105 | -85 | -85 | -85 |
|  | Config 1, 4 | dBm/15 KHz | -98 | | | | |
| Config 2, 5 | -98 | | | | |
| Config 3, 6 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 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.3.6. | | | | | | | |

**Table A.4.5.5.1.1-4: Void**



Figure A.4.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode

##### A.4.5.5.1.2 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 = 120+10 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.

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

##### A.4.5.5.2.1 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 8.5.

The test parameters are given in Tables A.4.5.5.2.1-1, A.4.5.5.2.1-2, A.4.5.5.2.1-3, A.4.5.5.2.1-4 and A.4.5.5.2.1-5 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.2.1-1 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.4.5.5.2.1-1 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 5 ms. 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.4.5.5.2.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.4.5.5.2.1-2: 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 |  |
| Active E-UTRA PCell | | | | |  | Cell 1 |  |
| E-UTRA RF Channel Number | | | | |  | 1 |  |
| Active PSCell | | | | |  | Cell 2 |  |
| RF Channel Number | | | | |  | 2 |  |
| Duplex mode | | | | Config 1, 4 |  | FDD |  |
|  | | | | Config 2, 3, 5, 6 |  | TDD |  |
| BWchannel | | | | Config 1, 4 | MHz | 10: NRB,c = 52 |  |
|  | | | | Config 2, 5 |  | 10: NRB,c = 52 |  |
|  | | | | Config 3, 6 |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | | | | Config 1, 4 |  | Not Applicable |  |
|  | | | | Config 2, 5 |  | TDDConf.1.1 |  |
|  | | | | Config 3, 6 |  | TDDConf.2.1 |  |
| RMSI CORESET Reference Channel | | | | Config 1, 4 |  | CR.1.1 FDD |  |
|  | | | | Config 2, 5 |  | CR.1.1 TDD |  |
|  | | | | Config 3, 6 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | | | | Config 1, 4 |  | CCR.1.1 FDD |  |
|  | | | | Config 2, 5 |  | CCR.1.1 TDD |  |
|  | | | | Config 3, 6 |  | CCR.2.1 TDD |  |
| SSB Configuration | | | | Config 1, 4 |  | SSB.3 FR1 |  |
|  | | | | Config 2, 5 |  | SSB.3 FR1 |  |
|  | | | | Config 3, 6 |  | SSB.4 FR1 |  |
| SMTC Configuration | | | | Config 1, 2, 4, 5 |  | SMTC.1 |  |
|  | | | | Config 3, 6 |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | | | | Config 1, 2, 4, 5 |  | 15 KHz |  |
|  | | | | Config 3, 6 |  | 30 KHz |  |
| PRACH Configuration | | | | Config 1, 2, 4, 5 |  | Table A.3.8.2.2-1 |  |
|  | | | | Config 3, 6 |  | Table A.3.8.2.2-1 |  |
| SSB Index assigned as BFD RS (q0) | | | | |  | 0 |  |
| SSB Index assigned as CBD RS (q1) | | | | |  | 1 |  |
| OCNG parameters | | | | |  | OP.1 |  |
| CP length | | | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | | | |  | 2x2 Low |  |
| Beam failure | | DCI format | | |  | 1-0 |  |
| detection transmission parameters | | Number of Control OFDM symbols | | |  | 2 |  |
|  | | Aggregation level | | | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | | dB | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | | dB | 0 |  |
|  | | DMRS precoder granularity | | |  | REG bundle size |  |
|  | | REG bundle size | | |  | 6 |  |
| DRX | | | | |  | DRX.7 | A.3.3.7 |
| Gap pattern ID | | | | |  | N.A. |  |
| rlmInSyncOutOfSyncThreshold | | | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | Config 1, 2, 4, 5 | | | | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  | Config 3, 6 | | | |  | -95 |
| powerControlOffsetSS | | | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | | | |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | | | |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | | Config 1, 4 | |  | CSI-RS.1.1 FDD |  |
|  | | | Config 2, 5 | |  | CSI-RS.1.1 TDD |  |
|  | | | Config 3, 6 | |  | CSI-RS.2.1 TDD |  |
| CSI-RS for tracking | | | Config 1, 4 | |  | TRS.1.1 FDD |  |
|  | | | Config 2, 5 | |  | TRS.1.1 TDD |  |
|  | | | Config 3, 6 | |  | TRS.1.2 TDD |  |
| SSB Index assigned as RLM RS | | | | |  | 0,1 |  |
| T310 Timer | | | | | ms | 1000 |  |
| N310 | | | | |  | 2 |  |
| T1 | | | | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | | | s | 5.17 |  |
| T3 | | | | | s | 3.24 |  |
| T4 | | | | | s | 0 |  |
| T5 | | | | | s | 1.97 |  |
| D1 | | | | | s | 1.93 |  |
| 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.4.5.5.2.1-3: 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 |
| 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, 4 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2, 5 |  | 5 | -3 | -12 | -12 | -12 |
|  | Config 3, 6 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1, 4 | dB | -10 | -10 | 10 | 10 | 10 |
|  | Config 2, 5 |  | -10 | -10 | 10 | 10 | 10 |
|  | Config 3, 6 |  | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1, 4 | dBm/ | -108 | -108 | -88 | -88 | -88 |
|  | Config 2, 5 | SCS kHz | -108 | -108 | -88 | -88 | -88 |
|  | Config 3, 6 |  | -105 | -105 | -85 | -85 | -85 |
|  | Config 1, 4 | dBm/15 KHz | -98 | | | | |
|  | Config 2, 5 |  | -98 | | | | |
|  | Config 3, 6 |  | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 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.3.6. | | | | | | | |

Table A.4.5.5.2.1-4: Void

Table A.4.5.5.2.1-5: Void



Figure A.4.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode

##### A.4.5.5.2.2 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 initiat 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 = 1920+10 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.

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.4.5.5.3 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with CSI-RS-based BFD and LR in non-DRX mode

##### A.4.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate 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 CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.3.1-1, A.4.5.5.3.1-2, and A.4.5.5.3.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.3.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q0 in the active PSCell to emulate CSI-RS based beam failure. Figure A.4.5.5.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS 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 5 ms. In the test, DRX configuration is not enabled.

Table A.4.5.5.3.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.4.5.5.3.1-2: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
|  | | |  | Test 1 |  |
| Active PCell | | |  | Cell 1 |  |
| RF Channel Number | | |  | 1 |  |
| Active PSCell | | |  | Cell 2 |  |
| RF Channel Number | | |  | 2 |  |
| Duplex mode | Config 1, 4 | |  | FDD |  |
|  | Config 2, 3, 5, 6 | |  | TDD |  |
| BWchannel | Config 1, 4 | | MHz | 10: NRB,c = 52 |  |
|  | Config 2, 5 | |  | 10: NRB,c = 52 |  |
|  | Config 3, 6 | |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | |  | DLBWP.1.1 |  |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 | |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 | |  | ULBWP.1.1 |  |
| TDD Configuration | Config 1, 4 | |  | Not Applicable |  |
|  | Config 2, 5 | |  | TDDConf.1.1 |  |
|  | Config 3, 6 | |  | TDDConf.2.1 |  |
| RMSI CORESET Reference Channel | Config 1, 4 | |  | CR.1.1 FDD | A.3.1.2 |
|  | Config 2, 5 | |  | CR.1.1 TDD |  |
|  | Config 3, 6 | |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference Channel | Config 1, 4 | |  | CCR.1.1 FDD | A.3.1.3 |
|  | Config 2, 5 | |  | CCR.1.1 TDD |  |
|  | Config 3, 6 | |  | CCR.2.1 TDD |  |
| SSB Configuration | Config 1, 4 | |  | SSB.3 FR1 | A.3.10 |
|  | Config 2, 5 | |  | SSB.3 FR1 |  |
|  | Config 3, 6 | |  | SSB.4 FR1 |  |
| SMTC Configuration | Config 1, 2, 4, 5 | |  | SMTC.1 | A.3.11 |
|  | Config 3, 6 | |  | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2, 4, 5 | |  | 15 KHz |  |
|  | Config 3, 6 | |  | 30 KHz |  |
| PRACH Configuration | Config 1, 2, 4, 5 | |  | FR1 PRACH configuration 4 | A.3.8.2 |
|  | Config 3, 6 | | FR1 PRACH configuration 4 | A.3.8.2 |
| csi-RS-Index assigned as beam failure detection RS in set q0 | | |  | 0 |  |
| OCNG parameters | | |  | OP.1 | A.3.2.1 |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure | DCI format | |  | 1-0 |  |
| detection transmission parameters | Number of Control OFDM symbols | |  | 2 |  |
|  | Aggregation level | | CCE | 8 |  |
|  | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 |  |
|  | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 |  |
|  | DMRS precoder granularity | |  | REG bundle size |  |
|  | REG bundle size | |  | 6 |  |
| DRX | | |  | OFF |  |
| Gap pattern ID | | |  | N.A. |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 | | |  | 1 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | Config 1, 2, 4, 5 | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
|  | | Config 3, 6 |  | -95 |  |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS | Config 1, 4 | |  | CSI-RS.1.2 FDD | A.3.14 |
| configuration for q0 | Config 2, 5 | |  | CSI-RS.1.2 TDD |  |
| and q1 | Config 3, 6 | |  | CSI-RS.2.2 TDD |  |
| CSI-RS | Config 1, 4 | |  | CSI-RS.1.1 FDD | A.3.14 |
| configuration for | Config 2, 5 | |  | CSI-RS.1.1 TDD |  |
| CSI reporting | Config 3, 6 | |  | CSI-RS.2.1 TDD |  |
| TRS configuration | Config 1, 4 | |  | TRS.1.1 FDD |  |
|  | Config 2, 5 | |  | TRS.1.1 TDD |  |
|  | Config 3, 6 | |  | TRS.1.2 TDD |  |
| csi-RS-Index | Config 1, 4 | |  | CSI-RS.1.2 FDD | A.3.14 |
| assigned as RLM | Config 2, 5 | |  | CSI-RS.1.2 TDD |  |
| RS | Config 3, 6 | |  | CSI-RS.2.2 TDD |  |
| T310 Timer | | | ms | 1000 |  |
| N310 | | |  | 2 |  |
| T1 | | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 0.18 |  |
| T3 | | | s | 0.14 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 0.08 |  |
| D1 | | | s | 0.04 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

Table A.4.5.5.3.1-3: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| 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\_CSI-RS of set q0 | Config 1, 4 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2, 5 |  | 5 | -3 | -12 | -12 | -12 |
|  | Config 3, 6 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1, 4 | dB | -10 | -10 | 10 | 10 | 10 |
|  | Config 2, 5 |  | -10 | -10 | 10 | 10 | 10 |
|  | Config 3, 6 |  | -10 | -10 | 10 | 10 | 10 |
| CSI-RS\_RP of set q1 | Config 1, 4 | dBm/ | -108 | -108 | -88 | -88 | -88 |
|  | Config 2, 5 | SCS kHz | -108 | -108 | -88 | -88 | -88 |
|  | Config 3, 6 |  | -105 | -105 | -85 | -85 | -85 |
|  | Config 1, 4 | dBm/15 KHz | -98 | | | | |
|  | Config 2, 5 |  | -98 | | | | |
|  | Config 3, 6 |  | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  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 REs carrying CSI-RS.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.3.6. | | | | | | | |

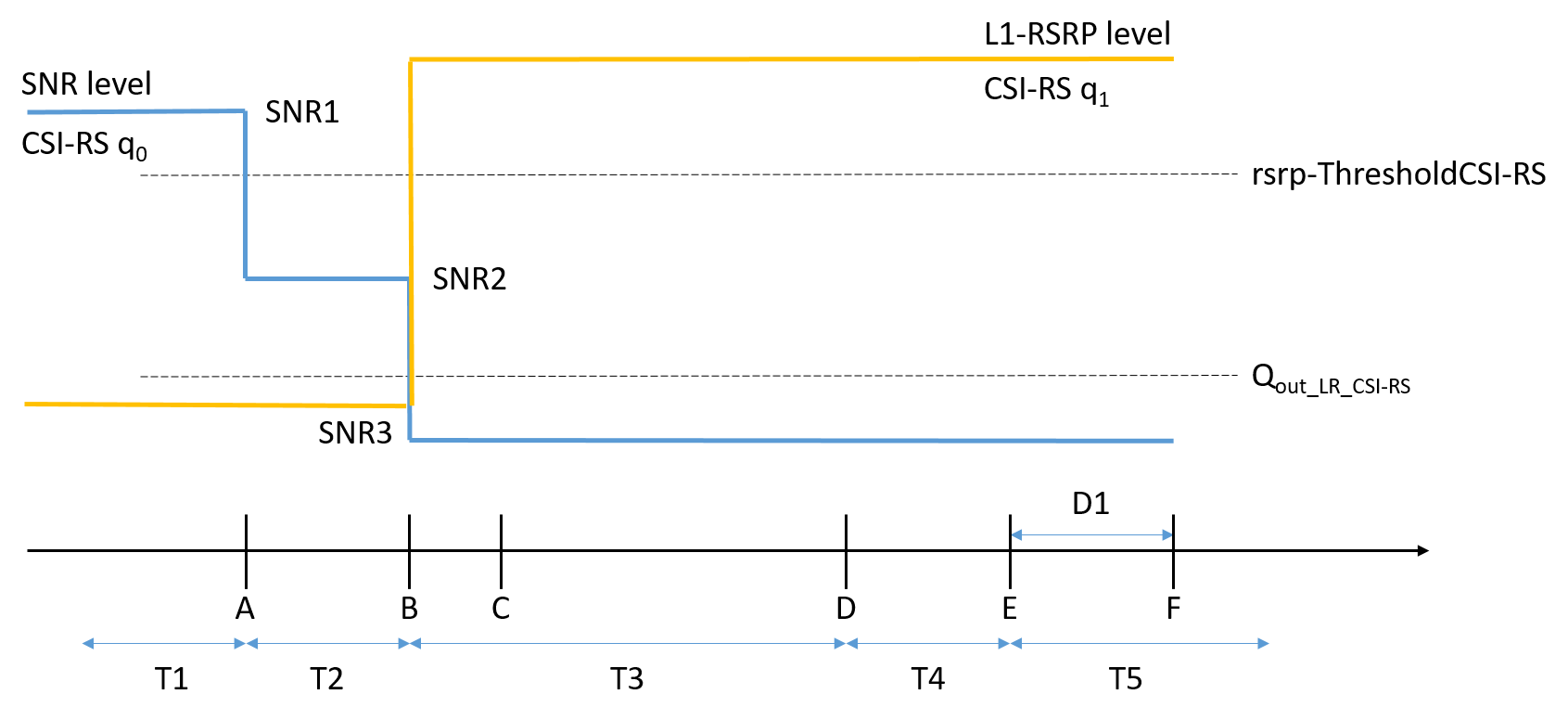


Figure A.4.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

##### A.4.5.5.3.2 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 initiat 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 = 30+10 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.

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.4.5.5.4 EN-DC Beam Failure Detection and Link Recovery Test for FR1 PSCell configured with CSI-RS-based BFD and LR in DRX mode

##### A.4.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate 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 CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.4.1-1, A.4.5.5.4.1-2, A.4.5.5.4.1-3, and A.4.5.5.4.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.4.1-1 shows the variation of the downlink SNR of the PSCell and the SNR of the CSI-RS in set q0 in the active PSCell to emulate CSI-RS based beam failure. Figure A.4.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS 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 5 ms. 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.4.5.5.4.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.4.5.5.4.1-2: General test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** | **Comment** |
| **Test 1** |
| Active PCell | | |  | Cell 1 |  |
| RF Channel Number | | |  | 1 |  |
| Active PSCell | | |  | Cell 2 |  |
| RF Channel Number | | |  | 2 |  |
| Duplex mode | | Config 1, 4 |  | FDD |  |
|  | | Config 2, 3, 5, 6 |  | TDD |  |
| BWchannel | | Config 1, 4 | MHz | 10: NRB,c = 52 |  |
|  | | Config 2, 5 |  | 10: NRB,c = 52 |  |
|  | | Config 3, 6 |  | 40: NRB,c = 106 |  |
| DL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |  |
| TDD Configuration | | Config 1, 4 |  | Not Applicable |  |
|  | | Config 2, 5 |  | TDDConf.1.1 |  |
|  | | Config 3, 6 |  | TDDConf.2.1 |  |
| RMSI CORESET Reference | | Config 1, 4 |  | CR.1.1 FDD | A.3.1.2 |
| Channel | | Config 2, 5 |  | CR.1.1 TDD |  |
|  | | Config 3, 6 |  | CR.2.1 TDD |  |
| Dedicated CORESET Reference | | Config 1, 4 |  | CCR.1.1 FDD | A.3.1.3 |
| Channel | | Config 2, 5 |  | CCR.1.1 TDD |  |
|  | | Config 3, 6 |  | CCR.2.1 TDD |  |
| SSB Configuration | | Config 1, 4 |  | SSB.3 FR1 | A.3.10 |
|  | | Config 2, 5 |  | SSB.3 FR1 |  |
|  | | Config 3, 6 |  | SSB.4 FR1 |  |
| SMTC Configuration | | Config 1, 2, 4, 5 |  | SMTC.1 | A.3.11 |
|  | | Config 3, 6 |  | SMTC.1 |  |
| PDSCH/PDCCH | | Config 1, 2, 4, 5 |  | 15 KHz |  |
| subcarrier spacing | | Config 3, 6 |  | 30 KHz |  |
| PRACH Configuration | | Config 1, 2, 4, 5 |  | FR1 PRACH configuration 4 | A.3.8.2 |
|  | | Config 3, 6 |  | FR1 PRACH configuration 4 | A.3.8.2 |
| csi-RS-Index assigned as beam failure detection RS in set q0 | | |  | 0 |  |
| OCNG parameters | | |  | OP.1 | A.3.2.1 |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure detection | | DCI format |  | 1-0 |  |
| transmission parameters | | Number of Control OFDM symbols |  | 2 |  |
|  | | Aggregation level | CCE | 8 |  |
|  | | Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |  |
|  | | Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |  |
|  | | DMRS precoder granularity |  | REG bundle size |  |
|  | | REG bundle size |  | 6 |  |
| DRX | | |  | DRX.7 | A.3.3.7 |
| Gap pattern ID | | |  | N.A. |  |
| csi-RS-Index assigned as candidate beam detection RS in set q1 | | |  | 1 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | | dBm | -98 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration | Config 1, 4 | |  | CSI-RS.1.2 FDD | A.3.14 |
| for q0 and q1 | Config 2, 5 | |  | CSI-RS.1.2 TDD |  |
|  | Config 3, 6 | |  | CSI-RS.2.2 TDD |  |
| CSI-RS configuration | Config 1, 4 | |  | CSI-RS.1.1 FDD | A.3.14 |
| for CSI reporting | Config 2, 5 | |  | CSI-RS.1.1 TDD |  |
|  | Config 3, 6 | |  | CSI-RS.2.1 TDD |  |
| TRS configuration | Config 1, 4 | |  | TRS.1.1 FDD |  |
|  | Config 2, 5 | |  | TRS.1.1 TDD |  |
|  | Config 3, 6 | |  | TRS.1.2 TDD |  |
| csi-RS-Index | Config 1, 4 | |  | CSI-RS.1.2 FDD | A.3.14 |
| assigned as RLM RS | Config 2, 5 | |  | CSI-RS.1.2 TDD |  |
|  | Config 3, 6 | |  | CSI-RS.2.2 TDD |  |
| T310 Timer | | | ms | 1000 |  |
| N310 | | |  | 2 |  |
| T1 | | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 8.37 |  |
| T3 | | | s | 6.44 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 1.97 |  |
| D1 | | | s | 1.93 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

Table A.4.5.5.4.1-3: Cell specific test parameters for FR1 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| 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\_CSI-RS of set q0 | Config 1, 4 | dB | 5 | -3 | -12 | -12 | -12 |
|  | Config 2, 5 |  | 5 | -3 | -12 | -12 | -12 |
|  | Config 3, 6 |  | 5 | -3 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1, 4 | dB | -10 | -10 | 10 | 10 | 10 |
|  | Config 2, 5 |  | -10 | -10 | 10 | 10 | 10 |
|  | Config 3, 6 |  | -10 | -10 | 10 | 10 | 10 |
| CSI-RS\_RP of set q1 | Config 1, 4 | dBm/ | -108 | -108 | -88 | -88 | -88 |
|  | Config 2, 5 | SCS kHz | -108 | -108 | -88 | -88 | -88 |
|  | Config 3, 6 |  | -105 | -105 | -85 | -85 | -85 |
|  | Config 1, 4 | dBm/15 KHz | -98 | | | | |
|  | Config 2, 5 |  | -98 | | | | |
|  | Config 3, 6 |  | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  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 REs carrying CSI-RS.  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.3.6. | | | | | | | |

Table A.4.5.5.4.1-4: Void

Table A.4.5.5.4.1-5: Void

Table A.4.5.5.4.1-6: Void

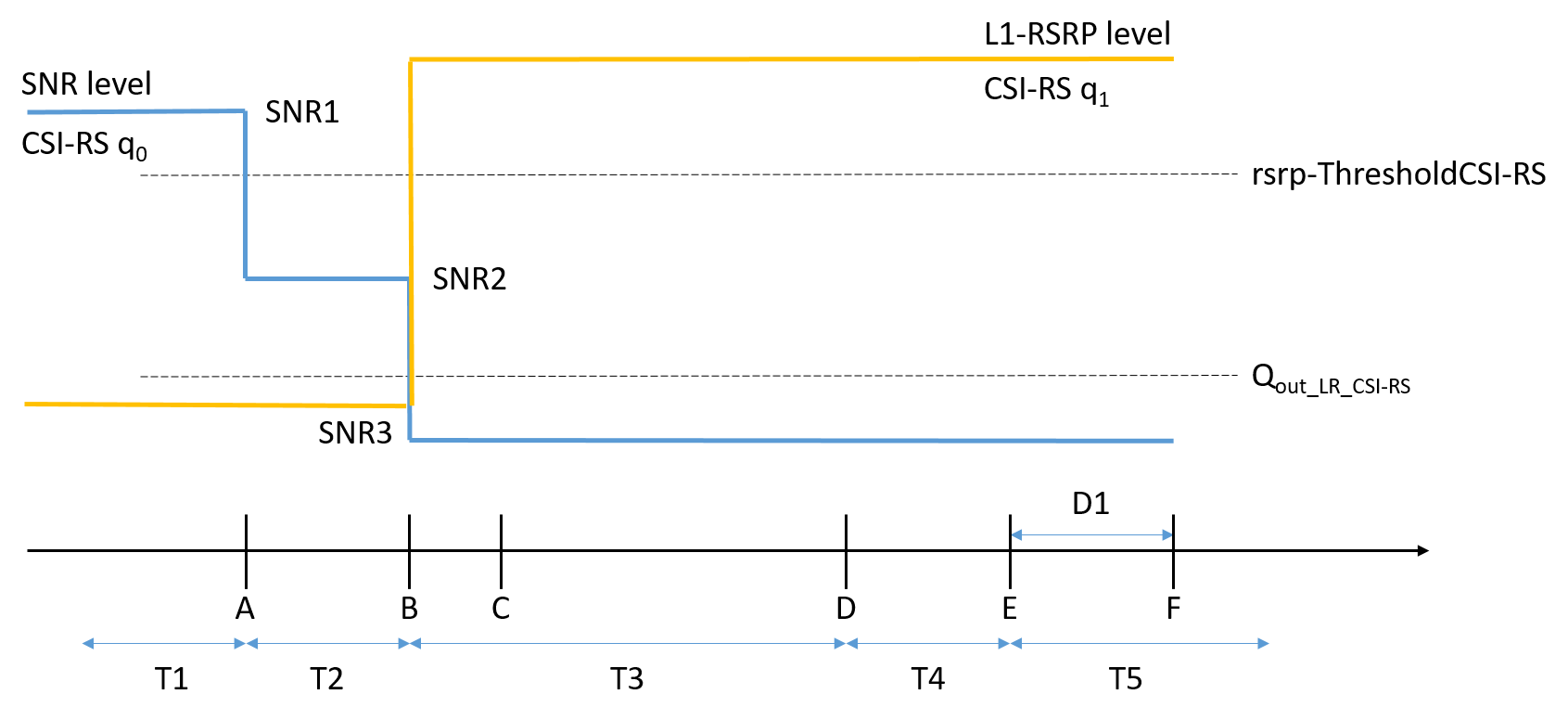


Figure A.4.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode

##### A.4.5.5.4.2 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 initiat 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 = 1920+10 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.

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.4.5.6 Active BWP switch

#### A.4.5.6.1 DCI-based and Timer-based Active BWP Switch

##### A.4.5.6.1.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

###### A.4.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.32.2.7. Supported test configurations are shown in Table A.4.5.6.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one PSCell (Cell 2) as given in Table A.4.5.6.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of PSCell is specified in Table A.4.5.6.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 in PSCell.

- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell’s slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of PSCell’s DL slot (*i+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than the first UL slot that occurs after the beginning of DL slot (*i+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on PSCell’s BWP-2 starting from the first DL slot that occurs after the beginning of DL slot (*i+TBWPswitchDelay*).

The starting time of E-UTRA PCell (Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

During T2, the test equipment won’t transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot #*j*, where j is the first slot of the subframe immediately after the *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of PSCell’s DL slot (*j+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest on the first UL slot that occurs after the beginning of DL slot (*j+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on PSCell’s BWP-1 starting from the first DL slot that occurs after the beginning of DL slot (*j+TBWPswitchDelay*).

The starting time of E-UTRA PCell (Cell 1) interruption due to BWP switch of PSCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell is carried out in the correct time span by monitoring ACK/NACK sent in E-UTRA PCell during BWP switch of PSCell, respectively.

Table A.4.5.6.1.1.1-1: DL BWP switch supported test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations.  Note 2: A UE which fulfils the requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1. | |

Table A.4.5.6.1.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

Table A.4.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,4 |  | 10 MHz: NRB,c = 52 |
| Config 2,5 | 10 MHz: NRB,c = 52 |
| Config 3,6 | 40 MHz: NRB,c = 106 |
| Active BWP ID | |  | 1, 2 |
| Initial DL BWP Configuration | Config 1,4 |  | DLBWP.0.2 Note 4 |
|  | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active DL BWP-1 Configuration | Config 1,4 |  | DLBWP.1.1 Note 4 |
|  | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active DL BWP-2 Configuration | Config 1,4 |  | DLBWP.1.3 Note 4 |
|  | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Initial UL BWP Configuration | Config 1,4 |  | ULBWP.0.2 Note 4 |
|  | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active UL BWP-1 Configuration | Config 1,4 |  | ULBWP.1.1 Note 4 |
|  | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active UL BWP-2 | Config 1,4 |  | N/A |
| Configuration | Config 2,5 |  | ULBWP.1.3 Note 4 |
|  | Config 3,6 |  | ULBWP.1.3 Note 4 |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1,4 |  | CCR.1.2 FDD |
| Config 2,5 | CCR.1.2 TDD |
| Config 3,6 | CCR.2.4 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 |  | SSB.2 FR1 |
| SMTC Configuration |  |  | SMTC.1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| TRS Configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 |  | TRS.1.1 TDD |
| Config 3,6 |  | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| NocNote 2 | Config 1,2,4,5 | dBm/SCS | -104 |
| Config 3,6 | -101 |
| NocNote 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | -87 |
| Config 3,6 | -84 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc 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: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | | |

###### A.4.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (*i+TBWPswitchDelay*+*k1*).

During T3, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (*j+TBWPswitchDelay*+*k1*).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration *TBWPswitchDelay* defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

During T1, the start time of E-UTRA PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of E-UTRA PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (*i+TBWPswitchDelay*+*k1*), (*j+TBWPswitchDelay*+*k1*), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

##### A.4.5.6.1.2 E-UTRAN – NR PSCell FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC

###### A.4.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6, and interruption requirements for NR victim cell defined in clause 8.2.1.2.7 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [15]. Supported test configurations for LTE PCell and NR PSCell are shown in Table A.4.5.6.1.2.1-1. Supported test configurations for NR SCell are shown in table A.4.5.6.1.2.1-1A. Test configuration for LTE PCell and NR PSCell and test configuration for NR SCell are chosen independently.

The test scenario comprises of one E-UTRA PCell (Cell 1), one PSCell (Cell 2) and one SCell (Cell 3) as given in Table A.4.5.6.1.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of PSCell and SCell are specified in Table A.4.5.6.1.2.1-3 and Table A.4.5.6.1.2.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) and PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 3 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 2 before starting the test.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 in SCell.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-0 in PSCell.

- UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell’s slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of SCell’s DL slot (*i+*TBWPswitchDela*y*) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell no later than on the first UL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay*+*k1). The UE shall be continuously scheduled on SCell’s BWP-2 starting from the first DL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay).

E-UTRA PCell(Cell 1) interruption due to BWP switch on PSCell shall occur within the BWP switch delay.

PSCell(Cell 2) interruption due to BWP switch on SCell shall occur within the BWP switch delay.

During T2, the test equipment won’t transmit DCI format for PDSCH reception on SCell(Cell 3).

During T3,

The time period T3 starts from the slot #*j*, where j is the first slot of the subframe immediately after *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of SCell’s DL slot (*j+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell no later than on the first UL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-1 starting from the first DL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay).

E-UTRA PCell(Cell 1) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

PSCell(Cell 2) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to E-UTRA PCell and NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in E-UTRA PCell and PSCell during BWP switch of SCell, respectively.

Table A.4.5.6.1.2.1-1: DL BWP switch supported test configurations for LTE PCell and NR PSCell

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: A UE which fulfils the requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1.  Note 3: Void  Note 4: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration | |

Table A.4.5.6.1.2.1-1A: DL BWP switch supported test configurations for NR SCell

|  |  |
| --- | --- |
| ConfigSCell | Description |
| 1 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: A UE which fulfils the requirements in test case A.4.5.6.1.2 can skip the test cases in A.4.5.6.1.1.  Note 3: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration | |

Table A.4.5.6.1.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2, 3 | Two NR radio channels are used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| Active SCell |  | Cell 3 | SCell on RF channel number 3. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| Cell3 timing offset to cell2 | μs | 3 | Synchronous cells |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

Table A.4.5.6.1.2.1-3: NR Cell specific test parameters for NR PSCell for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
| Config 2,3,5,6 | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
| Config 2,5 | TDDConf.1.1 |
| Config 3,6 | TDDConf.2.1 |
| BWchannel | Config 1,2,3,4,5,6 |  | Note 7 |
| BWoccupied | Config 1,2,4,5 | RB | 52 Note 5 |
|  | Config 3,6 |  | 106 Note 6 |
| Active BWP ID | |  | 0 |
| Initial DL BWP Configuration | Config 1,2,3,4,5,6 |  | DLBWP.0.2 |
| Active DL BWP-0 Configuration | Config 1,2,3,4,5,6 |  | DLBWP.0.2 |
| Active DL BWP-1 Configuration | Config 1,2,3,4,5,6 |  | N.A. |
| Active DL BWP-2 Configuration | Config 1,2,3,4,5,6 |  | N.A. |
| Initial UL BWP Configuration | Config 1,2,3,4,5,6 |  | ULBWP.0.2 |
| Active UL BWP-0 Configuration | Config 1,2,3,4,5,6 |  | ULBWP.0.2 |
| Active UL BWP-1 Configuration | Config 1,2,3,4,5,6 |  | N.A. |
| Active UL BWP-2 Configuration | Config 1,2,3,4,5,6 |  | N.A. |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD |
| Config 2,5 | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD |
| RMSI CORESET parameters | Config 1,4 |  | CR.1.1 FDD |
| Config 2,5 | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1,4 |  | CCR.1.2 FDD |
| Config 2,5 | CCR.1.2 TDD |
| Config 3,6 | CCR.2.4 TDD |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 5 |
|  | Config 3,6 |  | OP.1 Note 6 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
| Config 3,6 | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.1 |
| TRS Configuration | Config 1,4 |  | TRS.1.1 FDD |
| Config 2,5 |  | TRS.1.1 TDD |
| Config 3,6 |  | TRS.1.2 TDD |
| Antenna Configuration | |  | 1x2 |
| Propagation Condition | |  | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
| Config 3,6 | dBm/38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].  Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

Table A.4.5.6.1.2.1-4: NR Cell specific test parameters for NR SCell for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 3** |
| Frequency Range | |  | FR1 |
| Duplex mode | ConfigSCell 1 |  | FDD |
| ConfigSCell 2,3 | TDD |
| TDD configuration | ConfigSCell 1 |  | Not Applicable |
| ConfigSCell 2 | TDDConf.1.1 |
| ConfigSCell 3 | TDDConf.2.1 |
| BWchannel | ConfigSCell 1,2,3 |  | Note 7 |
| BWoccupied | ConfigSCell 1,2 | RB | 52 Note 5 |
|  | ConfigSCell 3 |  | 106 Note 6 |
| Active BWP ID | |  | 1,2 |
| Initial DL BWP Configuration | ConfigSCell 1,2,3 |  | DLBWP.0.2 |
| Active DL BWP-0 Configuration | ConfigSCell 1,2,3 |  | N.A. |
| Active DL BWP-1 Configuration | ConfigSCell 1,2,3 |  | DLBWP.1.3 |
| Active DL BWP-2 Configuration | ConfigSCell 1,2,3 |  | DLBWP.1.1 |
| Initial UL BWP Configuration | ConfigSCell 1,2,3 |  | N.A. |
| Active UL BWP-0 Configuration | ConfigSCell 1,2,3 |  | N.A. |
| Active UL BWP-1 Configuration | ConfigSCell 1,2,3 |  | N.A. |
| Active UL BWP-2 Configuration | ConfigSCell 1,2,3 |  | N.A. |
| PDSCH Reference measurement channel | ConfigSCell 1 |  | SR.1.1 FDD |
| ConfigSCell 2 | SR.1.1 TDD |
| ConfigSCell 3 | SR.2.1 TDD |
| RMSI CORESET parameters | ConfigSCell 1 |  | CR.1.1 FDD |
| ConfigSCell 2 | CR.1.1 TDD |
| ConfigSCell 3 | CR.2.1 TDD |
| Dedicated CORESET parameters | ConfigSCell 1 |  | CCR.1.2 FDD |
| ConfigSCell 2 | CCR.1.2 TDD |
| ConfigSCell 3 | CCR.2.4 TDD |
| OCNG Patterns | ConfigSCell 1,2 |  | OP.1 Note 5 |
|  | ConfigSCell 3 |  | OP.1 Note 6 |
| SSB Configuration | ConfigSCell 1,2 |  | SSB.1 FR1 |
| ConfigSCell 3 | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.1 |
| TRS Configuration | ConfigSCell 1 |  | TRS.1.1 FDD |
| ConfigSCell 2 |  | TRS.1.1 TDD |
| ConfigSCell 3 |  | TRS.1.2 TDD |
| Antenna Configuration | |  | 1x2 |
| Propagation Condition | |  | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | ConfigSCell 1,2 | dBm/9.36MHz | -58.96 |
| ConfigSCell 3 | dBm/38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled within BWoccupied.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].  Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.  Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel. | | | |

###### A.4.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay*+*k1).

During T3, the UE shall start to send the ACK/NACK for SCell on PSCell from the first UL slot that occurs after the beginning of DL slot (*j+*TBWPswitchDelay*+*k1).

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration TBWPswitchDelay defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

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

During T1, the start of the interruption of E-UTRA PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of E-UTRA PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of E-UTRA PCell shall not be longer than the interruption duration specified for active BWP switch in clause 7.32.2.7 of TS 36.133 [15].

During T1, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed E-UTRA PCell and PSCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay+k1), (*j+*TBWPswitchDelay+k1), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### A.4.5.6.2 RRC-based Active BWP Switch

A.4.5.6.2.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC

###### A.4.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.4.5.6.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one PSCell (Cell 2) as given in Table A.4.5.6.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of PSCell are specified in Table A.4.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1 (PSCell).

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 of initial condition in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

Time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in PSCell’s slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to receive PDSCH on PSCell from on the first DL slot that occurs after PSCell’s DL slot as defined in clause 8.6.3 and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot. The UE shall be continuously scheduled on PSCell’s BWP-1 starting from the first DL slot occurs after the begining of DL slot .

*TRRCprocessingDelay* and *TBWPswitchDelayRRC* are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRCReconfiguration message including updated BWP configurationis is sent till the time when a vaild ACK/NACK is received.

Table A.4.5.6.2.1.1-1: DL BWP switch supported test configurations

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

Table A.4.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 |  |

Table A.4.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 2** |
| Frequency Range | | |  | FR1 |
| Duplex mode | | Config 1,4 |  | FDD |
|  | | Config 2,3,5,6 |  | TDD |
| TDD configuration | | Config 1,4 |  | Not Applicable |
|  | | Config 2,5 |  | TDDConf.1.1 |
|  | | Config 3,6 |  | TDDConf.2.1 |
| BWchannel | | Config 1,4 |  | 10 MHz: NRB,c = 52 |
|  | | Config 2,5 |  | 10 MHz: NRB,c = 52 |
|  | | Config 3,6 |  | 40 MHz: NRB,c = 106 |
| Active DL BWP ID | | |  | 1 |
| Initial DL BWP | | Config 1,4 |  | DLBWP.0.2 |
| Configuration | | Config 2,5 |  |  |
|  | | Config 3,6 |  |  |
| Initial UL BWP | | Config 1,4 |  | ULBWP.0.2 |
| Configuration | | Config 2,5 |  |  |
|  | | Config 3,6 |  |  |
| Initial Condition | Active DL BWP-1 Configuration | Config 1,4 |  | DLBWP.1.3 |
|  |  | Config 2,5 |  |  |
|  |  | Config 3,6 |  |  |
|  | Active UL BWP-1 Configuration | Config 1,4 |  | ULBWP.1.3 |
|  |  | Config 2,5 |  |  |
|  |  | Config 3,6 |  |  |
| Final  Condition | Active DL BWP-1 Configuration | Config 1,4 |  | DLBWP.1.1 |
|  |  | Config 2,5 |  |  |
|  |  | Config 3,6 |  |  |
|  | Active UL BWP-1 Configuration | Config 1,4 |  | ULBWP.1.1 |
|  |  | Config 2,5 |  |  |
|  |  | Config 3,6 |  |  |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD |
|  | | Config 2,5 |  | SR.1.1 TDD |
|  | | Config 3,6 |  | SR.2.1 TDD |
| RMSI CORESET parameters | | Config 1,4 |  | CR.1.1 FDD |
|  | | Config 2,5 |  | CR.1.1 TDD |
|  | | Config 3,6 |  | CR.2.1 TDD |
| Dedicated CORESET parameters | | Config 1,4 |  | CCR.1.2 FDD |
|  | | Config 2,5 |  | CCR.1.2 TDD |
|  | | Config 3,6 |  | CCR.2.4 TDD |
| OCNG Patterns | | |  | OP.1 |
| SSB Configuration | | Config 1,2,4,5 |  | SSB.1 FR1 |
|  | | Config 3,6 |  | SSB.2 FR1 |
| SMTC Configuration | | |  | SMTC.1 |
| TRS Configuration | | Config 1,4 |  | TRS.1.1 FDD |
|  | | Config 2,5 |  | TRS.1.1 TDD |
|  | | Config 3,6 |  | TRS.1.2 TDD |
| Antenna Configuration | | |  | 1x2 |
| Propagation Condition | | |  | AWGN |
| EPRE ratio of PSS to SSS | | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |
| NocNote 2 | | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | | dBm/15 kHz | -87 |
| Ês/Iot | | | dB | 17 |
| Ês/Noc | | | dB | 17 |
| IoNote3 | | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 |
|  | | Config 3,6 | dBm/  38.16MHz | -52.86 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc 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: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | | | |

###### A.4.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant on PSCell from the first DL slot occurs after the beginning of DL slot , and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

### A.4.5.7 PSCell addition and release delay

#### A.4.5.7.1 Addition and Release Delay of known NR PSCell

##### A.4.5.7.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays under EN-DC are within the requirements stated in clause 7.31.2 [15] for the case when the PSCell is known by the UE at the time of addition.

Supported test configurations are shown in A.4.5.7.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.4.5.7.1.1-2 and cell-specific parameters in A.4.5.7.1.1-3 below. The test consists of five successive time periods with duration of T1, T2, T3, T4 and T5 respectively. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event B1 is configured for neighbour cell (Cell2). Before the start of T2 the UE is configured with the measurement gaps (gap pattern Id # 0). The Cell2 becomes known to the UE during T2. Therefore, during T2 the UE shall report Event B1. The point in time at which the RRC message to release measurement gap is transmitted from the test system defines the start of period T3. During T3, after measurement gap is released, the test system transmits the RRC message to the UE to add PSCell on radio channel 2.

The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

The test system shall observe the periodic reporting of CSI for PSCell during T5. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T5.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T5, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T6.

Table A.4.5.7.1.1-1: Supported test configurations for FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR SCS 15 kHz, BW 10 MHz, FDD |
| 2 | LTE FDD, NR SCS 15 kHz, BW 10 MHz, TDD |
| 3 | LTE FDD, NR SCS 30 kHz, BW 40 MHz, TDD |
| 4 | LTE TDD, NR SCS 15 kHz, BW 10 MHz, FDD |
| 5 | LTE TDD, NR SCS 15 kHz, BW 10 MHz, TDD |
| 6 | LTE TDD, NR SCS 30 kHz, BW 40 MHz, TDD |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

Table A.4.5.7.1.1-2: General Test Parameters for PSCell Addition and Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial Condition | Active PCell |  | Cell1 | PCell on RF channel number 1. |
| Neighbour cell | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | Cell1 | PCell on RF channel number 1. |
| Neighbour Cell | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| Threshold RSRP (Config 1,2,4,5) | dBm | -96 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.11.1 of TS 36.133 [15] into account plus margin. |
| Threshold RSRP (Config 3,6) | dBm | -93 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.11.1 of TS 36.133 [15] into account plus margin. |
| Time to Trigger | S | 0 |  |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | |  | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration on cell2 | |  | FR1 PRACH configuration 1 | Captured in A.3.8.2.1 |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1.5 | During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3 | | s | 3 | During this time the test system transmits the RRC messages to release measurement gap and add PSCell. |
| T4 | | s | 0.5 | During this time the UE adds the PSCell. |
| T5 | | s | 0.5 | During this time the UE sends CSI reports for PSCell. |
| T6 | | s | 0.5 | During this time the UE releases the PSCell. |

Table A.4.5.7.1.1-3: Cell Specific Parameters for PSCell Addition and Release

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test | | | | |
| T1 | T2 | T3 | T4 | T5 |
| E-UTRA RF Channel Number |  | 1,2,3,4,5,6 | 1 | | | | |
| NR RF Channel Number |  | 1,2,3,4,5,6 | 2 | | | | |
| TDD configuration |  | 1,4 | Not Applicable | | | | |
| 2,5 | TDDConf.1.1 | | | | |
| 3,6 | TDDConf.2.1 | | | | |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 | | | | |
| 2,5 | 10: NRB,c = 52 | | | | |
| 3,6 | 40: NRB,c = 106 | | | | |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 | | | | |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 | | | | |
| PDSCH Reference measurement channel |  | 1,4 | SR.1.1 FDD | | | | |
| 2,5 | SR.1.1 TDD | | | | |
| 3,6 | SR.2.1 TDD | | | | |
| RMSI CORESET Reference Channel |  | 1,4 | CR.1.1 FDD | | | | |
| 2,5 | CR.1.1 TDD | | | | |
| 3,6 | CR.2.1 TDD | | | | |
| Dedicated CORESET Reference Channel |  | 1,4 | CCR.1.1 FDD | | | | |
| 2,5 | CCR.1.1 TDD | | | | |
| 3,6 | CCR.2.1 TDD | | | | |
| OCNG Patterns |  | 1,2,3,4,5,6 | OP.1 | | | | |
| SSB configuration |  | 1,2,4,5 | SSB.1 FR1 | | | | |
| 3,6 | SSB.2 FR1 | | | | |
| SMTC configuration |  | 1,2,4,5 | SMTC.1 | | | | |
| 3,6 | SMTC.1 | | | | |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD | | | | |
|  | 2,5 | TRS.1.1 TDD | | | | |
|  | 3,6 | TRS.1.2 TDD | | | | |
| CSI-RS configuration for CSI reporting |  | 1,4 | CSI-RS.1.1 FDD | | | | |
| 2,5 | CSI-RS.1.1 TDD | | | | |
| 3,6 | CSI-RS.2.1 TDD | | | | |
| reportConfigType |  | 1,2,3,4,5,6 | periodic | | | | |
| reportQuantity |  | 1,2,3,4,5,6 | cri-RI-PMI-CQI | | | | |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 | | | | |
| 3,6 | 10 | | | | |
| CSI reporting offset | slot | 1,2,4,5 | 2 | | | | |
| 3,6 | 4 | | | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4,5,6 | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Note2 | dBm/15 kHz | 1,2,3,4,5,6 | N/A | -88 | | | |
| Note2 | dBm/SCS | 1,2,4,5 | N/A | -88 | | | |
| 3,6 | N/A | -85 | | | |
|  |  | 1,2,3,4,5,6 | -infinity | 0 | | | |
|  |  | 1,2,3,4,5,6 | -infinity | 0 | | | |
| SS-RSRPNote3 | dBm/SCS | 1,2,4,5 | -infinity | -88 | | | |
| 3,6 | -infinity | -85 | | | |
| IoNote3 | dBm/9.36MHz | 1,2,4,5 | N/A | -57 | | | |
| dBm/38.1MHz | 3,6 | N/A | -51 | | | |
| Propagation condition |  | 1,2,3,4,5,6 | AWGN | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

##### A.4.5.7.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell no later than 82 msNote1 from the start of T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell no later than 20ms from the start of T5.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31.2 [15]:

Tconfig\_PSCell = TRRC\_delay + Tprocessing + Tsearch + T∆ + TPSCell\_ DU + 2msWhere:

TRRC\_delay = 20ms

Tprocessing = 20ms

Tsearch = 0

T∆ = 20ms

TPSCell\_ DU = 1\*10+10 = 20ms

## A.4.6 Measurement procedure

### A.4.6.1 Intra-frequency Measurements

#### A.4.6.1.1 EN-DC event triggered reporting tests without gap under non-DRX

##### A.4.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

##### A.4.6.1.1.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.1.2-1, A.4.6.1.1.2-2, A.4.6.1.1.2-3 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.4.6.1.1.2-1: Supported test configurations

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

Table A.4.6.1.1.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| SSB configuration |  | 1, 4 | SSB.1 FR1 |  |
|  | 2, 5 | SSB.1 FR1 |  |
|  | 3, 6 | SSB.2 FR1 |  |
| SMTC configuration |  | 1, 4 | SMTC.2 |  |
|  | 2, 5 | SMTC.1 |  |
|  | 3, 6 | SMTC.1 |  |
| A3-Offset | dB | 1, 2, 3, 4, 5, 6 | -4.5 |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal |  |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 |  |
| Time To Trigger | s | 1, 2, 3, 4, 5, 6 | 0 |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | N/A | OFF |
| Time offset between PCell and PSCell |  | 1, 2, 3, 4, 5, 6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1, 4 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |  | 2, 5 | 3 μs | Synchronous cells |
|  |  | 3, 6 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 5 |  |

Table A.4.6.1.1.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|  |  |  | T1 | T2 | T1 | T2 |
| TDD |  | 1, 4 | N/A | | N/A | |
| configuration |  | 2, 5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3, 6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC |  | 1, 4 | SR.1.1 FDD | | N/A | |
| configuration |  | 2, 5 | SR.1.1 TDD | |  | |
|  |  | 3, 6 | SR.2.1 TDD | |  | |
| RMSI CORESET |  | 1, 4 | CR.1.1 FDD | | N/A | |
| RMC |  | 2, 5 | CR.1.1 TDD | | N/A | |
| configuration |  | 3, 6 | CR.2.1 TDD | | N/A | |
| Dedicated |  | 1, 4 | CCR.1.1 FDD | | N/A | |
| CORESET RMC |  | 2, 5 | CCR.1.1 TDD | | N/A | |
| configuration |  | 3, 6 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns |  | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS |  | 1, 4 | TRS.1.1 FDD | | N/A | |
| configuration |  | 2, 5 | TRS.1.1 TDD | | N/A | |
|  |  | 3, 6 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  |  | 2, 5 | -98 | | | |
|  |  | 3, 6 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  |  | 2, 5 |  | | | |
|  |  | 3, 6 |  | | | |
|  | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
|  |  | 2, 5 |  |  |  |  |
|  |  | 3, 6 |  |  |  |  |
|  | dB | 1, 4 | 4 | 4 | -Infinity | 4 |
|  |  | 2, 5 |  |  |  |  |
|  |  | 3, 6 |  |  |  |  |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -94 | -94 | -Infinity | -94 |
|  |  | 2, 5 | -94 | -94 | -Infinity | -94 |
|  |  | 3, 6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 4 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/9.36 MHz | 2, 5 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/38.16 MHz | 3, 6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | | |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.4.6.1.1.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

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

#### A.4.6.1.2 EN-DC event triggered reporting tests without gap under DRX

##### A.4.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

##### A.4.6.1.2.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.2.1-1, A.4.6.1.2.1-2, A.4.6.1.2.1-3 and A.4.6.1.2.1-4 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.1.2.2-1: Supported test configurations

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

Table A.4.6.1.2.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
|  |  |  | Test 1 | Test 2 |  |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRAN Cell 1 and NR Cell 2 | |  |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR Cell 3 | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1: Cell 1  2: Cell 2 and Cell 3 | |  |
| SSB configuration |  | 1, 4 | SSB.1 FR1 | |  |
|  | 2, 5 | SSB.1 FR1 | |  |
|  | 3, 6 | SSB.2 FR1 | |  |
| SMTC configuration |  | 1, 4 | SMTC.2 | |  |
|  | 2, 5 | SMTC.1 | |  |
|  | 3, 6 | SMTC.1 | |  |
| A3-Offset | dB | 1, 2, 3, 4, 5, 6 | -4.5 | |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal | |  |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | |  |
| Time To Trigger | s | 1, 2, 3, 4, 5, 6 | 0 | |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | DRX.1 | DRX.7 |  |
| Time offset between PCell and PSCell |  | 1, 2, 3, 4, 5, 6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1, 4 | 3 ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | 2, 5 | 3 μs | | Synchronous cells |
|  | 3, 6 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 5 | 10 |  |

Table A.4.6.1.2.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|  |  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  |  | 2, 5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3, 6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
| 2, 5 | SR.1.1 TDD | |  | |
| 3, 6 | SR.2.1 TDD | |  | |
| RMSI CORESET |  | 1, 4 | CR.1.1 FDD | | N/A | |
| RMC |  | 2, 5 | CR.1.1 TDD | | N/A | |
| configuration |  | 3, 6 | CR.2.1 TDD | | N/A | |
| Dedicated |  | 1, 4 | CCR.1.1 FDD | | N/A | |
| CORESET RMC |  | 2, 5 | CCR.1.1 TDD | | N/A | |
| configuration |  | 3, 6 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns |  | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS |  | 1, 4 | TRS.1.1 FDD | | N/A | |
| configuration |  | 2, 5 | TRS.1.1 TDD | | N/A | |
|  |  | 3, 6 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  |  | 2, 5 | -98 | | | |
|  |  | 3, 6 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  |  | 2, 5 |  | | | |
|  |  | 3, 6 |  | | | |
|  | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
|  |  | 2, 5 |  |  |  |  |
|  |  | 3, 6 |  |  |  |  |
|  | dB | 1, 4 | 4 | 4 | -Infinity | 4 |
|  |  | 2, 5 |  |  |  |  |
|  |  | 3, 6 |  |  |  |  |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -94 | -94 | -Infinity | -94 |
|  |  | 2, 5 | -94 | -94 | -Infinity | -94 |
|  |  | 3, 6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 4 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/9.36 MHz | 2, 5 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/38.16 MHz | 3, 6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | | |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.4.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

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

#### A.4.6.1.3 EN-DC event triggered reporting tests with per-UE gaps under non-DRX

##### A.4.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

##### A.4.6.1.3.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.The test parameters for PSCell are given in Table A.4.6.1.3.1-1 and A.4.6.1.3.1-2 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.4.6.1.3.2-1: Supported test configurations

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

Table A.4.6.1.3.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| Measurement gap type |  | 1, 2, 3, 4, 5, 6 | Per-UE gaps |  |
| Measurement gap repitition periodicity | ms | 1, 2, 3, 4, 5, 6 | 40 |  |
| Measurement gap length | ms | 1, 2, 3, 4, 5, 6 | 6 |  |
| Measurement gap offset | ms | 1, 2, 3, 4, 5, 6 | 39 |  |
| SSB configuration |  | 1, 4 | SSB.1 FR1 |  |
|  | 2, 5 | SSB.1 FR1 |  |
|  | 3, 6 | SSB.2 FR1 |  |
| SMTC configuration |  | 1, 4 | SMTC.2 |  |
|  | 2, 5 | SMTC.1 |  |
|  | 3, 6 | SMTC.1 |  |
| CSI-RS parameters |  | 1, 4 | CSI-RS.1.2 FDD resource #0 |  |
|  | 2, 5 | CSI-RS.1.2 TDD resource #0 |  |
|  | 3, 6 | CSI-RS.2.2 TDD resource #0 |  |
| A3-Offset | dB | 1, 2, 3, 4, 5, 6 | -4.5 |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal |  |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 |  |
| Time To Trigger | s | 1, 2, 3, 4, 5, 6 | 0 |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | N/A | OFF |
| Time offset between PCell and PSCell |  | 1, 2, 3, 4, 5, 6 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1, 4 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | 2, 5 | 3 μs | Synchronous cells |
|  | 3, 6 | 3 μs | Synchronous cells |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 5 |  |

Table A.4.6.1.3.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test | Cell 2 | | Cell 3 | |
|  |  | configuration | T1 | T2 | T1 | T2 |
| TDD |  | 1, 4 | N/A | | N/A | |
| configuration |  | 2, 5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3, 6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC |  | 1, 4 | SR.1.1 FDD | | N/A | |
| configuration |  | 2, 5 | SR.1.1 TDD | |  | |
|  |  | 3, 6 | SR.2.1 TDD | |  | |
| RMSI CORESET |  | 1, 4 | CR.1.1 FDD | | N/A | |
| RMC |  | 2, 5 | CR.1.1 TDD | | N/A | |
| configuration |  | 3, 6 | CR.2.1 TDD | | N/A | |
| Dedicated |  | 1, 4 | CCR.1.2 FDD | | N/A | |
| CORESET RMC |  | 2, 5 | CCR.1.2 TDD | | N/A | |
| configuration |  | 3, 6 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns |  | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS |  | 1, 4 | TRS.1.1 FDD | | N/A | |
| configuration |  | 2, 5 | TRS.1.1 TDD | | N/A | |
|  |  | 3, 6 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  |  | 2, 5 | -98 | | | |
|  |  | 3, 6 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  |  | 2, 5 |  | | | |
|  |  | 3, 6 |  | | | |
|  | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
|  |  | 2, 5 |  |  |  |  |
|  |  | 3, 6 |  |  |  |  |
|  | dB | 1, 4 | 4 | 4 | -Infinity | 4 |
|  |  | 2, 5 |  |  |  |  |
|  |  | 3, 6 |  |  |  |  |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -94 | -94 | -Infinity | -94 |
|  |  | 2, 5 | -94 | -94 | -Infinity | -94 |
|  |  | 3, 6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 4 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/9.36 MHz | 2, 5 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/38.16 MHz | 3, 6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | | |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.4.6.1.3.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 800 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

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

#### A.4.6.1.4 EN-DC event triggered reporting tests with per-UE gaps under DRX

##### A.4.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

##### A.4.6.1.4.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.4.2-1, A.4.6.1.4.2-2, A.4.6.1.4.2-3 A.4.6.1.4.2-4 and A.4.6.1.4.2-5 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.1.4.2-1: Supported test configurations

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

Table A.4.6.1.4.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
|  |  |  | Test 1 | Test 2 |  |
| Active cell |  | 1, 2, 3, 4, 5, 6 | E-UTRAN Cell 1 and NR Cell 2 | |  |
| Neighbour cell |  | 1, 2, 3, 4, 5, 6 | NR Cell 3 | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3, 4, 5, 6 | 1: Cell 1  2: Cell 2 and Cell 3 | |  |
| Measurement gap type |  | 1, 2, 3, 4, 5, 6 | Per-UE gaps | |  |
| Measurement gap repitition periodicity | ms | 1, 2, 3, 4, 5, 6 | 40 | |  |
| Measurement gap length | ms | 1, 2, 3, 4, 5, 6 | 6 | |  |
| Measurement gap offset | ms | 1, 2, 3, 4, 5, 6 | 39 | |  |
| SSB configuration |  | 1, 4 | SSB.1 FR1 | |  |
|  |  | 2, 5 | SSB.1 FR1 | |  |
|  |  | 3, 6 | SSB.2 FR1 | |  |
| SMTC configuration |  | 1, 4 | SMTC.2 | |  |
|  |  | 2, 5 | SMTC.1 | |  |
|  |  | 3, 6 | SMTC.1 | |  |
| CSI-RS parameters |  | 1, 4 | CSI-RS.1.2 FDD resource #0 | |  |
|  |  | 2, 5 | CSI-RS.1.2 TDD resource #0 | |  |
|  |  | 3, 6 | CSI-RS.2.2 TDD resource #0 | |  |
| A3-Offset | dB | 1, 2, 3, 4, 5, 6 | -4.5 | |  |
| CP length |  | 1, 2, 3, 4, 5, 6 | Normal | |  |
| Hysteresis | dB | 1, 2, 3, 4, 5, 6 | 0 | |  |
| Time To Trigger | s | 1, 2, 3, 4, 5, 6 | 0 | |  |
| Filter coefficient |  | 1, 2, 3, 4, 5, 6 | 0 | | L3 filtering is not used |
| DRX |  | 1, 2, 3, 4, 5, 6 | DRX.1 | DRX.7 |  |
| Time offset between PCell and PSCell |  | 1, 2, 3, 4, 5, 6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1, 4 | 3 ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |  | 2, 5 | 3 μs | | Synchronous cells |
|  |  | 3, 6 | 3 μs | | Synchronous cells |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | |  |
| T2 | s | 1, 2, 3, 4, 5, 6 | 5 | 10 |  |

Table A.4.6.1.4.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with per-UE gaps for PSCell in FR1 with DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|  |  |  | T1 | T2 | T1 | T2 |
| TDD |  | 1, 4 | N/A | | N/A | |
| configuration |  | 2, 5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3, 6 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC |  | 1, 4 | SR.1.1 FDD | | N/A | |
| configuration |  | 2, 5 | SR.1.1 TDD | |  | |
|  |  | 3, 6 | SR.2.1 TDD | |  | |
| RMSI CORESET |  | 1, 4 | CR.1.1 FDD | | N/A | |
| RMC |  | 2, 5 | CR.1.1 TDD | | N/A | |
| configuration |  | 3, 6 | CR.2.1 TDD | | N/A | |
| Dedicated |  | 1, 4 | CCR.1.2 FDD | | N/A | |
| CORESET RMC |  | 2, 5 | CCR.1.2 TDD | | N/A | |
| configuration |  | 3, 6 | CCR.2.1 TDD | | N/A | |
| OCNG Patterns |  | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS |  | 1, 4 | TRS.1.1 FDD | | N/A | |
| configuration |  | 2, 5 | TRS.1.1 TDD | | N/A | |
|  |  | 3, 6 | TRS.1.2 TDD | | N/A | |
| Initial BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2, 3, 4, 5, 6 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2, 3, 4, 5, 6 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2, 3, 4, 5, 6 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  |  | 2, 5 | -98 | | | |
|  |  | 3, 6 | -95 | | | |
| Note 2 | dBm/15 KHz | 1, 4 | -98 | | | |
|  |  | 2, 5 |  | | | |
|  |  | 3, 6 |  | | | |
|  | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
|  |  | 2, 5 |  |  |  |  |
|  |  | 3, 6 |  |  |  |  |
|  | dB | 1, 4 | 4 | 4 | -Infinity | 4 |
|  |  | 2, 5 |  |  |  |  |
|  |  | 3, 6 |  |  |  |  |
| SS-RSRP Note 3 | dBm/SCS KHz | 1, 4 | -94 | -94 | -Infinity | -94 |
|  |  | 2, 5 | -94 | -94 | -Infinity | -94 |
|  |  | 3, 6 | -91 | -91 | -Infinity | -91 |
| Io | dBm/9.36 MHz | 1, 4 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/9.36 MHz | 2, 5 | -64.60 | -62.25 | -64.60 | -62.25 |
|  | dBm/38.16 MHz | 3, 6 | -58.50 | -56.16 | -58.50 | -56.16 |
| Propagation Condition |  | 1, 2, 3, 4, 5, 6 | AWGN | | | |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.4.6.1.4.3 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 6400 ms from the beginning of time period T2. The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

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

#### A.4.6.1.5 EN-DC event triggered reporting tests without gap under non-DRX with SSB index reading

##### A.4.6.1.5.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

##### A.4.6.1.5.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell.The test parameters for FDD PSCell are given in Table A.4.6.1.5.1-1 and A.4.6.1.5.1-2 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.4.6.1.5.2-1: Supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2 | |

Table A.4.6.1.5.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1, 2 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| SSB configuration |  | 1, 2 | SSB.1 FR1 |  |
| SMTC configuration |  | 1, 2 | SMTC.2 |  |
| A3-Offset | dB | 1, 2 | -4.5 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX |  | 1, 2 | N/A | OFF |
| Time offset between PCell and PSCell |  | 1, 2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1, 2 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

Table A.4.6.1.5.1-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for FDD PSCell in FR1 with SSB index reading

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|  |  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 2 | N/A | | N/A | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.1 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | SSB | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
|  | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.60 | -62.25 | -64.60 | -62.25 |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.4.6.1.5.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

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

#### A.4.6.1.6 EN-DC event triggered reporting tests with SSB index reading with per-UE gaps

##### A.4.6.1.6.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the intra-frequency cell search requirements in clause 9.2.6.2 and 9.2.6.3.

##### A.4.6.1.6.2 Test parameters

Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters for PSCell are given in Table A.4.6.1.6.2-1 A.4.6.1.6.2-2 and A.4.6.1.6.2-3 below and the test parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

Table A.4.6.1.6.2-1: Supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2 | |

Table A.4.6.1.6.2-2: General test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2 | E-UTRAN Cell 1 and NR Cell 2 |  |
| Neighbour cell |  | 1, 2 | NR Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1  2: Cell 2 and Cell 3 |  |
| Measurement gap type |  | 1, 2 | Per-UE gaps |  |
| Measurement gap repitition periodicity | ms | 1, 2 | 40 |  |
| Measurement gap length | ms | 1, 2 | 6 |  |
| Measurement gap offset | ms | 1, 2 | 39 |  |
| SSB configuration |  | 1, 2 | SSB.1 FR1 |  |
| SMTC configuration |  | 1, 2 | SMTC.2 |  |
| CSI-RS parameters |  | 1, 2 | CSI-RS.1.2 FDD resource #0 |  |
| A3-Offset | dB | 1, 2 | -4.5 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX |  | 1, 2 | N/A | OFF |
| Time offset between PCell and PSCell |  | 1, 2 | 3 μs | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | 1, 2 | 3 ms | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

Table A.4.6.1.6.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting with gap for PSCell in FR1 with SSB index reading

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test | Cell 2 | | Cell 3 | |
|  |  | configuration | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 2 | N/A | | N/A | |
| PDSCH RMC configuration |  | 1, 2 | SR.1.1 FDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.1.1 FDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.1.2 FDD | | N/A | |
| OCNG Patterns |  | 1, 2 | OP.1 | | OP.1 | |
| TRS configuration |  | 1, 2 | TRS.1.1 FDD | | N/A | |
| Initial BWP configuration |  | 1, 2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1, 2 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1, 2 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1, 2 | CSI-RS | | SSB | |
| Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
|  | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
|  | dB | 1, 2 | 4 | 4 | -Infinity | 4 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 2 | -94 | -94 | -Infinity | -94 |
| Io | dBm/9.36 MHz | 1, 2 | -64.60 | -62.25 | -64.60 | -62.25 |
| Propagation Condition |  | 1, 2 | AWGN | | | |
| 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 levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.4.6.1.6.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

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

### A.4.6.2 Inter-frequency Measurements

#### A.4.6.2.1 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is not used

##### A.4.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.1.1-1, A.4.6.2.1.1-2, and A.4.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.1.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.4.6.2.1.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.1.1-1.

Table A.4.6.2.1.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | |

Table A.4.6.2.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | 4 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 9 | 9 |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3 ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3 μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1 | 1 |  |

Table A.4.6.2.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | |
|  | Config 2,3,5,6 | TDD | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | NA | |
| Config 2,5 | TRS.1.1 TDD | | NA | |
| Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | |  | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | |  | |
|  |  | Config 2,5 | CCR.1.1 TDD | |  | |
|  |  | Config 3,6 | CCR.2.1 TDD | |  | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 |  | Config 1,4 | SMTC.2 | | SMTC.5 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz |  | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| Config 3,6 | -91 | -91 | -Infinity | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

##### A.4.6.2.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 760 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is not required to report SSB time index.

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

#### A.4.6.2.2 EN-DC event triggered reporting tests for FR1 cell without SSB time index detection when DRX is used

##### A.4.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.2.1-1, A.4.6.2.2.1-2, and A.4.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.2.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.2.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.2.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.2.2.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | |

Table A.4.6.2.2.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | | | Two FR1 NR carrier frequencies is used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | | 4 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 39 | | 9 | |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | | | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | | | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1.1 | 11 | 1.1 | 11 |  |

Table A.4.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | |
|  | Config 2,3,5,6 | TDD | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | NA | |
| Config 2,5 | TRS.1.1 TDD | | NA | |
| Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | |  | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR2.1 TDD | |
|  |  | Config 1,4 | CCR.1.1 FDD | |  | |
| Dedicated CORESET Reference Channel |  | Config 2,5 | CCR.1.1 TDD | |  | |
|  |  | Config 3,6 | CCR.2.1 TDD | |  | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 |  | Config 1,4 | SMTC.2 | | SMTC.5 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz |  | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| Config 3,6 | -91 | -91 | -Infinity | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

##### A.4.6.2.2.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1080 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 10240 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is not required to report SSB time index.

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

#### A.4.6.2.3 Void

#### A.4.6.2.4 Void

#### A.4.6.2.5 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is not used

##### A.4.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.5.1-1, A.4.6.2.5.1-2, and A.4.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #4 as defined in Table A.4.6.2.5.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.5.1-1.

Table A.4.6.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | |

Table A.4.6.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | 4 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 9 | 9 |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1.1 | 1 |  |

Table A.4.6.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | |
|  | Config 2,3,5,6 | TDD | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
| Config 2,5 | 10: NRB,c = 52 | | | |
| Config 3,6 | 40: NRB,c = 106 | | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.1.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.2.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | NA | |
| Config 2,5 | TRS.1.1 TDD | | NA | |
| Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | |  | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR2.1 TDD | |
|  |  | Config 1,4 | CCR.1.1 FDD | |  | |
| Dedicated CORESET Reference Channel |  | Config 2,5 | CCR.1.1 TDD | |  | |
|  |  | Config 3,6 | CCR.2.1 TDD | |  | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 |  | Config 1,4 | SMTC.2 | | SMTC.5 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz |  | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
| Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| Config 3,6 | -91 | -91 | -Infinity | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

##### A.4.6.2.5.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 880 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

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

#### A.4.6.2.6 EN-DC event triggered reporting tests for FR1 cell with SSB time index detection when DRX is used

##### A.4.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.2.6.1-1, A.4.6.2.6.1-2, and A.4.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.6.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.2.6.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

Table A.4.6.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR1

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | |

Table A.4.6.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | | | One E-UTRAN carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | | | Two FR1 NR carrier frequencies is used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | | 4 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 9 | | 9 | |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | | | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | | | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1.3 | 13.5 | 1.3 | 13.5 |  |

Table A.4.6.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | | |
| T1 | T2 | T1 | | T2 |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | | |
| Duplex mode |  | Config 1,4 | FDD | | | | |
|  | Config 2,3,5,6 | TDD | | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | | |
| Config 2,5 | 10: NRB,c = 52 | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | | |
| Config 2,5 | 10: NRB,c = 52 | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR.2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR.2.1 TDD | |
|  |  | Config 1,4 | CCR.1.1 FDD | |  | | |
| Dedicated CORESET Reference Channel |  | Config 2,5 | CCR.1.1 TDD | |  | | |
|  |  | Config 3,6 | CCR.2.1 TDD | |  | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | | | |
|  | Config 3,6 | TDDConf.2.1 | | | | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | | | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | | N/A | |
|  |  | Config 2,5 | TRS.1.1 TDD | | | N/A | |
|  |  | Config 3,6 | TRS.1.2 TDD | | | N/A | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | | | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | | | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | | | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | | |
|  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | | |
|  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | | |
| SMTC configuration defined in A.3.11 |  | Config 1,4 | SMTC.2 | | SMTC.5 | | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.4 | | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | | |
| Config 3,6 | 30 | | | | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz |  | -98 | | -98 | | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | | |
| Config 3,6 | -95 | | -95 | | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | | -91 |
| Config 3,6 | -91 | -91 | -Infinity | | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | | -62.26 |
| dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

##### A.4.6.2.6.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 13440 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1, 2, 3 and 4 UE is required to report SSB time index.

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

#### A.4.6.2.7 Void

#### A.4.6.2.8 Void

### A.4.6.3 Void

### A.4.6.4 L1-RSRP measurement for beam reporting

#### A.4.6.4.1 SSB based L1-RSRP measurement when DRX is not used

##### A.4.6.4.1.1 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 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.4.1.1-1.

Table A.4.6.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

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

##### A.4.6.4.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.1.2-1 and Table A.4.6.4.1.2-2 below.

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

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.4.6.4.1.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| OCNG Patterns | 1~6 |  | OP.1 |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| DRX configuration | 1~6 |  | Off |
| reportConfigType | 1~6 |  | periodic |
| reportQuantity | 1~6 |  | ssb-Index-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.4.6.4.1.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| 3,6 | -91.65 | | | |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.65 |
| 3,6 | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1~6 | 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. | | | | | | |

##### A.4.6.4.1.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms 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.4.6.4.2 SSB based L1-RSRP measurement when DRX is used

##### A.4.6.4.2.1 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 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.4.2.1-1.

Table A.4.6.4.2.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

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

##### A.4.6.4.2.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.6.4.2.2-1 and Table A.4.6.4.2.2-2 below.

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

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.4.6.4.2.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| OCNG Patterns | 1~6 |  | OP.1 |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | periodic |
| reportQuantity | 1~6 |  | ssb-Index-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| L1-RSRP reporting period | 1~6 | slot | 80 |
| T1 | 1~6 | s | 5 |
| T2 | 1~6 | s | 1 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.4.6.4.2.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| 3,6 | -91.65 | | | |
|  | 1~6 | dB | 0 | 0 | -Infinity | 3 |
| SSB RSRP Note3 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -94.65 | -Infinity | -91.65 |
| 3,6 | -91.65 | -91.65 | -Infinity | -88.65 |
| Io Note3 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -63.69 | -66.70 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.59 | -57.59 | -60.61 | -55.84 |
|  | 1~6 | 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. | | | | | | |

##### A.4.6.4.2.3 Test Requirements

The UE shall send L1-RSRP report every 80 slots. No later than 640ms 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 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.4.6.4.3 CSI-RS based L1-RSRP measurement when DRX is not used

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

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

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

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

##### A.4.6.4.3.2 Test parameters

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

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

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

Table A.4.6.4.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-RS configuration | 1,4 |  | CSI-RS 1.3 FDD |
| 2,5 | CSI-RS 1.3 TDD |
| 3,6 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DRX configuration | 1~6 |  | Off |
| reportConfigType | 1~6 |  | aperiodic |
| reportQuantity | 1~6 |  | cri-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| qcl-Info | 1~6 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 8 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
| Note1 | 1~6 | dBm/15kHz | -94.65 | |
| Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| 3,6 | -91.65 | |
|  | 1~6 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.65 |
| 3,6 | -91.65 | -88.65 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~6 | dB | 0 | 3 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.4.6.4.3.3 Test Requirements

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

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

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

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

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

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

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

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

##### A.4.6.4.4.2 Test parameters

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

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

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

Table A.4.6.4.4.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~6 |  | freq1 |
| Duplex mode | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | 1,4 |  | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 |
| CSI-RS configuration | 1,4 |  | CSI-RS 1.3 FDD |
| 2,5 | CSI-RS 1.3 TDD |
| 3,6 | CSI-RS 2.3 TDD |
| OCNG Patterns | 1~6 |  | OP.1 |
| TRS Configuration | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | 1~6 |  | SMTC.1 |
| DRX configuration | 1~6 |  | DRX.3 |
| reportConfigType | 1~6 |  | aperiodic |
| reportQuantity | 1~6 |  | cri-RSRP |
| Number of reported RS | 1~6 |  | 2 |
| qcl-Info | 1~6 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~6 | slots | 8 |
| T1 | 1~6 | s | 5 |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation condition | 1~6 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Note1 | 1~6 | dBm/15kHz | -94.65 | |
| Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| 3,6 | -91.65 | |
|  | 1~6 | dB | 0 | 3 |
| CSI-RS RSRP Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -91.65 |
| 3,6 | -91.65 | -88.65 |
| Io Note2 | 1,2,4,5 | dBm/9.36 MHz | -63.69 | -61.93 |
| 3,6 | dBm/38.16 MHz | -57.59 | -55.84 |
|  | 1~6 | dB | 0 | 3 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

##### A.4.6.4.4.3 Test Requirements

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

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

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

## A.4.7 Measurement Performance requirements

Unless explicitly stated otherwise:

- Reported measurements shall be within defined range of accuracy limits defined in Clause 10 for at least 90 % of the reported cases. If multiple measurement performance requirements are verified in the same test, the reported measurements for each requirement shall be within defined range of accuracy limits of the corresponding requirement defined in Clause 10 for at least 90% of the reported cases.

- Measurements are performed in RRC\_CONNECTED state.

- The reference channels assume transmission of PDSCH with a maximum number of 5 HARQ transmissions unless otherwise specified.

### A.4.7.1 SS-RSRP

#### A.4.7.1.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.2.1.1 and 10.1.2.1.2 for intra-frequency measurements.

##### A.4.7.1.1.2 Test parameters

In this set of test cases all NR cells are on the same carrier frequency. Supported test configurations are shown in table A.4.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in A.4.7.1.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1 In all test cases, Cell 2 is the PSCell, and Cell 3 is the target cell.

Table A.4.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

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

Table A.4.7.1.1.2-2: SS-RSRP Intra frequency test parameters

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | | Unit | Test 1 | | | | | | Test 2 | | | Test 3 | | |
| Cell 2 | | Cell 3 | | | | Cell 2 | Cell 3 | | Cell 2 | | Cell 3 |
| Physical cell ID | | | | |  | 489 | | 0 | | | | 489 | | 0 | 489 | | 0 |
| SSB ARFCN | | | | |  | freq1 | | | | | | freq1 | | | freq1 | | |
| Duplex mode | | | Config 1,4 | |  | FDD | | | | | | | | | | | |
| Config 2,3,5,6 | | TDD | | | | | | | | | | | |
| TDD configuration | | | Config 1,4 | |  | Not Applicable | | | | | | | | | | | |
| Config 2,5 | | TDDConf.1.1 | | | | | | | | | | | |
| Config 3,6 | | TDDConf.2.1 | | | | | | | | | | | |
| BWchannel | | | Config 1,4 | | MHz | 10: NRB,c = 52 | | | | | | | | | | | |
| Config 2,5 | | 10: NRB,c = 52 | | | | | | | | | | | |
| Config 3,6 | | 40: NRB,c = 106 | | | | | | | | | | | |
| Downlink initial BWP configuration | | | | |  | DLBWP.0.1 | | | | | | | | | | | |
| Downlink dedicated BWP configuration | | | | |  | DLBWP.1.1 | | | | | | | | | | | |
| Uplink initial BWP configuration | | | | |  | ULBWP.0.1 | | | | | | | | | | | |
| Uplink dedicated BWP configuration | | | | |  | ULBWP.1.1 | | | | | | | | | | | |
| TRS configuration | | Config 1,4 | | |  | TRS.1.1 FDD | NA | | | | TRS.1.1 FDD | | | NA | | TRS.1.1 FDD | NA |
| Config 2,5 | | |  | TRS.1.1 TDD | NA | | | | TRS.1.1 TDD | | | NA | | TRS.1.1 TDD | NA |
| Config 3,6 | | |  | TRS.1.2 TDD | NA | | | | TRS.1.2 TDD | | | NA | | TRS.1.2 TDD | NA |
| DRX Cycle | | | | | ms | Not Applicable | | | | | | | | | | | |
| PDSCH Reference measurement channel | | | | Config 1,4 |  | SR.1.1 FDD | | | - | | | SR.1.1 FDD | - | | SR.1.1 FDD | | - |
| Config 2,5 | SR.1.1 TDD | | | SR.1.1 TDD | SR.1.1 TDD | |
| Config 3,6 | SR2.1 TDD | | | SR2.1 TDD | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | | | Config 1,4 |  | CR.1.1 FDD | | | - | | | CR.1.1 FDD | - | | CR.1.1 FDD | | - |
| Config 2,5 | CR.1.1 TDD | | | CR.1.1 TDD | CR.1.1 TDD | |
| Config 3,6 | CR2.1 TDD | | | CR2.1 TDD | CR2.1 TDD | |
| Control Channel RMC | | | | Config 1,4 |  | CCR.1.1 FDD | | | - | | | CCR.1.1 FDD | - | | CCR.1.1 FDD | | - |
| Config 2,5 | CCR.1.1 TDD | | | CCR.1.1 TDD | CCR.1.1 TDD | |
| Config 3,6 | CCR2.1 TDD | | | CCR2.1 TDD | CCR2.1 TDD | |
| SSB configuration | | | | Config 1,4 |  | SSB.1 FR1 | | | SSB.1 FR1 | | | SSB.1 FR1 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 |
| Config 2,5 |  | SSB.1 FR1 | | | SSB.1 FR1 | | | SSB.1 FR1 | SSB.1 FR1 | | SSB.1 FR1 | | SSB.1 FR1 |
| Config 3,6 |  | SSB.2 FR1 | | | SSB.2 FR1 | | | SSB.2 FR1 | SSB.2 FR1 | | SSB.2 FR1 | | SSB.2 FR1 |
| Time offset with Cell 2 | | | | Config 1,4 | ms | - | | | 3 | | | - | 3 | | - | | 3 |
| Config 2,3,5,6 | μs | - | | | 3 | | | - | 3 | | - | | 3 |
| SMTC configuration | | | | Config 1,4 |  | SMTC.2 | | | | | | | | | | | |
| Config 2,3,5,6 |  | SMTC.1 | | | | | | | | | | | |
| OCNG Patterns | | | | |  | OP.1 | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2,4,5 | | kHz | 15 kHz | | | | | | | | | | | |
| Config 3,6 | | 30kHz | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | | | dB | 0 | | | 0 | | | 0 | | 0 | 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 | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | | |
| Note2 | Config 1,2,4,5 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/15KhZ | -106 | | | | | | -88 | | | -114 | | |
| NR\_FDD\_FR1\_B | -113.5 | | |
| NR\_TDD\_FR1\_C | -113 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | | |
| NR\_FDD\_FR1\_G | -111 | | |
| NR\_FDD\_FR1\_H | -110.5 | | |
| Config 3,6 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | Not applicableNote 5 | | | | | | -94 | | | -114 | | |
| NR\_FDD\_FR1\_B | -113.5 | | |
| NR\_TDD\_FR1\_C | -113 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | | |
| NR\_FDD\_FR1\_G | -111 | | |
| NR\_FDD\_FR1\_H | -110.5 | | |
| Note2 | Config 1,2,4,5 | | | | dBm/SCS | -106 | | | | | | -88 | | | Same as Noc/15kHz | | |
| Config 3,6 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | | Not applicableNote 5 | | | | | | -91 | | | -111 | | |
| NR\_FDD\_FR1\_B | | -110.5 | | |
| NR\_TDD\_FR1\_C | | -110 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | | -109.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | | -109 | | |
| NR\_FDD\_FR1\_G | | -108 | | |
| NR\_FDD\_FR1\_H | | -107.5 | | |
|  | | | | | dB | 2.46 | | | | -5.97 | | 2.46 | | -5.97 | -0.01 | | -4.76 |
|  | | | | | dB | 6 | | | | 1 | | 6 | | 1 | 3 | | 0 |
| SS-RSRPNote3 | Config 1,2,4,5 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -100 | | | | -105 | | -82 | | -87 | -111.00 | | -114.00 |
| NR\_FDD\_FR1\_B | -110.50 | | -113.50 |
| NR\_TDD\_FR1\_C | -110.00 | | -113.00 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -109.50 | | -112.50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -109.00 | | -112.00 |
| NR\_FDD\_FR1\_G | -108.00 | | -111.00 |
| NR\_FDD\_FR1\_H | -107.50 | | -110.50 |
| Config 3,6 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | - Not applicableNote 5 | | | | Not applicableNote 5 | | -85 | | -90 | -108.00 | | -111.00 |
| NR\_FDD\_FR1\_B | -107.50 | | -110.50 |
| NR\_TDD\_FR1\_C | -107.00 | | -110.00 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -106.50 | | -109.50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -106.00 | | -109.00 |
| NR\_FDD\_FR1\_G | -105.00 | | -108.00 |
| NR\_FDD\_FR1\_H | -104.50 | | -107.50 |
| IoNote3 | Config 1,2,4,5 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -70.09 | | | | | | -52.09 | | | -80.03 | | |
| NR\_FDD\_FR1\_B | -79.53 | | |
| NR\_TDD\_FR1\_C | -79.03 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -78.53 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -78.03 | | |
| NR\_FDD\_FR1\_G | -77.03 | | |
| NR\_FDD\_FR1\_H | -76.53 | | |
| Config 3,6 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | Not applicableNote 5 | | | | | | -51.99 | | | -73.94 | | |
| NR\_FDD\_FR1\_B | -73.44 | | |
| NR\_TDD\_FR1\_C | -72.94 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -72.44 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -71.94 | | |
| NR\_FDD\_FR1\_G | -70.94 | | |
| NR\_FDD\_FR1\_H | -70.44 | | |
| Propagation condition | | | | | - | AWGN | | | | | | | | | | | |
| Antenna configuration | | | | |  | 1x2 | | | | | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Subtest 1 is not used when testing with 30kHz SSB SCS  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | | | | | | | | | |

##### A.4.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy for cell 2 and cell 3 shall fulfil absolute requirement in clause 10.1.2.1.1 and relative requirement in clause 10.1.2.1.2.

#### A.4.7.1.2 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.4.1.1 and 10.1.4.1.2 for inter-frequency measurements with the testing configurations in Table A.4.7.1.2.1-1.

**Table A.4.7.1.2.1-1: Applicable NR configurations for FR1 inter-frequency SS-RSRP accuracy test**

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

##### A.4.7.1.2.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR1 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.4.7.1.2.2-1 below. Both absolute and relative accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.4.7.1.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.4.7.1.2.2-1: SS-RSRP inter-frequency test parameters**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** | | | | **Test 2** | | | |
| **Cell 2** | | **Cell 3** | | **Cell 2** | | **Cell 3** | |
| SSB ARFCN | | 1~6 |  | freq1 | | freq2 | | freq1 | | freq2 | |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | | | | 10: NRB,c = 52 | | | |
| 2,5 | 10: NRB,c = 52 | | | | 10: NRB,c = 52 | | | |
| 3,6 | 40: NRB,c = 106 | | | | 40: NRB,c = 106 | | | |
| Gap pattern ID | |  |  | 0 | | | | 0 | | | |
| Duplex mode | | 1,4 |  | FDD | | | | FDD | | | |
| 2,5 | TDD | | | | TDD | | | |
| 3,6 | TDD | | | | TDD | | | |
| TDD configuration | | 1,4 |  | N/A | | | | N/A | | | |
| 2,5 | TDDConf.1.1 | | | | TDDConf.1.1 | | | |
| 3,6 | TDDConf.2.1 | | | | TDDConf.2.1 | | | |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD | | - | | SR.1.1 FDD | | - | |
| 2,5 | SR.1.1 TDD | | SR.1.1 TDD | |
| 3,6 | SR.2.1 FDD | | SR.2.1 FDD | |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD | | - | | CR.1.1 FDD | | - | |
| 2,5 | CR.1.1 TDD | | - | | CR.1.1 TDD | | - | |
| 3,6 | CR.2.1 FDD | | - | | CR.2.1 FDD | | - | |
| Dedicated CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD | | - | | CCR.1.1 FDD | | - | |
| 2,5 |  | CCR.1.1 TDD | | - | | CCR.1.1 TDD | | - | |
| 3,6 |  | CCR.2.1 TDD | | - | | CCR.2.1 TDD | | - | |
| SSB configuration | | 1,4 |  | SSB.1 FR1 | | | | SSB.1 FR1 | | | |
| 2,5 | SSB.1 FR1 | | | | SSB.1 FR1 | | | |
| 3,6 | SSB.2 FR1 | | | | SSB.2 FR1 | | | |
| OCNG Patterns | | 1~6 |  | OP.1 | | | | OP.1 | | | |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | | | - | TRS.1.1 FDD | | | - |
| 2,5 | TRS.1.1 TDD | | | TRS.1.1 TDD | | |
| 3,6 | TRS.1.2 TDD | | | TRS.1.2 TDD | | |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | | | | DLBWP.0.1  ULBWP.0.1 | | | |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | | | | DLBWP.1.1  ULBWP.1.1 | | | |
| Time offset with Cell 2 | | 1,4 | ms | - | 3 | | | - | 3 | | |
| 2,3,5,6 | μs | - | 3 | | | - | 3 | | |
| SMTC configuration | | 1,4 |  | SMTC.2 | | | | SMTC.2 | | | |
| 2,3,5,6 |  | SMTC.1 | | | | SMTC.1 | | | |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 | | 0 | | 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 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 1~6 | dBm/15kHz | -94.65 | | | | ( for Cell 3 +8dB) | | -115 | |
| NR\_FDD\_FR1\_B | -114.5 | |
| NR\_TDD\_FR1\_C | -114 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | |
| NR\_FDD\_FR1\_G | -112 | |
| NR\_FDD\_FR1\_H | -111.5 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | | ( for Cell 3 +8dB) | | -115 | |
| NR\_FDD\_FR1\_B | -114.5 | |
| NR\_TDD\_FR1\_C | -114 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | |
| NR\_FDD\_FR1\_G | -112 | |
| NR\_FDD\_FR1\_H | -111.5 | |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 3,6 | -91.65 | | | | ( for C 3 +8dB) | | -112.00 | |
| NR\_FDD\_FR1\_B | -111.50 | |
| NR\_TDD\_FR1\_C | -111.00 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -110.50 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -110.00 | |
| NR\_FDD\_FR1\_G | -109.00 | |
| NR\_FDD\_FR1\_H | -108.50 | |
|  | | 1~6 | dB | 10 | | 10 | | 13 | | -3 | |
| SS-RSRPNote3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5~~,~~ | 1,2,4,5 | dBm/SCS | -84.65 | | | | (RSRP for Cell 3 +25dB) | | -118.00 | |
| NR\_FDD\_FR1\_B | -117.50 | |
| NR\_TDD\_FR1\_C | -117.00 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.50 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116.00 | |
| NR\_FDD\_FR1\_G | -115.00 | |
| NR\_FDD\_FR1\_H | -114.50 | |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5, | 3,6 | -81.65 | | | | (RSRP for Cell 3 +25dB) | | -115.00 | |
| NR\_FDD\_FR1\_B | -114.50 | |
| NR\_TDD\_FR1\_C | -114.00 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.50 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113.00 | |
| NR\_FDD\_FR1\_G | -112.00 | |
| NR\_FDD\_FR1\_H | -111.50 | |
| IoNote3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, | 1,2,4,5 | dBm/  9.36MHz | -56.28 | | | | (Io for Channel 3 +19.75dB) | | -85.28 | |
| NR\_FDD\_FR1\_B | -84.78 | |
| NR\_TDD\_FR1\_C | -84.28 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -83.78 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -83.28 | |
| NR\_FDD\_FR1\_G | -82.28 | |
| NR\_FDD\_FR1\_H | -81.78 | |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6, | 3,6 | dBm/  38.16MHz | -50.19 | | | | (Io for Channel 3 +19.75dB) | | -79.19 | |
| NR\_FDD\_FR1\_B | -78.69 | |
| NR\_TDD\_FR1\_C | -78.19 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -77.69 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -77.19 | |
| NR\_FDD\_FR1\_G | -76.19 | |
| NR\_FDD\_FR1\_H | -75.69 | |
|  | | 1~6 | dB | 10 | | 10 | | 13 | | -3 | |
| Propagation condition | | 1~6 | - | AWGN | | | | AWGN | | | |
| Antenna configuration | |  |  | 1x2 | | | | 1x2 | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5 The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | | | | | | | | |

##### A.4.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the Absolute requirement in clause 10.1.4.1.1 and Relative requirement in clause 10.1.4.1.2.

#### A.4.7.1.3 Void

### A.4.7.2 SS-RSRQ

#### A.4.7.2.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.1.1.

##### A.4.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.4.7.2.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.4.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

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

Table A.4.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | | Test 2 | | | Test 3 | | |
| Cell 2 | Cell 3 | | Cell 2 | Cell 3 | | Cell 2 | | Cell 3 |
| SSB ARFCN | | |  | freq1 | | | freq1 | | | freq1 | | |
| Duplex mode | | Config 1,4 |  | FDD | | | | | | | | |
| Config 2,3,5,6 | TDD | | | | | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | | | | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | | | | | | | | |
| Config 2,5 | 10: NRB,c = 52 | | | | | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | | | | | |
| BWP configuration | | Initial DL BWP |  | DLBWP.0.1 | | | | | | | | |
| Dedicated DL BWP | DLBWP.1.1 | | | | | | | | |
| Initial UL BWP | ULBWP.0.1 | | | | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | | | | |
| DRX Cycle | | | ms | Not Applicable | | | | | | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | - | | SR.1.1 FDD | - | | SR.1.1 FDD | | - |
| Config 2,5 | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD | |
| Config 3,6 | SR2.1 TDD | SR2.1 TDD | SR2.1 TDD | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | - | | CR.1.1 FDD | - | | CR.1.1 FDD | |  |
| Config 2,5 | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD | |
| Config 3,6 | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD | |
| Control Channel RMC | | Config 1,4 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | - | | CCR.1.1 FDD | | - |
| Config 2,5 | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD | |
| Config 3,6 | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | - | | TRS.1.1 FDD | - | | TRS.1.1 FDD | | - |
|  | | Config 2,5 |  | TRS.1.1 TDD |  | | TRS.1.1 TDD |  | | TRS.1.1 TDD | |  |
|  | | Config 3,6 |  | TRS.1.2 TDD |  | | TRS.1.2 TDD |  | | TRS.1.2 TDD | |  |
| OCNG Patterns | | |  | OP. 1 | | | | | | | | |
| SS-RSSI-Measurement | | |  | Not Applicable | | | | | | | | |
| Time offset with Cell 2 | | Config 1,4 | ms | - | | 3 | - | | 3 | | - | 3 |
| Config 2,3,5,6 | μs | - | | 3 | - | | 3 | | - | 3 |
| SMTC configuration | | Config 1,4 |  | SMTC.2 | | | | | | | | |
| Config 2,3,5,6 |  | SMTC.1 | | | | | | | | |
| SSB configuration | | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | | | | | | | |
| Config 3,6 | 30kHz | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | | 0 | 0 | | 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 | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | Config 1,2,4,5 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | dBm/15kHz | -85 | | | -101 | | | -114 | | |
| NR\_FDD\_FR1\_B | -113.5 | | |
| NR\_TDD\_FR1\_C | -113 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | | |
| NR\_FDD\_FR1\_G | -111 | | |
| NR\_FDD\_FR1\_H | -110.5 | | |
| Config 3,6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | -91 | | | - | | | -114 | | |
| NR\_FDD\_FR1\_B | -113.5 | | |
| NR\_TDD\_FR1\_C | -113 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | | |
| NR\_FDD\_FR1\_G | -111 | | |
| NR\_FDD\_FR1\_H | -110.5 | | |
| Note2 | Config 1,2,4,5 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | dBm/SC S | -85 | | | -101 | | | -114 | | |
| NR\_FDD\_FR1\_B | -113.5 | | |
| NR\_TDD\_FR1\_C | -113 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | | |
| NR\_FDD\_FR1\_G | -111 | | |
| NR\_FDD\_FR1\_H | -110.5 | | |
| Config 3,6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | -88 | | | - | | | -111 | | |
| NR\_FDD\_FR1\_B | -110.5 | | |
| NR\_TDD\_FR1\_C | -110 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -109.5 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -109 | | |
| NR\_FDD\_FR1\_G | -108 | | |
| NR\_FDD\_FR1\_H | -107.5 | | |
|  | | | dB | -1.76 | | | -4.7 | | | -5.46 | | -5.46 |
|  | | | dB | 3 | 3 | | -2.9 | -2.9 | | -4 | | -4 |
| SS-RSRPNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | dBm/SCS | -82 | -82 | | -103.9 | -103.9 | | -118 | | -118 |
| NR\_FDD\_FR1\_B | -117.5 | | -117.5 |
| NR\_TDD\_FR1\_C | -117 | | -117 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 | | -116.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 | | -116 |
| NR\_FDD\_FR1\_G | -115 | | -115 |
| NR\_FDD\_FR1\_H | -114.5 | | -114.5 |
| Config 3,6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | -85 | -85 | | - | - | | -115 | | -115 |
| NR\_FDD\_FR1\_B | -114.5 | | -114.5 |
| NR\_TDD\_FR1\_C | -114 | | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | | -113.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | | -113 |
| NR\_FDD\_FR1\_G | -112 | | -112 |
| NR\_FDD\_FR1\_H | -111.5 | | -111.5 |
| SS-RSRQ Note3 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | dB | -14.77 | -14.77 | | -16.76 | -16.76 | | -17.34 | | -17.34 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | dBm/  9.36MHz | -50 | | | -70 | | | -83.5 | | |
| NR\_FDD\_FR1\_B | -83 | | |
| NR\_TDD\_FR1\_C | -82.5 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -82 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -81.5 | | |
| NR\_FDD\_FR1\_G | -80.5 | | |
| NR\_FDD\_FR1\_H | -80 | | |
| Config 3,6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 7 | dBm/  38.16MHz | -50 | | | - | | | -77.4 | | |
| NR\_FDD\_FR1\_B | -76.9 | | |
| NR\_TDD\_FR1\_C | -76.4 | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -75.9 | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -75.4 | | |
| NR\_FDD\_FR1\_G | -74.4 | | |
| NR\_FDD\_FR1\_H | -73.9 | | |
| Propagation condition | | | - | AWGN | AWGN | | AWGN | AWGN | | AWGN | | AWGN |
| Antenna configuration | | |  | 1x2 | 1x2 | | 1x2 | 1x2 | | 1x2 | | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in Clause 3.5.2.  Note 6: Subtest 2 is not used when testing with 30kHz SSB SCS.  Note 7: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | | | | | | |

##### A.4.7.2.1.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.1.1.

#### A.4.7.2.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter frequency measurement.

##### A.4.7.2.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test parameters in Table A.4.7.2.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.4.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

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

Table A.4.7.2.2.2-2: SS-RSRQ Inter frequency test parameters

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | | | | | Test 2 | | | | Test 3 | | | |
| Cell 2 | | | | Cell 3 | | Cell 2 | | Cell 3 | | Cell 2 | | | Cell 3 |
| SSB ARFCN | | |  | freq1 | | | freq2 | | | freq1 | | freq2 | | freq1 | | freq2 | |
| Duplex mode | | Config 1,4 |  | FDD | | | | | | | | | | | | | |
| Config 2,3,5,6 | TDD | | | | | | | | | | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | | | | | | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | | | | | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | | | | | | | | | |
| BWchannel | | Config 1,4 | MHz | 10: NRB,c = 52 | | | | | | | | | | | | | |
| Config 2,5 | 10: NRB,c = 52 | | | | | | | | | | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | | | | | | | | | | |
| BWP BW | | Config 1,4 | MHz | 10: NRB,c = 52 | | | | | | | | | | | | | |
| Config 2,5 | 10: NRB,c = 52 | | | | | | | | | | | | | |
| Config 3,6 | 40: NRB,c = 106 | | | | | | | | | | | | | |
| DRX Cycle | | | ms | Not Applicable | | | | | | | | | | | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | | - | | | | SR.1.1 FDD | | - | | SR.1.1 FDD | | | - |
| Config 2,5 | SR.1.1 TDD | | SR.1.1 TDD | | SR.1.1 TDD | | |
| Config 3,6 | SR.2.1 TDD | | SR.2.1 TDD | | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | | - | | | | CR.1.1 FDD | | - | | CR.1.1 FDD | | | - |
| Config 2,5 | CR.1.1 TDD | | CR.1.1 TDD | | CR.1.1 TDD | | |
| Config 3,6 | CR.2.1 TDD | | CR.2.1 TDD | | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | | Config 1,4 |  | CCR.1.1 FDD | | - | | | | CCR.1.1 FDD | | - | | CCR.1.1 FDD | | | - |
| Config 2,5 | CCR.1.1 TDD | | CCR.1.1 TDD | | CCR.1.1 TDD | | |
| Config 3,6 | CCR.2.1 TDD | | CCR.2.1 TDD | | CCR.2.1 TDD | | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | | - | | | | TRS.1.1 FDD | | - | | TRS.1.1 FDD | | | - |
|  | | Config 2,5 |  | TRS.1.1 TDD | |  | | | | TRS.1.1 TDD | |  | | TRS.1.1 TDD | | |  |
|  | | Config 3,6 |  | TRS.1.2 TDD | |  | | | | TRS.1.2 TDD | |  | | TRS.1.2 TDD | | |  |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | | | | | | | | | |
| Time offset with Cell 2 | | Config 1,4 | ms | - | 3 | | | | - | | 3 | | - | | 3 | | |
| Config 2,3,5,6 | μs | - | 3 | | | | - | | 3 | | - | | 3 | | |
| SMTC configuration | | Config 1,4 |  | SMTC pattern 2 | | | | | | | | | | | | | |
| Config 2,3,5,6 | SMTC pattern 1 | | | | | | | | | | | | | |
| SSB configuration | | Config 1,2,4,5 | SSB pattern 1 in FR1 | | | | | | | | | | | | | |
| Config 3,6 | SSB pattern 2 in FR1 | | | | | | | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2,4,5 | kHz | 15 kHz | | | | | | | | | | | | | |
| Config 3,6 | 30 kHz | | | | | | | | | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | | | | 0 | | 0 | | 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 | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |
| Note2 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A  NR\_SDL\_FR1\_A | dBm/15kHz | -80.18 | | | -80.18 | | | -106 | | -106 | | -116 | | -116 | |
| NR\_FDD\_FR1\_B | -115.5 | | -115.5 | |
| NR\_TDD\_FR1\_C | -115 | | -115 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -114.5 | | -114.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114 | | -114 | |
| NR\_FDD\_FR1\_G | -113 | | -113 | |
| NR\_FDD\_FR1\_H | -112.5 | | -112.5 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A  NR\_SDL\_FR1\_A | dBm/15kHz | -86.27 | | | -86.27 | | | -113 | | -113 | | -116 | | -116 | |
| NR\_FDD\_FR1\_B | -115.5 | | -115.5 | |
| NR\_TDD\_FR1\_C | -115 | | -115 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -114.5 | | -114.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114 | | -114 | |
| NR\_FDD\_FR1\_G | -113 | | -113 | |
| NR\_FDD\_FR1\_H | -112.5 | | -112.5 | |
| Note2 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A  NR\_SDL\_FR1\_A | dBm/SCS | -80.18 | | | -80.18 | | | -106 | | -106 | | -116 | | -116 | |
| NR\_FDD\_FR1\_B | -115.5 | | -115.5 | |
| NR\_TDD\_FR1\_C | -115 | | -115 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -114.5 | | -114.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114 | | -114 | |
| NR\_FDD\_FR1\_G | -113 | | -113 | |
| NR\_FDD\_FR1\_H | -112.5 | | -112.5 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A  NR\_SDL\_FR1\_A | -83.27 | | | -83.27 | | | -110 | | -110 | | -113 | | -113 | |
| NR\_FDD\_FR1\_B | -112.5 | | -112.5 | |
| NR\_TDD\_FR1\_C | -112 | | -112 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -111.5 | | -111.5 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -111 | | -111 | |
| NR\_FDD\_FR1\_G | -110 | | -110 | |
| NR\_FDD\_FR1\_H | -109.5 | | -109.5 | |
|  | | | dB | -1.75 | | | -1.75 | | | -1.75 | | -1.75 | | 3 | | | -1.75 |
|  | | | dB | -1.75 | | | -1.75 | | | -1.75 | | -1.75 | | 3 | | | -1.75 |
| SS-RSRPNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A  NR\_SDL\_FR1\_A | dBm/SCS | -81.93 | | | | -81.93 | | -107.75 | | -107.75 | | -113 | | -117.75 | |
| NR\_FDD\_FR1\_B | -112.5 | | -117.25 | |
| NR\_TDD\_FR1\_C | -112 | | -116.75 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -111.5 | | -116.25 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -111 | | -115.75 | |
| NR\_FDD\_FR1\_G | -110 | | -114.75 | |
| NR\_FDD\_FR1\_H | -109.5 | | -114.25 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A  NR\_SDL\_FR1\_A | -85.02 | | | | -85.02 | | -111.75 | | -111.75 | | -110 | | | -114.75 |
| NR\_FDD\_FR1\_B | -109.5 | | | -114.25 |
| NR\_TDD\_FR1\_C | -109 | | | -113.75 |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -108.5 | | | -113.25 |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -108 | | | -112.75 |
| NR\_FDD\_FR1\_G | -107 | | | -111.75 |
| NR\_FDD\_FR1\_H | -106.5 | | | -111.25 |
| SS-RSRQ Note3 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A | dB | -14.77 | | | | -14.77 | | -40.59 | | -40.59 | | -12.56 | | | -14.76 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | Config 1,2,4,5 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A  NR\_SDL\_FR1\_A | dBm/  9.36MHz | -50 | | | -50 | | | -75.83 | | -75.83 | | -83.28 | | -85.83 | |
| NR\_FDD\_FR1\_B | -82.78 | | -85.33 | |
| NR\_TDD\_FR1\_C | -82.28 | | -84.83 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -81.78 | | -84.33 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -81.28 | | -83.83 | |
| NR\_FDD\_FR1\_G | -80.28 | | -82.83 | |
| NR\_FDD\_FR1\_H | -79.78 | | -82.33 | |
| Config 3,6 | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A  NR\_SDL\_FR1\_A | dBm/  38.16MHz | -50 | | | -50 | | | -76.73 | | -76.73 | | -77.19 | | -79.73 | |
| NR\_FDD\_FR1\_B | -76.69 | | -79.23 | |
| NR\_TDD\_FR1\_C | -76.19 | | -78.73 | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -75.69 | | -78.23 | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -75.19 | | -77.73 | |
| NR\_FDD\_FR1\_G | -74.19 | | -76.73 | |
| NR\_FDD\_FR1\_H | -73.69 | | -76.53 | |
| Propagation condition | | |  | AWGN | | AWGN | | | | AWGN | | AWGN | | AWGN | | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRQ, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRQ, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | | | | | | | | | |

##### A.4.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in section 10.1.9.1.1 and 10.1.9.1.2.

### A.4.7.3 SS-SINR

#### A.4.7.3.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.1.1.

##### A.4.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is tested by using the parameters in Table A.4.7.3.1.2-2. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.4.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

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

Table A.4.7.3.1.2-2: SS-SINR Intra frequency test parameters

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Test 1 | | | Test 2 | | | |
| Cell 2 | Cell 3 | | Cell 2 | | | Cell 3 |
| SSB ARFCN | | | |  | freq1 | | | freq1 | | | |
| Duplex mode | | | Config 1,4 |  | FDD | | | | | | |
| Config 2,3,5,6 | TDD | | | | | | |
| TDD configuration | | | Config 1,4 |  | Not Applicable | | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | | |
| Downlink initial BWP configuration | | | |  | DLBWP.0.1 | | | | | | |
| Downlink dedicated BWP configuration | | | |  | DLBWP.1.1 | | | | | | |
| Uplink initial BWP configuration | | | |  | ULBWP.0.1 | | | | | | |
| Uplink dedicated BWP configuration | | | |  | ULBWP.1.1 | | | | | | |
| DRX Cycle configuration | | | | ms | Not Applicable | | | | | | |
| TRS Configuration | | | Config 1,4 |  | TRS.1.1 FDD | - | | TRS.1.1 FDD | | | - |
|  | | | Config 2,5 |  | TRS.1.1 TDD | TRS.1.1 TDD | | |
|  | | | Config 3,6 |  | TRS.1.2 TDD | TRS.1.2 TDD | | |
| PDSCH Reference measurement channel | | | Config 1,4 |  | SR.1.1 FDD | - | | SR.1.1 FDD | | | - |
| Config 2,5 | SR.1.1 TDD | SR.1.1 TDD | | |
| Config 3,6 | SR.2.1 TDD | SR2.1 TDD | | |
| RMSI CORESET Reference Channel | | | Config 1,4 |  | CR.1.1 FDD | - | | CR.1.1 FDD | | |  |
| Config 2,5 | CR.1.1 TDD | CR.1.1 TDD | | |
| Config 3,6 | CR.2.1 TDD | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | | | Config 1,4 |  | CCR.1.1 FDD | - | | CCR.1.1 FDD | | | - |
| Config 2,5 | CCR.1.1 TDD | CCR.1.1 TDD | | |
| Config 3,6 | CCR.2.1 TDD | CCR.2.1 TDD | | |
| OCNG Patterns | | | |  | OP.1 | | | | | | |
| SS-RSSI-Measurement | | | |  | Not Applicable | | | | | | |
| Time offset with Cell 2 | | | Config 1,4 | ms | - | | 3 | | - | 3 | |
| Config 2,3,5,6 | μs | - | | 3 | | - | 3 | |
| SMTC configuration | | | Config 1,4 |  | SMTC.2 | | | | | | |
| Config 2,3,5,6 |  | SMTC.1 | | | | | | |
| SSB configuration | | | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2,4,5 | kHz | 15 | | | | | | |
| Config 3,6 | 30 | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | 0 | | 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 | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -93 | | | -116 | | | |
| NR\_FDD\_FR1\_B | -115.5 | | | |
| NR\_TDD\_FR1\_C | -115 | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -114.5 | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -114 | | | |
| NR\_FDD\_FR1\_G | -113 | | | |
| NR\_FDD\_FR1\_H | -112.5 | | | |
| Note2 | Config 1,2,4,5 | | | dBm/SCS | -93 | | | Same as Noc for 15kHz | | | |
| Config 3,6 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | -90 | | | -113 | | | |
| NR\_FDD\_FR1\_B | -112.5 | | | |
| NR\_TDD\_FR1\_C | -112 | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -111.5 | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -111 | | | |
| NR\_FDD\_FR1\_G | -110 | | | |
| NR\_FDD\_FR1\_H | -109.5 | | | |
|  | | | | dB | 0 | -3.19 | | -5.46 | | | -5.46 |
|  | | | | dB | 4.54 | 2.66 | | -4 | | | -4 |
| SS-RSRPNote3 | Config 1,2,4,5 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -88.46 | -90.34 | | -120 | | | -120 |
| NR\_FDD\_FR1\_B | -119.5 | | | -119.5 |
| NR\_TDD\_FR1\_C | -119 | | | -119 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -118.5 | | | -118.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -118 | | | -118 |
| NR\_FDD\_FR1\_G | -117 | | | -117 |
| NR\_FDD\_FR1\_H | -116.5 | | | -116.5 |
| Config 3,6 | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | -85.46 | -87.34 | | -117 | | | -117 |
| NR\_FDD\_FR1\_B | -116.5 | | | -116.5 |
| NR\_TDD\_FR1\_C | -116 | | | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 | | | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 | | | -115 |
| NR\_FDD\_FR1\_G | -114 | | | -114 |
| NR\_FDD\_FR1\_H | -113.5 | | | -113.5 |
| SS-SINR Note3 | | | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dB | 0 | -3.19 | | -5.46 | | | -5.46 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | | Config 1,2,4,5 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -57.5 | | | -85.51 | | | |
| NR\_FDD\_FR1\_B | -85.01 | | | |
| NR\_TDD\_FR1\_C | -84.51 | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -84.01 | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -83.51 | | | |
| NR\_FDD\_FR1\_G | -82.51 | | | |
| NR\_FDD\_FR1\_H | -82.01 | | | |
| Config 3,6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | -51.41 | | | -79.41 | | | |
| NR\_FDD\_FR1\_B | -78.91 | | | |
| NR\_TDD\_FR1\_C | -78.41 | | | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -77.91 | | | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -77.41 | | | |
| NR\_FDD\_FR1\_G | -76.41 | | | |
| NR\_FDD\_FR1\_H | -75.91 | | | |
| Propagation condition | | | | - | AWGN | | | | | | |
| Antenna configuration | | | | - | 1x2 | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in Clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | | | | | |

##### A.4.7.3.1.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.1.1.

#### A.4.7.3.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.14.1.1 and 10.1.14.1.2 for interfrequency measurement.

##### A.4.7.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.4.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test parameters in Table A.4.7.3.2.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell of which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.4.7.3.2.2-1: SS-SINR Inter frequency SS-SINR supported test configurations

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

Table A.4.7.3.2.2-2: SS-SINR Inter frequency test parameters

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | | Unit | Test 1 | | Test 2 | | | Test 3 | | |
| Cell 2 | Cell 3 | Cell 2 | | Cell 3 | Cell 2 | | Cell 3 |
| SSB ARFCN | | | |  | freq1 | freq2 | freq1 | | freq2 | freq1 | | freq2 |
| Duplex mode | | | Config 1,4 |  | FDD | | | | | | | |
| Config 2,3,5,6 | TDD | | | | | | | |
| TDD configuration | | | Config 1,4 |  | Not Applicable | | | | | | | |
| Config 2,5 | TDDConf.1.1 | | | | | | | |
| Config 3,6 | TDDConf.2.1 | | | | | | | |
| Downlink initial BWP configuration | | | |  | DLBWP.0.1 | | | | | | | |
| Downlink dedicated BWP configuration | | | |  | DLBWP.1.1 | | | | | | | |
| Uplink initial BWP configuration | | | |  | ULBWP.0.1 | | | | | | | |
| Uplink dedicated BWP configuration | | | |  | ULBWP.1.1 | | | | | | | |
| DRX Cycle configuration | | | | ms | Not Applicable | | | | | | | |
| Gap pattern ID | |  | |  | 0 | - | 0 | - | | 0 | - | |
| TRS Configuration | | | Config 1,4 |  | TRS.1.1 FDD | - | TRS.1.1 FDD | | - | TRS.1.1 FDD | | - |
|  | | | Config 2,5 |  | TRS.1.1 TDD | TRS.1.1 TDD | | TRS.1.1 TDD | |
|  | | | Config 3,6 |  | TRS.1.2 TDD | TRS.1.2 TDD | | TRS.1.2 TDD | |
| PDSCH Reference measurement channel | | | Config 1,4 |  | SR.1.1 FDD | - | SR.1.1 FDD | | - | SR.1.1 FDD | | - |
| Config 2,5 | SR.1.1 TDD | SR.1.1 TDD | | SR.1.1 TDD | |
| Config 3,6 | SR.2.1 TDD | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | | Config 1,4 |  | CR.1.1 FDD | - | CR.1.1 FDD | | - | CR.1.1 FDD | | - |
| Config 2,5 | CR.1.1 TDD | CR.1.1 TDD | | CR.1.1 TDD | |
| Config 3,6 | CR.2.1 TDD | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | | Config 1,4 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | | - | CCR.1.1 FDD | | - |
| Config 2,5 | CCR.1.1 TDD | CCR.1.1 TDD | | CCR.1.1 TDD | |
| Config 3,6 | CCR.2.1 TDD | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | | |  | OP.1 | | | | | | | |
| SS-RSSI-Measurement | | | |  | Not Applicable | | | | | | | |
| SMTC configruation | | | |  | SMTC.1 | | | | | | | |
| Time offset with Cell 2 | | | Config 1,4 | ms | - | 3 | - | 3 | | - | 3 | |
|  | | | Config 2,3,5,6 | μs | - | 3 | - | 3 | | - | 3 | |
| SMTC configruation | | | Config 1,4 |  | SMTC.2 | | | | | | | |
| Config 2,3,5,6 |  | SMTC.1 | | | | | | | |
| SSB configuration | | | Config 1,2,4,5 |  | SSB.1 FR1 | | | | | | | |
| Config 3,6 | SSB.2 FR1 | | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | | Config 1,2,4,5 | kHz | 15 | | | | | | | |
| Config 3,6 | 30 | | | | | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | 0 | 0 | | 0 | 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 | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | Config 1,2,4,5 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/15kHz | -88 | | -108.5 | | | -119.5 | | |
| NR\_FDD\_FR1\_B | -119 | | |
| NR\_TDD\_FR1\_C | -118.5 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -118 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -117.5 | | |
| NR\_FDD\_FR1\_G | -116.5 | | |
| NR\_FDD\_FR1\_H | -116 | | |
| Note2 | Config 1,2,4,5 | | | dBm/SCS | -88 | | -108.5 | | | Same as Noc for 15kHz | | |
| Config 3,6 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -85 | | -105.5 | | | -116.5 | | |
| NR\_FDD\_FR1\_B | -116 | | |
| NR\_TDD\_FR1\_C | -115.5 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -115 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -114.5 | | |
| NR\_FDD\_FR1\_G | -114.5 | | |
| NR\_FDD\_FR1\_H | -113 | | |
|  | | | | dB | -1.75 | | 20 | | | -4.0 | | |
|  | | | | dB | -1.75 | | 20 | | | -4.0 | | |
| SS-RSRPNote3 | Config 1,2,4,5 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/SCS | -89.75 | | -88.5 | | | -123.5 | | |
| NR\_FDD\_FR1\_B | -123 | | |
| NR\_TDD\_FR1\_C | -122.5 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -122 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -121.5 | | |
| NR\_FDD\_FR1\_G | -120.5 | | |
| NR\_FDD\_FR1\_H | -120 | | |
| Config 3,6 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | -86.75 | | -85.5 | | | -120.5 | | |
| NR\_FDD\_FR1\_B | -120 | | |
| NR\_TDD\_FR1\_C | -119.5 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -119 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -118.5 | | |
| NR\_FDD\_FR1\_G | -117.5 | | |
| NR\_FDD\_FR1\_H | -117 | | |
| SS-SINR Note3 | | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dB | -1.75 | | 20 | | | -4.0 | | |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| IoNote3 | Config 1,2,4,5 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  9.36MHz | -57.83 | | -60.5 | | | -90.09 | | |
| NR\_FDD\_FR1\_B | -89.59 | | |
| NR\_TDD\_FR1\_C | -89.09 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -88.59 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -88.09 | | |
| NR\_FDD\_FR1\_G | -87.09 | | |
| NR\_FDD\_FR1\_H | -86.59 | | |
| Config 3,6 | | NR\_FDD\_FR1\_A  NR\_TDD\_FR1\_A NOTE 6 | dBm/  38.16MHz | -51.73 | | -54.41 | | | -84 | | |
| NR\_FDD\_FR1\_B | -83.5 | | |
| NR\_TDD\_FR1\_C | -83 | | |
| NR\_FDD\_FR1\_D  NR\_TDD\_FR1\_D | -82.5 | | |
| NR\_FDD\_FR1\_E  NR\_TDD\_FR1\_E | -82 | | |
| NR\_FDD\_FR1\_G | -81 | | |
| NR\_FDD\_FR1\_H | -80.5 | | |
| Propagation condition | | | | - | AWGN | | | | | | | |
| Antenna configuration | | | | - | 1x2 | | | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: NR operating band groups are as defined in Clause 3.5.2.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | | | | | | |

##### A.4.7.3.2.3 Test Requirements

The SS-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.1.1 and 10.1.14.1.2.

### A.4.7.4 L1-RSRP measurement for beam reporting

#### A.4.7.4.1 SSB based L1-RSRP measurement

##### A.4.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.2 and clause 10.1.19.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.4.7.4.1.1-1.

Table A.4.7.4.1.1-1: Applicable NR configurations for FR1 SSB based L1-RSRP test

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

##### A.4.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.4.1.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.4.7.4.1.2-1.

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

Table A.4.7.4.1.2-1: FR1 SSB based L1-RSRP test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | | 1~6 |  | freq1 | freq1 |
| Duplex mode | | 1,4 |  | FDD | FDD |
| 2,5 | TDD | TDD |
| 3,6 | TDD | TDD |
| TDD Configuration | | 1,4 |  | N/A | N/A |
| 2,5 | TDDConf.1.1 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.3 FR1 | SSB.3 FR1 |
| 2,5 | SSB.3 FR1 | SSB.3 FR1 |
| 3,6 | SSB.4 FR1 | SSB.4 FR1 |
| OCNG Patterns | | 1~6 |  | OP.1 | OP.1 |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | TRS.1.1 FDD |
| 2,5 | TRS.1.1 TDD | TRS.1.1 TDD |
| 3,6 | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| SMTC configuration | | 1~6 |  | SMTC.1 | SMTC.1 |
| reportConfigType | | 1~6 |  | periodic | periodic |
| reportQuantity | | 1~6 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | | 1~6 |  | 2 | 2 |
| L1-RSRP reporting period | | 1~6 |  | slot80 | slot80 |
| EPRE ratio of PSS to SSS | | 1~6 | 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 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~6 | dBm/15kHz | -94.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SSB SCS | -94.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -91.65 | -114 |
| NR\_FDD\_FR1\_B | -113.5 |
| NR\_TDD\_FR1\_C | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 |
| NR\_FDD\_FR1\_G | -111 |
| NR\_FDD\_FR1\_H | -110.5 |
|  | | 1~6 | dB | 10 | -3 |
| SSB RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SSB SCS | -84.65 | -120 |
| NR\_FDD\_FR1\_B | -119.5 |
| NR\_TDD\_FR1\_C | -119 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -118.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -118 |
| NR\_FDD\_FR1\_G | -117 |
| NR\_FDD\_FR1\_H | -116.5 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -81.65 | -117 |
| NR\_FDD\_FR1\_B | -116.5 |
| NR\_TDD\_FR1\_C | -116 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 |
| NR\_FDD\_FR1\_G | -114 |
| NR\_FDD\_FR1\_H | -113.5 |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.28 |
| NR\_FDD\_FR1\_B | -86.78 |
| NR\_TDD\_FR1\_C | -86.28 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -85.78 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -85.28 |
| NR\_FDD\_FR1\_G | -84.28 |
| NR\_FDD\_FR1\_H | -83.78 |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | dBm/38.16 MHz | -50.19 | -81.19 |
| NR\_FDD\_FR1\_B | -80.69 |
| NR\_TDD\_FR1\_C | -80.19 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -79.69 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -79.19 |
| NR\_FDD\_FR1\_G | -78.19 |
| NR\_FDD\_FR1\_H | -77.69 |
|  | | 1~6 | dB | 10 | -3 |
| Propagation condition | | 1~6 |  | AWGN | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | |

##### A.4.7.4.1.3 Test Requirements

The L1-RSRP measurement accuracy for SSB resource reported by UE in L1-RSRP report (SSB#0 or SSB#1) of Cell 2 shall fulfil the requirements in clauses 10.1.19.1.

#### A.4.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

##### A.4.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.3 and clause 10.1.19.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.4.7.4.2.1-1.

Table A.4.7.4.2.1-1: Applicable NR configurations for FR1 CSI-RS based L1-RSRP test

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

##### A.4.7.4.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.4.7.4.2.2-1 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.4.7.4.2.2-1.

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

Table A.4.7.4.2.2-1: FR1 CSI-RS based L1-RSRP test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** | **Test 2** | |
| SSB GSCN | | 1~6 |  | freq1 | freq1 | |
| Duplex mode | | 1,4 |  | FDD | FDD | |
| 2,5 | TDD | TDD | |
| 3,6 | TDD | TDD | |
| TDD Configuration | | 1,4 |  | N/A | N/A | |
| 2,5 | TDDConf.1.1 | TDDConf.1.1 | |
| 3,6 | TDDConf.2.1 | TDDConf.2.1 | |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 | |
| 2,5 | 10: NRB,c = 52 | 10: NRB,c = 52 | |
| 3,6 | 40: NRB,c = 106 | 40: NRB,c = 106 | |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD | SR.1.1 FDD | |
| 2,5 | SR.1.1 TDD | SR.1.1 TDD | |
| 3,6 | SR.2.1 TDD | SR.2.1 TDD | |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD | CR.1.1 FDD | |
| 2,5 | CR.1.1 TDD | CR.1.1 TDD | |
| 3,6 | CR.2.1 TDD | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD | CCR.1.1 FDD | |
| 2,5 | CCR.1.1 TDD | CCR.1.1 TDD | |
| 3,6 | CCR.2.1 TDD | CCR.2.1 TDD | |
| SSB configuration | | 1,4 |  | SSB.3 FR1 | SSB.3 FR1 | |
| 2,5 | SSB.3 FR1 | SSB.3 FR1 | |
| 3,6 | SSB.4 FR1 | SSB.4 FR1 | |
| OCNG Patterns | | 1~6 |  | OP.1 | OP.1 | |
| TRS configuration | | 1,4 |  | TRS.1.1 FDD | TRS.1.1 FDD | |
| 2,5 | TRS.1.1 TDD | TRS.1.1 TDD | |
| 3,6 | TRS.1.2 TDD | TRS.1.2 TDD | |
| Initial BWP Configuration | | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | | 1~6 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 | |
| SMTC configuration | | 1~6 |  | SMTC.1 | SMTC.1 | |
| CSI-RS | | 1,4 |  | CSI-RS 1.2 FDD | CSI-RS 1.2 FDD | |
| 2,5 | CSI-RS 1.2 TDD | CSI-RS 1.2 TDD | |
| 3,6 | CSI-RS 2.2 TDD | CSI-RS 2.2 FDD | |
| reportConfigType | | 1~6 |  | periodic | periodic | |
| reportQuantity | | 1~6 |  | cri-RSRP | cri-RSRP | |
| Number of reported RS | | 1~6 |  | 2 | 2 | |
| L1-RSRP reporting period | | 1~6 |  | slot80 | slot80 | |
| EPRE ratio of PSS to SSS | | 1~6 | 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 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~6 | dBm/15kHz | -94.65 | -117 | |
| NR\_FDD\_FR1\_B | -116.5 | |
| NR\_TDD\_FR1\_C | -116 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 | |
| NR\_FDD\_FR1\_G | -114 | |
| NR\_FDD\_FR1\_H | -113.5 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/CSI-RS SCS | -94.65 | -117 | |
| NR\_FDD\_FR1\_B | -116.5 | |
| NR\_TDD\_FR1\_C | -116 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 | |
| NR\_FDD\_FR1\_G | -114 | |
| NR\_FDD\_FR1\_H | -113.5 | |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -91.65 | -114 | |
| NR\_FDD\_FR1\_B | -113.5 | |
| NR\_TDD\_FR1\_C | -114 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -112.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -112 | |
| NR\_FDD\_FR1\_G | -111 | |
| NR\_FDD\_FR1\_H | -110.5 | |
|  | | 1~6 | dB | 10 | 10 | |
| CSI-RS RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/CSI-RS SCS | -84.65 | -120 | |
| NR\_FDD\_FR1\_B | -119.5 | |
| NR\_TDD\_FR1\_C | -119 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -118.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -118 | |
| NR\_FDD\_FR1\_G | -117 | |
| NR\_FDD\_FR1\_H | -116.5 | |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -81.65 | -117 | |
| NR\_FDD\_FR1\_B | -116.5 | |
| NR\_TDD\_FR1\_C | -116 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -115.5 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -115 | |
| NR\_FDD\_FR1\_G | -114 | |
| NR\_FDD\_FR1\_H | -113.5 | |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/9.36 MHz | -56.28 | -87.28 | |
| NR\_FDD\_FR1\_B | -86.78 | |
| NR\_TDD\_FR1\_C | -86.28 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -85.78 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -85.28 | |
| NR\_FDD\_FR1\_G | -84.28 | |
| NR\_FDD\_FR1\_H | -83.78 | |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | dBm/38.16 MHz | -50.19 | -81.19 | |
| NR\_FDD\_FR1\_B | -80.69 | |
| NR\_TDD\_FR1\_C | -80.19 | |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -79.69 | |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -79.19 | |
| NR\_FDD\_FR1\_G | -78.19 | |
| NR\_FDD\_FR1\_H | -77.69 | |
|  | | 1~6 | dB | 10 | -3 | |
| Propagation condition | | 1~6 |  | AWGN | AWGN | |
| Antenna configuration | | 1~6 |  | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | |

##### A.4.7.4.2.3 Test Requirements

The L1-RSRP measurement accuracy for CSI-RS resource reported by UE in L1-RSRP report (CSI-RS#0 or CSI-RS#1) of Cell 2 shall fulfil the requirements in clauses 10.1.19.2.

### A.4.7.5 SFTD accuracy

#### A.4.7.5.1 SFTD accuracy

##### A.4.7.5.1.1 Test Purpose and Environment

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 9.1.27 in TS 36.133 [15] for EN-DC SFTD measurements.

##### A.4.7.5.1.2 Test Parameters

Supported test configurations are shown in Table A.4.7.5.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is E-UTRAN PCell and Cell 2 is NR FR1 PSCell. The test parameters of cell 1 are given in clause A.3.7.2.1. The test parameters of cell 2 are given in Table A.4.7.5.1.2-2. The SFTD between PCell and PSCell shall be set by the test equipment to one of the time differences in Table A.4.7.5.1.2-3.

Table A.4.7.5.1.2-1: Supported test configurations for SFTD accuracy

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

Table A.4.7.5.1.2-2: Test parameters for SFTD accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Config** | **Unit** | **Test 1** |
| SSB GSCN | | 1~6 |  | freq1 |
| Duplex mode | | 1,4 |  | FDD |
| 2,5 | TDD |
| 3,6 | TDD |
| TDD Configuration | | 1,4 |  | N/A |
| 2,5 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 |
| 2,5 | 10: NRB,c = 52 |
| 3,6 | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD |
| 2,5 | SR.1.1 TDD |
| 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD |
| 2,5 | CR.1.1 TDD |
| 3,6 | CR.2.1 TDD |
| RMC CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD |
| 2,5 | CCR.1.1 TDD |
| 3,6 | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.1 FR1 |
| 2,5 | SSB.1 FR1 |
| 3,6 | SSB.2 FR1 |
| SMTC configuration | | 1~6 |  | SMTC.1 |
| DL BWP configuration | | 1~6 |  | DLBWP.1.1 |
| UL BWP configuration | | 1~6 |  | ULBWP.1.1 |
| CSI-RS for tracking | | 1,4 |  | TRS.1.1 FDD |
| 2,5 |  | TRS.1.1 TDD |
| 3,6 |  | TRS.1.2 TDD |
| OCNG Patterns | | 1~6 |  | OP.1 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~6 | dBm/15kHz | -104 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SSB SCS | -104 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -101 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
|  | | 1~6 | dB | -3 |
|  | | 1~6 | dB | -3 |
| SS-RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SCS | -107 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -104 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/9.36 MHz | -74.28 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | dBm/38.16 MHz | -68.18 |
| NR\_FDD\_FR1\_B |
| NR\_TDD\_FR1\_C |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
| NR\_FDD\_FR1\_G |
| NR\_FDD\_FR1\_H |
| Propagation condition | | 1~6 |  | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | |

Table A.4.7.5.1.2-3: Timing offsets for SFTD accuracy test

|  |  |  |
| --- | --- | --- |
| Condition | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

##### A.4.7.5.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and PSCell. The reported SFTD accuracy shall fulfil the requirement in clause 9.1.27 in TS 36.133 [15].

#### A.4.7.5.2 Void

#### A.4.7.5.3 Void

## A.4.8 Void

# A.4A NE-DC test with all NR cells in FR1

## A.4A.1 Signaling characteristics

### A.4A.1.1 E-UTRAN PSCell addition

#### A.4A.1.1.1 Test purpose and environment

The purpose of this test is to verify that the LTE PSCell addition/release delay and interruption under NE-DC are within the requirements stated in clause 8.8 and clause 8.2.3.2.3 for the case when the PSCell is known by the UE at the time of addition.

Supported test configurations are shown in A.4A.1.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.1-1.

The test parameters for NR cell are given in Tables A.4A.1.1.1-2 and cell-specific parameters in A.4A.1.1.1-3 below. The test consists of five successive time periods with duration of T1, T2, T3, T4 and T5 respectively. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (NR PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (E-UTRAN PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event B1 is configured for neighbour cell (Cell2). Before the start of T2 the UE is configured with the measurement gaps (gap pattern Id # 0). The Cell2 becomes known to the UE during T2. Therefore, during T2 the UE shall report Event B1. The point in time at which the RRC message to release measurement gap is transmitted from the test system defines the start of period T3. During T3, after measurement gap is released, the test system transmits the RRC message to the UE to add PSCell on radio channel 2.

The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

The test system shall observe the periodic reporting of CSI for PSCell during T5. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T5.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T5, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T6.

Table A.4A.1.1.1-1: Applicable E-UTRA and NR configurations for NE-DC PSCell addition and Release test

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

Table A.4A.1.1.1-2: General Test Parameters for PSCell Addition and Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | Two radio channels are used for this test. One for NR cell and second for E-UTRAN Cell |
| Initial | Active PCell |  | Cell1 | PCell on RF channel number 1. |
|  | Neighbour cell |  | Cell2 | Neighbour cell on RF channel number 2. |
| Final | Active PCell |  | Cell1 | PCell on RF channel number 1. |
| Condition | Neighbour Cell |  | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
|  | Threshold RSRP  (Config 1,2,4,5) | dBm | -96 | Actual RSRP threshold for event B1. |
|  | Threshold RSRP (Config 3,6) | dBm | -93 | Actual RSRP threshold for event B1. |
|  | Time to Trigger | s | 0 |  |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| Measurement gap pattern Id | |  | 0 | Gaps are configured before T2 and released before T3. |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1 | During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3 | | s | 3.5 | During this time the test system transmits the RRC messages to release measurement gap and add PSCell. |
| T4 | | s | 0.5 | During this time the UE adds the PSCell. |
| T5 | | s | 0.5 | During this time the UE sends CSI reports for PSCell. |
| T6 | | s | 0.5 | During this time the UE releases the PSCell. |

Table A.4A.1.1.1-3: NR Cell Specific Parameters for PSCell Addition and Release

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Config | Test |
|  |  |  |
| NR RF Channel Number |  | 1,2,3,4,5,6 | 1 |
| E-UTRA RF Channel Number |  | 1,2,3,4,5,6 | 2 |
| TDD |  | 1,4 | Not Applicable |
| configuration |  | 2,5 | TDDConf.1.1 |
|  |  | 3,6 | TDDConf.2.1 |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 |
|  |  | 2,5 | 10: NRB,c = 52 |
|  |  | 3,6 | 40: NRB,c = 106 |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 |
| PDSCH Reference |  | 1,4 | SR.1.1 FDD |
| measurement |  | 2,5 | SR.1.1 TDD |
| channel |  | 3,6 | SR.2.1 TDD |
| RMSI CORESET Reference |  | 1,4 | CR.1.1 FDD |
| Channel |  | 2,5 | CR.1.1 TDD |
|  |  | 3,6 | CR.2.1 TDD |
| Dedicated CORESET Reference |  | 1,4 | CCR.1.1 FDD |
| Channel |  | 2,5 | CCR.1.1 TDD |
|  |  | 3,6 | CCR.2.1 TDD |
| OCNG Patterns |  | 1,2,3,4,5,6 | OP.1 |
| SSB configuration |  | 1,2,4,5 | SSB.1 FR1 |
|  |  | 3,6 | SSB.2 FR1 |
| SMTC configuration |  | 1,2,4,5 | SMTC.1 |
|  |  | 3,6 | SMTC.1 |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD |
|  |  | 2,5 | TRS.1.1 TDD |
|  |  | 3,6 | TRS.1.2 TDD |
| CSI-RS configuration for CSI reporting |  | 1,4 | CSI-RS.1.1 FDD |
|  |  | 2,5 | CSI-RS.1.1 TDD |
|  |  | 3,6 | CSI-RS.2.1 TDD |
| reportConfigType |  | 1,2,3,4,5,6 | periodic |
| reportQuantity |  | 1,2,3,4,5,6 | cri-RI-PMI-CQI |
| CSI reporting periodicity | slot | 1,2,4,5 | 5 |
|  |  | 3,6 | 10 |
| CSI reporting offset | slot | 1,2,4,5 | 2 |
|  |  | 3,6 | 4 |
| 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 | dB | 1,2,3,4,5,6 | 0 |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |
| Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -88 |
| Note2 | dBm/SCS | 1,2,4,5 | -88 |
|  |  | 3,6 | -85 |
|  |  | 1,2,3,4,5,6 | 0 |
|  |  | 1,2,3,4,5,6 | 0 |
| SS-RSRPNote3 | dBm/SCS | 1,2,4,5 | -88 |
|  |  | 3,6 | -85 |
| IoNote3 | dBm/9.36MHz | 1,2,4,5 | -57 |
|  | dBm/38.1MHz | 3,6 | -51 |
| Propagation condition |  | 1,2,3,4,5,6 | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | |

Table A.4A.1.1.1-4: E-UTRAN cell specific test parameters for PSCell Addition and Release tests

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | E-UTRAN Cell | | | | | |
| T1 | T2 | | T3 | T4 | T5 |
| Duplex mode |  | FDD or TDD | | | | | |
| TDD special subframe configurationNote1 |  | 6 | | | | | |
| TDD uplink-downlink configurationNote1 |  | 1 | | | | | |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 | | | | | |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD | | | | | |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD | | | | | |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD | | | | | |
| PBCH\_RA | dB |  | | | | | |
| PBCH\_RB | dB |  | | | | | |
| PSS\_RA | dB |  | | | | | |
| SSS\_RA | dB |  | | | | | |
| PCFICH\_RB | dB |  | | | | | |
| PHICH\_RA | dB |  | | | | | |
| PHICH\_RB | dB | 0 | | | | | |
| PDCCH\_RA | dB |  | | | | | |
| PDCCH\_RB | dB |  | | | | | |
| PDSCH\_RA | dB |  | | | | | |
| PDSCH\_RB | dB |  | | | | | |
| OCNG\_RANote3 | dB |  | | | | | |
| OCNG\_RBNote3 | dB |  | | | | | |
| NocNote4 | dBm/15 kHz | N/A | | -104 | | | |
| Ês/Noc | dB | -infinite | | 17 | | | |
| Ês/Iot | dB | -infinite | | 17 | | | |
| RSRP Note5 | dBm/15 kHz | -infinite | | -87 | | | |
| SCH\_RP Note5 | dBm/15 kHz | -infinite | | -87 | | | |
| Io Note5 | dBm/Ch BW | N/A | | -59.13+10log(NRB,c /50) | | | |
| Propagation Condition |  | AWGN | | | | | |
| Antenna Configuration |  | 1x2 | | | | | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: 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 Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

#### A.4A.1.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 120 msNote1 into T3.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T4.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T4

The UE shall stop sending CSI reports for PSCell in at latest 20ms into T5.

Interruption on PCell during PSCell addition and release shall not exceed the values specified for NE-DC in Clause 8.2.3.2.3.

All the above test requirements shall be fulfilled in order for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 8.8 [15]:

Tconfig\_EUTRAN-PSCell = 20ms + Tactivation\_time + 50ms + TPCell\_ DU + TE-UTRAN-PSCell\_ DU

Where:

Tactivation\_time = 20ms

TPSCell\_ DU = 0ms

TE-UTRAN-PSCell\_ DU = 30ms

### A.4A.1.2 Active BWP switch

#### A.4A.1.2.1 E-UTRAN PSCell – NR PCell FR1 DCI-based and Timer-based DL active BWP switch in non-DRX in synchronous NE-DC

##### A.4A.1.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS38.133 clause 8.6, and interruption requirement for E-UTRA victim cell defined in TS36.133 clause 7.36.2.6. Supported test configurations are shown in Table A.4A.1.2.1.1-1.

The test scenario comprises of one NR PCell (Cell 1), and one E-UTRA PSCell (Cell 2) as given in Table A.4A.1.2.1.1-2. Cell-specific parameters of NR PCell is specified in Table A.4A.1.2.1.1-3. below, and cell-specific parameters of E-UTRA PSCell are specified in Table A.3.7.2.1-1.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for PCell, BWP-1 and BWP-2, in Cell 1 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 in PCell.

- UE is configured with a *bwp-InactivityTimer* timer value for PCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PCell’s slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PCell’s DL slot (*i+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell no later than at the beginning of the DL slot right after DL slot (*i+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on PCell’s BWP-2 starting from the beginning of the DL slot right after DL slot (*i+TBWPswitchDelay*).

The starting time of PSCell(Cell 2) interruption due to BWP switch on PCell shall occur within the BWP switch delay.

During T2, the test equipment won’t transmit DCI format for PDSCH reception on PCell(Cell 1).

During T3,

The time period T3 starts from the slot #*j*, where j is the beginning slot of the DL subframe immediately after the *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PCell’s DL slot (*j+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the PCell at latest at the beginning of the DL slot right after DL slot (*j+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on PCell’s BWP-1 starting from the beginning of the DL slot right after DL slot (*j+TBWPswitchDelay*).

The starting time of PSCell(Cell 2) interruption due to BWP switch of PCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in PCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK is received.

The test equipment verifies that potential interruption to E-UTRA PSCell is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during BWP switch of PCell, respectively.

**Table A.4A.1.2.1.1-1: DL BWP switch supported test configurations**

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

Table A.4A.1.2.1.1-2: General test parameters for DL BWP switch in synchronous NE-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| NR RF Channel Number |  | 1 | One NR radio channel is used for this test |
| E-UTRA RF Channel Number |  | 2 | One E-UTRA radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | [200] |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous NE-DC |
| T1 | s | [0.2] |  |
| T2 | s | [0.2] |  |
| T3 | s | [0.2] |  |

**Table A.4A.1.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous NE-DC**

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 |
| Frequency Range | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
|  | Config 2,3,5,6 |  | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
|  | Config 2,5 |  | TDDConf.1.1 |
|  | Config 3,6 |  | TDDConf.2.1 |
| BWchannel | Config 1,4 |  | 10 MHz: NRB,c = 52 |
|  | Config 2,5 |  | 10 MHz: NRB,c = 52 |
|  | Config 3,6 |  | 40 MHz: NRB,c = 106 |
| Active BWP ID | |  | 1, 2 |
| Initial DL BWP | Config 1,4 |  | DLBWP.0.2 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active DL BWP-1 | Config 1,4 |  | DLBWP.1.1 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active DL BWP-2 | Config 1,4 |  | DLBWP.1.3 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Initial UL BWP | Config 1,4 |  | ULBWP.0.2 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active UL BWP-1 | Config 1,4 |  | ULBWP.1.1 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| Active UL BWP-2 | Config 1,4 |  | ULBWP.1.3 Note 4 |
| Configuration | Config 2,5 |  |  |
|  | Config 3,6 |  |  |
| PDSCH Reference | Config 1,4 |  | SR.1.1 FDD |
| measurement channel | Config 2,5 |  | SR.1.1 TDD |
|  | Config 3,6 |  | SR.2.1 TDD |
| RMSI CORESET | Config 1,4 |  | CR.1.1 FDD |
| parameters | Config 2,5 |  | CR.1.1 TDD |
|  | Config 3,6 |  | CR.2.1 TDD |
| Dedicated CORESET | Config 1,4 |  | CCR.1.1 FDD |
| parameters | Config 2,5 |  | CCR.1.1 TDD |
|  | Config 3,6 |  | CCR.2.3 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
|  | Config 3,6 |  | SSB.2 FR1 |
| SMTC Configuration |  |  | SMTC.1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| TRS Configuration | Config 1,4 |  | TRS.1.1 FDD |
|  | Config 2,5 |  | TRS.1.1 TDD |
|  | Config 3,6 |  | TRS.1.2 TDD |
| 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 | | dB | 0 |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |
| NocNote 2 | Config 1,2,4,5 | dBm/SCS | [-104] |
|  | Config 3,6 |  | [-101] |
| NocNote 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | [-87] |
|  | Config 3,6 |  | [-90] |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | [-59] |
|  | Config 3,6 | dBm/38.16MHz | [-61.9] |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc 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: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | | |

A.4A.1.2.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PCell in the DL slot right after DL slot (*i+TBWPswitchDelay*+*k1*).

During T3, the UE shall start to send the ACK for PCell in the DL slot right after DL slot (*j+TBWPswitchDelay*+*k1*).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration *TBWPswitchDelay* defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

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

During T1, the start time of PSCell interruption during PCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PSCell interruption of during PCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.36.2.6.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK in the DL slot right after DL slot (*i+TBWPswitchDelay*+*k1*), (*j+TBWPswitchDelay*+*k1*), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

## A.4A.2 Measurement performance

### A.4A.2.1 SFTD accuracy

#### A.4A.2.1.1 SFTD accuracy

##### A.4A.2.1.1.1 Test Purpose

The purpose of this set of tests is to verify that the SFTD measurement accuracy is within the specified limits. This test will verify the requirements as specified in clause 10.21.1.1 for NE-DC SFTD measurements.

##### A.4A.2.1.1.2 Test Environment

Supported test configurations are shown in Table A.4A.2.1.1.2-1. In this set of test cases there are two cells on different carriers. Cell 1 is NR FR1 PCell and Cell 2 is E-UTRAN target cell. The test parameters of cell 1 are given in clause A.4A.2.1.1.2-2. The test parameters of cell 2 are given in Table A.3.7.2.1. The SFTD between PCell and target cell shall be set by the test equipment to one of the time differences in Table A.4A.2.1.1.2-3.

Table A.4A.2.1.1.2-1: Supported test configurations for SFTD accuracy

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6 | NR 30kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode, LTE TDD |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: A UE which fulfils the requirements in test case A.4A.1.1 can skip the test cases in A.4.7.5.1 | |

Table A.4A.2.1.1.2-2: Test parameters for SFTD accuracy (Cell 1)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Config | Unit | Test 1 |
| SSB GSCN | | 1~6 |  | freq1 |
| Duplex mode | | 1,4 |  | FDD |
|  | | 2,5 |  | TDD |
|  | | 3,6 |  | TDD |
| TDD Configuration | | 1,4 |  | N/A |
|  | | 2,5 |  | TDDConf.1.1 |
|  | | 3,6 |  | TDDConf.2.1 |
| BWchannel | | 1,4 | MHz | 10: NRB,c = 52 |
|  | | 2,5 |  | 10: NRB,c = 52 |
|  | | 3,6 |  | 40: NRB,c = 106 |
| PDSCH Reference measurement channel | | 1,4 |  | SR.1.1 FDD |
|  | | 2,5 |  | SR.1.1 TDD |
|  | | 3,6 |  | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,4 |  | CR.1.1 FDD |
|  | | 2,5 |  | CR.1.1 TDD |
|  | | 3,6 |  | CR.2.1 TDD |
| RMC CORESET Reference Channel | | 1,4 |  | CCR.1.1 FDD |
|  | | 2,5 |  | CCR.1.1 TDD |
|  | | 3,6 |  | CCR.2.1 TDD |
| SSB configuration | | 1,4 |  | SSB.1 FR1 |
|  | | 2,5 |  | SSB.1 FR1 |
|  | | 3,6 |  | SSB.2 FR1 |
| SMTC configuration | | 1~6 |  | SMTC.1 |
| DL BWP configuration | | 1~6 |  | DLBWP.1.1 |
| UL BWP configuration | | 1~6 |  | ULBWP.1.1 |
| OCNG Patterns | | 1~6 |  | OP.1 |
| EPRE ratio of PSS to SSS | | 1~6 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1~6 | dBm/15kHz | -104 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
| Note2 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SSB SCS | -104 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | -101 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
|  | | 1~6 | dB | -3 |
|  | | 1~6 | dB | -3 |
| SS-RSRP Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/SCS | -107 |
|  | NR\_FDD\_FR1\_B |  |
|  | NR\_TDD\_FR1\_C |  |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |
|  | NR\_FDD\_FR1\_F |  |
|  | NR\_FDD\_FR1\_G |  |
|  | NR\_FDD\_FR1\_H |  |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 |  | -104 |
|  | NR\_FDD\_FR1\_B |  |
|  | NR\_TDD\_FR1\_C |  |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |  |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |  |
|  | NR\_FDD\_FR1\_F |  |
|  | NR\_FDD\_FR1\_G |  |
|  | NR\_FDD\_FR1\_H |  |
| Io Note3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 1,2,4,5 | dBm/9.36 MHz | -74.28 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
|  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A NOTE 5 | 3,6 | dBm/38.16 MHz | -68.18 |
|  | NR\_FDD\_FR1\_B |
|  | NR\_TDD\_FR1\_C |
|  | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D |
|  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E |
|  | NR\_FDD\_FR1\_F |
|  | NR\_FDD\_FR1\_G |
|  | NR\_FDD\_FR1\_H |
| Propagation condition | | 1~6 |  | AWGN |
| Antenna configuration | | 1~6 |  | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification | | | | |

Table A.4A.2.1.1.2-3: Timing offsets for SFTD accuracy test

|  |  |  |
| --- | --- | --- |
| Configuration | SFN offset between PCell and PSCell | Frame boundary offset between PCell and PSCell (Ts) |
| 1 | 100 | -122000 |
| 2 | 300 | -60540 |
| 3 | 500 | 1000 |
| 4 | 700 | 62540 |
| 5 | 900 | 124000 |

##### A.4A.2.1.1.3 Test Requirements

The SFTD reported by the UE consists of 2 elements, SFN offset and frame boundary offset between PCell and E-UTRAN target cell. The reported SFTD accuracy shall fulfil the requirement in clause 10.1.21.1.

# A.5 EN-DC tests with one or more NR cells in FR2

## A.5.1 Void

## A.5.2 Void

## A.5.3 RRC\_CONNECTED state mobility

### A.5.3.1 Void

### A.5.3.2 RRC Connection Mobility Control

#### A.5.3.2.1 Void

#### A.5.3.2.2 Random Access

##### A.5.3.2.2.1 Contention based random access test in FR2 for PSCell/SCell in EN-DC

A.5.3.2.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.1.1-1. UE capable of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.1.1-2 and Table A.5.3.2.2.1.1-3.

Table A.5.3.2.2.1.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | |

Table A.5.3.2.2.1.1-2: General test parameters for contention based random access test in FR2 for PSCell/SCell in EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | **Comments** |
| SSB Configuration | Config 1,2 |  | SSB.1 FR2 | As defined in A.3.10 |
| CSI-RS for tracking | Config 1,2 |  | TRS.2.1 TDD |  |
| Duplex Mode for Cell 2 | Config 1,2 |  | TDD |  |
| TDD Configuration | Config 1,2 |  | TDDConf.3.1 |  |
| BWchannel | Config 1 | MHz | 100: NRB,c = 24 |  |
| OCNG Pattern Note 1 | |  | OP.3 | As defined in A.3.2.1. |
| PDSCH Reference Channel Note 2 | Config 1,2 |  | SR.3.1 TDD | As defined in A.3.1.1. |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD | As defined in A.3.1.2 |
| Dedicated CORESET Reference Channel | Config 1,2 |  | CCR.3.1 TDD |  |
| NR RF Channel Number | |  | 1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | dB |  |
| *ss-PBCH-BlockPower* | | dBm/ SCS | +20 +ΔUL | As defined in TS 38.331 [2].  ΔUL is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power () | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19] |
| PRACH Configuration | |  | FR2 PRACH configuration 1 | As defined in A.3.8.3, with exceptions as defined below. |
| *rsrp-ThresholdSSB* | | dBm | RSRP\_69 +ΔDL | RSRP\_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | | dBm | -100 | As defined in TS 38.331 [2]. |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: The ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.  Note 4: The ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP\_x, x is treated as a positive integer value. | | | | |

**Table A.5.3.2.2.1.1-3: OTA-related test parameters for contention based random access test in FR2 for PSCell/SCell in EN-DC**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test-1** | **Comments** |
| AoA setup | | |  | Setup 1 | As defined in A.3.15.1 |
| Assumption for UE beamsNote 3 | | |  | Rough |  |
| SSB with index 0 | Es Note1 | | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| SSB\_RP | | dBm/SCS | -80.6 |
| Es/IotBB | | dB | 21.09 |  |
| Io | | dBm/95.04 MHz | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | | Es Note1 | dBm/SCS | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -95.0 |
| Es/IotBB | dB | 6.69 |  |
| Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | | - | AWGN |  |
| Note 1: No articial noise is applied in this test.  Note 2: Void.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

A.5.3.2.2.1.2 Test Requirements

Contention based random access is triggered by *not* explicitly assigning a random access preamble via dedicated signalling in the downlink.

A.5.3.2.2.1.2.1 Random Access Preamble Transmission

To test the UE behavior specified in Clause 6.2.2.2.1.1 the System Simulator shall receive the Random Access Preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *rsrp-ThresholdSSB*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.5.3.2.2.1.2.2 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.1.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. In response to the first 2 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.5.3.2.2.1.2.3 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.1.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 3 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 2 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be 0.6 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.5.3.2.2.1.2.4 Receiving an UL grant for msg3 retransmission

To test the UE behavior specified in clause 6.2.2.2.1.4 the System Simulator shall provide an UL grant for msg3 retransmission following a successful Random Access Response.

The UE shall re-transmit the msg3 upon the reception of an UL grant for msg3 retransmission.

A.5.3.2.2.1.2.5 Void

A.5.3.2.2.1.2.6 Void

A.5.3.2.2.1.2.7 Contention Resolution Timer expiry

To test the UE behavior specified in Clause 6.2.2.2.1.6 the System Simulator shall *not* send a response to a msg3.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.

##### A.5.3.2.2.2 Non-contention based random access test in FR2 for PSCell/SCell in EN-DC

A.5.3.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the behavior of the random access procedure is according to the requirements and that the PRACH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.2 and clause 7.1.2 in an AWGN model.

For this test two cells are used, with the configuration of Cell 1 (E-UTRA PCell) specified in clause A.3.7.2.1 and Cell 2 configured as PSCell or SCell in FR2. Supported test parameters are shown in Table A.5.3.2.2.2.1-1. UE capable of EN-DC withPSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.2.1-2 and Table A.5.3.2.2.2.1-3 for SSB-based non-contention based random access test (Test 1) and CSI-RS-based non-contention based random access test (Test 2). Test 2 is only applicable to UE which supports csi-RSRP-AndRSRQ-MeasWithSSB or csi-RSRP-AndRSRQ-MeasWithoutSSB.

Table A.5.3.2.2.2.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR PSCell/SCell 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations depending on UE capability | |

Table A.5.3.2.2.2.1-2: General test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test-1 | Test-2 | **Comments** |
| SSB Configuration | Config 1,2 |  | SSB.1 FR2 | SSB.1 FR2 | As defined in A.3.10 |
| CSI-RS Configuration | Config 1,2 |  | N/A | CSI-RS.3.1 TDD | As defined in A.3.1.4 |
| CSI-RS for tracking | Config 1,2 |  | TRS.2.1 TDD | TRS.2.1 TDD |  |
| Duplex Mode for Cell 2 | Config 1,2 |  | TDD | TDD |  |
| TDD Configuration | Config 1,2 |  | TDDConf.3.1 | TDDConf.3.1 |  |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 24 | 100: NRB,c = 24 |  |
| OCNG Pattern Note 1 | |  | OP.3 | OP.3 | As defined in A.3.2.1. |
| PDSCH Reference Channel Note 2 | Config 1,2 |  | SR3.1 TDD | SR3.1 TDD | As defined in A.3.1.1. |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD | CR.3.1 TDD | As defined in A.3.1.2 |
| Dedicated CORESET Reference Channel | Config 1,2 |  | CCR.3.1 TDD | CCR.3.1 TDD |  |
| NR RF Channel Number | |  | 1 | 1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |  |
| EPRE ratio of PBCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PBCH to PBCH\_DMRS | | dB |  |
| EPRE ratio of PDCCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS | | dB |  |
| EPRE ratio of PDSCH\_DMRS to SSS | | dB |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS | | dB |  |
| *ss-PBCH-BlockPower* | | dBm/ SCS | +20 +ΔUL | +20 +ΔUL | As defined in TS 38.331 [2].  ΔUL is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power () | | dBm | maximum value configurable for certain power class | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19] |
| PRACH Configuration | |  | FR2 PRACH configuration 2 | FR2 PRACH configuration 3 | As defined in A.3.8.3, with exceptions as defined below |
| *rsrp-ThresholdSSB* | | dBm | RSRP\_69 +ΔDL | RSRP\_69 +ΔDL | RSRP\_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| *preambleReceivedTargetPower* | | dBm | -100 | -100 | As defined in TS 38.331 [2] |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. The OCNG pattern is chosen during the test according to the presence of a DL reference measurement channel.  Note 2: The DL PDSCH reference measurement channel is used in the test only when a downlink transmission dedicated to the UE under test is required.  Note 3: The ΔUL value is calculated as -ROUND(PPRACH0 -1), where PPRACH0 is the measured first PRACH power with -80.6dBm/SCS applied, *preambleReceivedTargetPower* = -100dBm and *ss-PBCH-BlockPower* = 20dBm. These values are used during the uplink calibration process carried out before the test case is run, with the UE configured to send PRACH.  Note 4: The ΔDL value is calculated as (RSRP\_REP – RSRP\_76), where RSRP\_REP is the SS-RSRP Reported value in Table 10.1.6.1-1 with -80.6dBm/SCS applied. These values are used during the downlink calibration process carried out before the test case is run, with the UE configured to report SS-RSRP. For a Reported value RSRP\_x, x is treated as a positive integer value. | | | | | |

**Table A.5.3.2.2.2.1-3: OTA-related test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test-1** | **Test-2** | **Comments** |
| AoA setup | |  | Setup 1 | Setup 1 | As defined in A.3.15.1 |
| Assumption for UE beamsNote 3 | |  | Rough | Rough |  |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | -80.6 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -80.6 | -80.6 |
| Es/IotBB | dB | 21.09 | 21.09 |  |
| Io | dBm/95.04 MHz | -56.01 | -56.01 | Io in symbols containing SSB index 0 |
| SSB with index 1 | Es Note1 | dBm/SCS | -95.0 | -95.0 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| SSB\_RP | dBm/SCS | -95.0 | -95.0 |
| Es/IotBB | dB | 6.69 | 6.69 |  |
| Io | dBm/95.04 MHz | -70.41 | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | AWGN | AWGN |  |
| Note 1: No articial noise is applied in this test.  Note 2: void.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

A.5.3.2.2.2.2 Test Requirements

Non-Contention based random access is triggered by explicitly assigning a random access preamble via dedicated signalling in the downlink. In the test, the non-contention based random access procedure is not initialized for Other SI requested from UE or beam failure recovery.

A.5.3.2.2.2.2.1 SSB-based Random Access Preamble Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.2.2.1 for SSB-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the SSB with index 0, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.5.3.2.2.2.2.2 CSI-RS-based Random Access Preamble Transmission

In Test-2, to test the UE behavior specified in Clause 6.2.2.2.2.1 for CSI-RS-based Random Access Preamble tranmsision, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs configured, the System Simulator shall receive the Random Access Preamble which has the Preamble Index associated with the CSI-RS configured.

In addition, the System Simulator shall receive the Random Access Preamble on the PRACH occasion which belongs to the PRACH occasions corresponding to the CSI-RS configured, and the selected PRACH occasion shall belongs to the PRACH occassions permitted by the restrictions given by the *ra-OccasionList*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.5.3.2.2.2.2.3 Random Access Response Reception

To test the UE behavior specified in Clause 6.2.2.2.2.2 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a Random Access Response *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for Random Access Response(s) if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

A.5.3.2.2.2.2.4 No Random Access Response Reception

To test the UE behavior specified in clause 6.2.2.2.2.3 the System Simulator shall transmit a Random Access Response containing a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble after 5 preambles have been received by the System Simulator. The System Simulator shall *not* respond to the first 4 preambles.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2 in TS38.321 [7], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon*.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first preamble shall be -60 dBm to be received at TE with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19]. The relative power applied to additional preambles shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-2 [19].

The transmit timing of all PRACH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.3 Void

## A.5.4 Timing

### A.5.4.1 UE transmit timing

#### A.5.4.1.1 NR UE Transmit Timing Test for FR2

##### A.5.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 5.4.1.1.1-1.

Table A.5.4.1.1.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

The test consists of E-UTRA PCell and NR PSCell. The configuration for E-UTRA is given in A.3.7.2.1. Tables A.5.4.1.1.1-2 and A.5.4.1.1.1-2A define the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.5.4.1.1.1-3.

Table A.5.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test1 | | | Test2 | | Band Group |
| SSB ARFCN |  | 1,2 | Freq1 | | | Freq1 | |  |
| Duplex Mode |  | 1,2 | TDD | | | | |  |
| TDD configuration |  | 1,2 | | TDDConf.3.1 | | | |  |
| BWchannel | MHz | 1,2 | 100: NRB,c = 66 | | | | |  |
| Data RBs allocated |  | 1,2 | 66 | | | | |  |
| Initial BWP Configuration |  | 1,2 | DLBWP.0.1  ULBWP.0.1 | | | | |  |
| Dedicated BWP Configuration |  | 1,2 | DLBWP.1.1  ULBWP.1.1 | | | | |  |
| TRS Configuration |  | 1,2 | TRS.2.1 TDD | | | | |  |
| PDSCH/PDCCH TCI state |  | 1,2 | TCI.State.2 | | | | |  |
| DRx Cycle | ms | 1,2 | N/A | | | | DRX.8Note5 |  |
| PDSCH Reference measurement channel |  | 1,2 | SR.3.3 TDD | | | | |  |
| RMSI CORESET Reference Channel |  | 1,2 | CR.3.2 TDD | | | | |  |
| Dedicated CORESET Reference Channel |  | 1,2 | CCR.3.7 TDD | | | | |  |
| OCNG Patterns |  | 1,2 | OP.1 | | | | |  |
| SSB Configuration |  | 1,2 | SSB.4 FR2 | | | | |  |
| SMTC Configuration |  | 1,2 | SMTC.1 | | | | |  |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 | | | | |  |
| EPRE ratio of PSS to SSS | dB | 1,2 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Propagation condition |  | 1,2 | AWGN | | | | |  |
| SRS Config |  | 1,2 | SRSConf.1Note6 | | SRSConf.2Note6 | | |  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: DRx related parameters are given in Table A.3.3.8-1  Note 6: SRS configs are given in Table A.5.4.1.1.1-3 | | | | | | | | |

Table A.5.4.1.1.1-2A: OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 6 |  | Fine | |
| Note1 | dBm/15kHzNote4 | -112 | |
| Note1 | dBm/SCSNote3 | -100 | |
|  | dB | 4 | |
| SSB\_RPNote2 | dBm/SCS Note4 | -96 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | |

Table A.5.4.1.1.1-3: SRS Configuration for Timing Accuracy Test

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Field | SRSConf.1 | SRSConf.2 | Comments |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |  |
| srs-ResourceIdList | 0 | 0 |  |
| resourceType | Periodic | Periodic |  |
| Usage | Codebook | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 | 0 |  |
| nrofSRS-Ports | Port1 | Port1 |  |
| transmissionComb | n2 | n2 |  |
| combOffset-n2 | 0 | 0 |  |
| cyclicShift-n2 | 0 | 0 |  |
| resourceMapping  startPosition | 0 | 0 |  |
| resourceMapping  nrofSymbols | n1 | n1 |  |
| resourceMapping  repetitionFactor | n1 | n1 |  |
| freqDomainPosition | 0 | 0 |  |
| freqDomainShift | 0 | 0 |  |
| freqHopping  c-SRS | 17 | 17 | Matches NRB,c |
| freqHopping  b-SRS | 0 | 0 |  |
| freqHopping  b-hop | 0 | 0 |  |
| groupOrSequenceHopping | Neither | Neither |  |
| resourceType | Periodic | Periodic |  |
| periodicityAndOffset-p | sl1,0 | sl2560,4 | Offset to align with DRx periodicity |
| sequenceId | 0 | 0 | Any 10 bit number |

Table A.5.4.1.1.1-4: Void

##### A.5.4.1.1.2 Test requirements

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.2-1 and setup NR PSCell according to parameters given in Table A.5.4.1.1.1-1.

2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB.

a. The NTA offset value (in Tc units) is 13792

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1

3) The test system shall adjust the timing of the DL path by values given in Table A.5.4.1.1.2-1

Table A.5.4.1.1.2-1 Adjustment Value for DL Timing

|  |  |  |
| --- | --- | --- |
| **SCS of SSB signals (kHz)** | **Adjustment Value** | |
|  | Test1 | Test2 |
| 240 | +8\*64Tc | +4\*64Tc |

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within (NTA + NTA\_offset) ×Tc ± Te respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.

5) The test system shall verify that the UE transmit timing offset stays within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

### A.5.4.2 UE timer accuracy

### A.5.4.3 Timing advance

#### A.5.4.3.1 EN-DC FR2 timing advance adjustment accuracy

##### A.5.4.3.1.1 Test Purpose and Environment

The purpose of the test is to verify UE Timing Advance adjustment delay and accuracy requirement defined in clause 7.3.

##### A.5.4.3.1.2 Test Parameters

Supported test configurations are shown in table A.5.4.3.1.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.5.4.3.1.2-2, A.5.4.3.1.2-3, A.5.4.3.1.2-3A and A.5.4.3.1.2-4. The configuration of Cell 1 (LTE PCell) is specified in clause A.3.7.2.1.

In all test cases, two cells are used. Cell 1 is the PCell in the primary Timing Advance Group (pTAG) and cell 2 is the PSCell is in the secondary Timing Advance Group (sTAG). Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands for sTAG are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.5.4.3.1.2-3, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured for PSCell in sTAG.

During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element for sTAG, as specified in clause 6.1.3.4 in TS 38.321 [7]. The Timing Advance Command value shall be set to 31, which according to clause 4.2 in TS 38.213 [3] results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance for sTAG used by the UE is established.

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements for sTAG, with Timing Advance Command value specified in table A.5.4.3.1.2-2. This value shall result in changes of the timing advance for sTAG used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in clause 7.3.2.1, the UE adjusts its uplink timing at slot n+k for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

Table A.5.4.3.1.2-1: Timing advance supported test configurations

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

Table A.5.4.3.1.2-2: General test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF channel number |  | Cell 1: 1  Cell 2: 2 | 1 for E-UTRAN PCell  2 for NR PSCell |
| Initial DL BWP |  | DLBWP.0.1 | As specified in Table A.3.9.2.1-1 |
| Dedicated DL BWP |  | DLBWP.1.1 | As specified in Table A.3.9.2.2-1 |
| Initial UL BWP |  | ULBWP.0.1 | As specified in Table A.3.9.3.1-1 |
| Dedicated UL BWP |  | ULBWP.1.1 | As specified in Table A.3.9.3.2-1 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA\_new = NTA\_old* for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | *For 120 kHz SCS NTA\_new = NTA\_old + 1024\*Tc* (based on equation in clause 4.2 of TS 38.213 [3]) |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

Table A.5.4.3.1.2-3: Cell specific test parameters for timing advance

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test1 | |
| T1 | T2 |
| Duplex mode |  | TDD | |
| TDD configuration |  | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | |
| BWP BW | MHz | 100: NRB,c = 66 | |
| DRx Cycle | ms | Not Applicable | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | |
| Dedicated CORESET Reference Channel |  | CCR.3.1 TDD | |
| TRS configuration |  | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state |  | TCI.State.2 | |
| OCNG Patterns |  | OCNG pattern 1 | |
| SMTC configuration |  | SMTC.1 FR2 | |
| SSB configuration |  | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | kHz | 120 kHz | |
| EPRE ratio of PSS to SSS | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation condition | - | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.5.4.3.1.2-3A: OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | |
|  |  | T1 | T2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 6 |  | Fine | |
| Note1 | dBm/15kHzNote4 | -112 | |
| Note1 | dBm/SCSNote3 | -103 | |
|  | dB | 4 | |
| SS-RSRPNote2 | dBm/SCS Note4 | -99 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | |

Table A.5.4.3.1.2-4: Sounding Reference Symbol Configuration for timing advance

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| c-SRS | 16 | Frequency hopping is disabled |
| b-SRS | 0 |
| b-hop | 0 |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | sl5=4 | Once every 5 slots |
| pathlossReferenceRS | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | Codebook | Codebook based UL transmission |
| startPosition | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | n1 |
| repetitionFactor | n1 |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

##### A.5.4.3.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value for PSCell in sTAG to the transmission timing at the designated activation time i.e. *k+1* slots after the reception of the timing advance command, where *k* = 11.

The Timing Advance adjustment accuracy for PSCell in sTAG shall be within the limits specified in clause 7.3.2.2.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

## A.5.5 Signaling characteristics

### A.5.5.1 Radio link Monitoring

In the following clause, any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

*Editor note: The metric for the detection of the UE UL transmitted signal by the TE is FFS.*

#### A.5.5.1.1 Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in non-DRX mode

##### A.5.5.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.5.5.1.1.1-1. The test parameters are given in Tables A.5.5.1.1.1-2, A.5.5.1.1.1-3, and A. 5.5.1.1.1-4 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure A.5.5.1.1.1-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. 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 5 ms. In addition to RLM-RS radio link monitoring using SSB index 0 and SSB index 1, the UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

Table A.5.5.1.1.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Table A.5.5.1.1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
| Test 1 |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 2 |  | TDD |
| BWchannel | | Config 1, 2 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1, 2 |  | 24 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1, 2 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | CCR.3.4 TDD |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 120 KHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | Config 1, 2 |  | 0,1 |
| OCNG parameters | | |  | OP.5 |
| CP length | | |  | Normal |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | *gp0* |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 9.68 |
| T3 | | | s | 9.68 |
| D1 | | | s | 9.64 |
| 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.5.5.1.1.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | |  | Setup 3 defined in A.3.15 | | | | | |
| AoA1 | | | AoA2 | | |
| Assumption for UE beamsNote 5 | |  | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| 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 |
| ssb-Index 0 SNR | Config 1, 2 | dB | 2Note 6 | -6Note 6 | -15 |
| ssb-Index 1 SNR | Config 1, 2 |  | Not sent | | | 2Note 6 | -15 | -15 |
|  | Config 1, 2 | dBm/ 15kHz | -92.1 | | | -92.1 | | |
| Time multiplexing of the downlink transmissions from each AoA | |  | Defined in Figure A.5.5.1.1.1-2 | | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | TDL-A 30ns 75Hz | | |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: 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 A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | |

Table A.5.5.1.1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
| Value |
| gapOffset | 0 |
| Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap). | | |

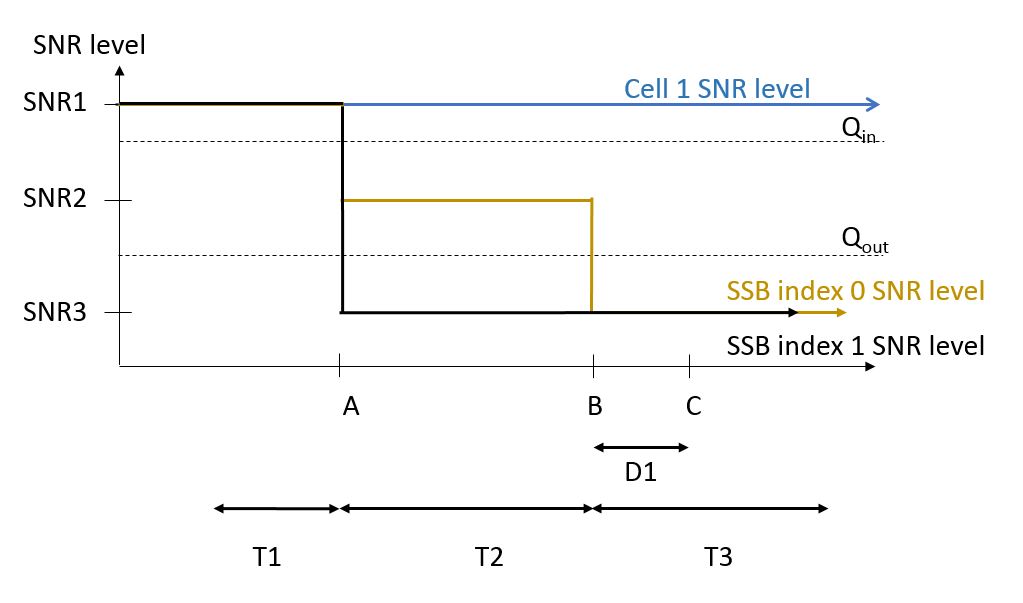


Figure A.5.5.1.1.1-1: SNR variation for out-of-sync testing



Figure A.5.5.1.1.1-2: Time multiplexed downlink transmissions

##### A.5.5.1.1.2 Test Requirements

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

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

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

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

#### A.5.5.1.2 Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in non-DRX mode

##### A.5.5.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.5.5.1.2.1-1. The test parameters are given in Tables A.5.5.1.2.1-2, and A.5.5.1.2.1-3 below. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states, and Figure A.5.5.1.2.1-2 shows the Time multiplexed downlink transmissions from each Angle of Arrival. 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 5ms.

Table A.5.5.1.2.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Table A.5.5.1.2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
| Test 1 |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 2 |  | TDD |
| BWchannel | | Config 1, 2 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1, 2 |  | 24 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1, 2 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | CCR.3.1 TDD |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 120 KHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | Config 1, 2 |  | 0,1 |
| OCNG parameters | | |  | OP.5 |
| CP length | | |  | Normal |
| In sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 1.88 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.84 |
| D1 | | | s | 3.8 |
| 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.5.5.1.2.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 3 defined in A.3.15 | | | | | | | | | |
| AoA1 | | | | | AoA2 | | | | |
| Assumption for UE beamsNote 5 | |  | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| 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 |
| ssb-Index 0 SNR | Config 1, 2 | dB | 2Note 6 | -6Note 6 | -15 | -4.5 | 2Note 6 |
| ssb-Index 1 SNR | Config 1, 2 |  | Not sent | | | | | 2Note 6 | -15 | -15 | -15 | -15 |
|  | Config 1, 2 | dBm/ 15kHz | -92.1 | | | | | -92.1 | | | | |
| Time multiplexing of the downlink transmissions from each AoA | |  | Defined in Figure A.5.5.1.2.1-2 | | | | | | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: 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 A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | | | | | |

Table A.5.5.1.2.1-4: Void

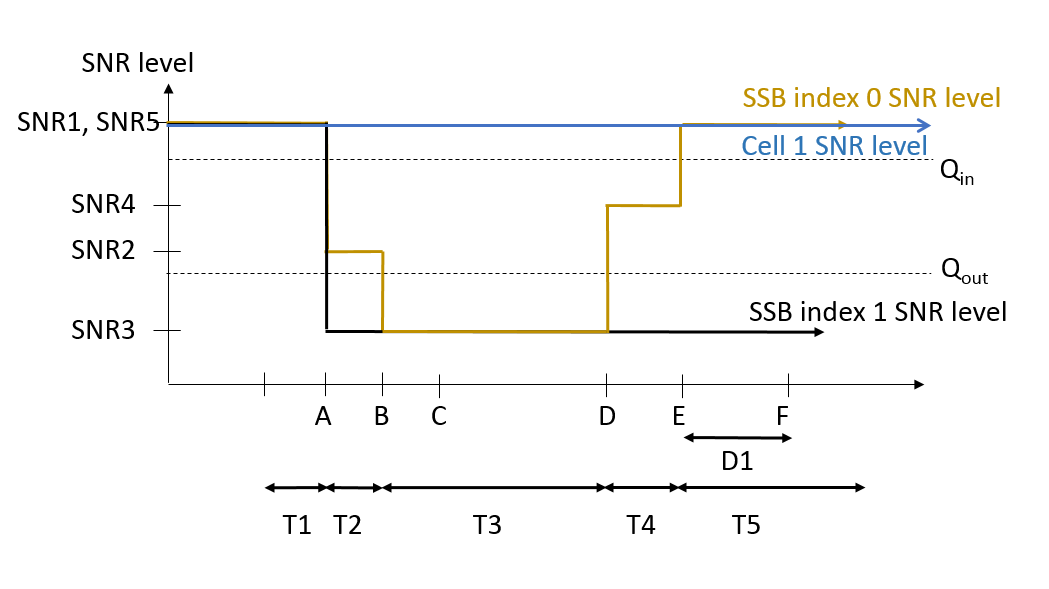


Figure A.5.5.1.2.1-1: SNR variation for in-sync testing



Figure A.5.5.1.2.1-2: Time multiplexed downlink transmissions

##### A.5.5.1.2.2 Test Requirements

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

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

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

#### A.5.5.1.3 Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with SSB-based RLM RS in DRX mode

##### A.5.5.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.5.5.1.3.1-1. The test parameters are given in Tables A.5.5.1.3.1-2, and A.5.5.1.3.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.3.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI 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.5.5.1.3.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Table A.5.5.1.3.1-2: General test parameters for FR2 out-of-sync testing in DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
| Test 1 |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 2 |  | TDD |
| BWchannel | | Config 1, 2 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1, 2 |  | 66 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1, 2 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | CCR.3.4 TDD |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 120 KHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | Config 1, 2 |  | 0,1 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 14.48 |
| T3 | | | s | 14.48 |
| D1 | | | s | 14.44 |
| 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.5.5.1.3.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for out-of-sync radio link monitoring tests in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
| T1 | T2 | T3 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | |
| Assumption for UE beamsNote 5 | |  | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| 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 |
| ssb-Index 0 SNR | Config 1, 2 | dB | 2Note 6 | -6Note 6 | -15 |
| ssb-Index 1 SNR | Config 1, 2 | 2Note 6 | -15 | -15 |
|  | Config 1, 2 | dBm/15KHz | -104.7dBm | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: 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 A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | |

Table A.5.5.1.3.1-4: Void

Table A.5.5.1.3.1-5: Void

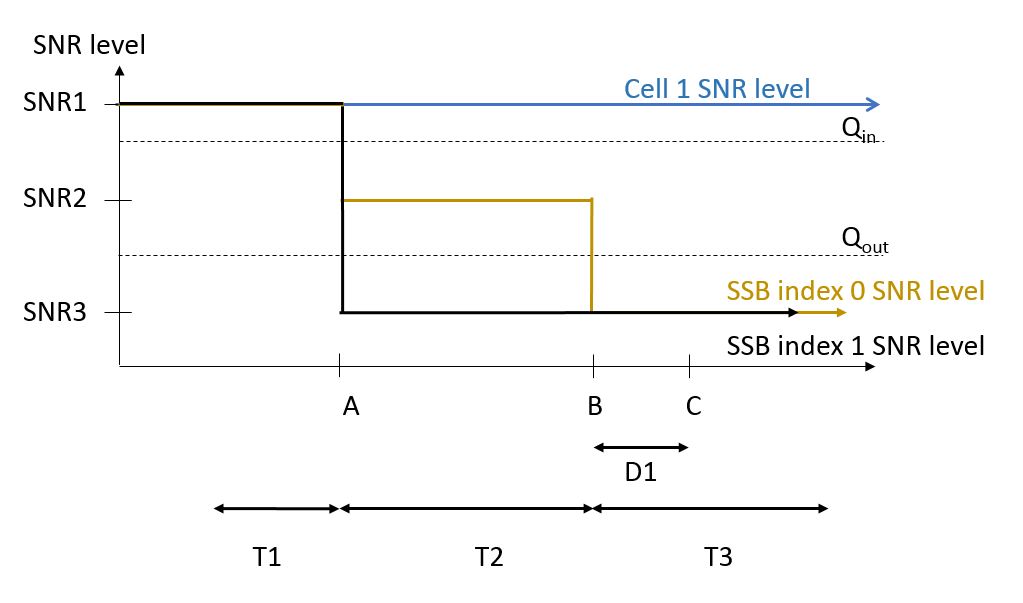


Figure A.5.5.1.3.1-1: SNR variation for out-of-sync testing

##### A.5.5.1.3.2 Test Requirements

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

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

The UE shall stop transmitting uplink signal in Cell 2 no later than time point C (D1 second after the start of the time duration T3).

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

#### A.5.5.1.4 Radio Link Monitoring In-sync Test for FR2 PSCell configured with SSB-based RLM RS in DRX mode

##### A.5.5.1.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0 and SSB#1, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.5.5.1.4.1-1. The test parameters are given in Tables A.5.5.1.4.1-2, and A.5.5.1.4.1-3. There are two cells, Cell 1 is the E-UTRAN PCell, and Cell 2 is the PSCell, in the test. The E-UTRAN PCell setting refers to Table A.3.7.2.1-2. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.4.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1 and Cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI 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.5.5.1.4.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, NR 120 KHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Table A.5.5.1.4.1-2: General test parameters for FR2 in-sync testing in DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
| Test 1 |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex mode | | Config 1, 2 |  | TDD |
| BWchannel | | Config 1, 2 |  | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1, 2 |  | 66 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| TDD Configuration | | Config 1, 2 |  | TDDConf.3.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | CCR.3.1 TDD |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.3 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 120 KHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | Config 1, 2 |  | 0,1 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| In sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX Configuration | | |  | DRX.11 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 4000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | | Config 1, 2 |  | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| TCI states for PDCCH/PDSCH | | |  | TCI.State.2 |
| CSI-RS for tracking | | Config 1, 2 |  | TRS.2.1 TDD |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 2.8 |
| T4 | | | s | 0.2 |
| T5 | | | s | 3.88 |
| D1 | | | s | 3.84 |
| 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.5.5.1.4.1-3: OTA related cell specific test parameters for FR2 (Cell 2) for in-sync radio link monitoring test in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beamsNote 5 | |  | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| 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 |
| ssb-Index 0 SNR | Config 1, 2 | dB | 2Note 6 | -6Note 6 | -15 | -4.5 | 2Note 6 |
| ssb-Index 1 SNR | Config 1, 2 | 2Note 6 | -15 | -15 | -15 | -15 |
|  | Config 1, 2 | dBm/15KHz | -104.7dBm | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: 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 A.3.6.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 6: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

Table A.5.5.1.4.1-4: Void

Table A.5.5.1.4.1-5: Void

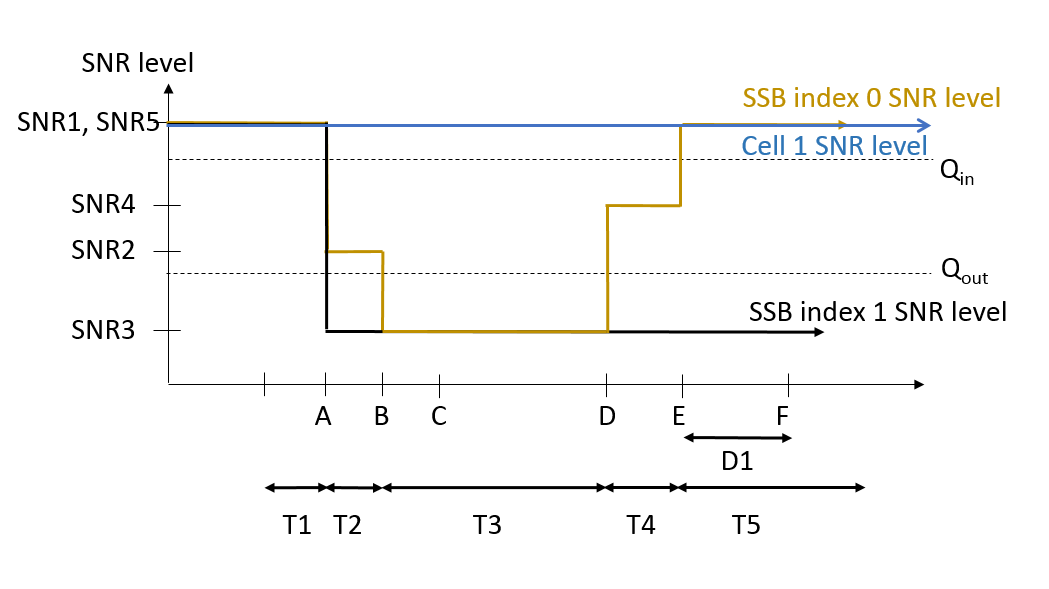


Figure A.5.5.1.4.1-1: SNR variation for in-sync testing.

##### A.5.5.1.4.2 Test Requirements

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

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

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

#### A.5.5.1.5 EN-DC Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode

A.5.5.1.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.5.1-1, A.5.5.1.5.1-2, A.5.5.1.5.1-3 and A.5.5.1.5.1-3A below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.5.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 and SSB1 are configured as BFD-RS.

**Table A.5.5.1.5.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

**Table A.5.5.1.5.1-2: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in non-DRX mode**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | |  | Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| Active PSCell | |  | Cell 2 |
| RF Channel Number | |  | 2 |
| Duplex Mode | |  | TDD |
| BWchannel | Config 1, 2 |  | 100: NRB,c = 66 |
| Data RBs allocated | Config 1, 2 |  | 24 |
| BWoccupied | Config 1, 2 |  | 24 |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| Config 2 | TDDConf.3.1 |
| DL initial BWP configuration | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 |  | DLBWP.1.4 |
| UL initial BWP configuration | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 |  | ULBWP.1.4 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD |
|  | Config 2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.3.4 TDD  CCR.3.6 TDD |
| Config 2 | CCR.3.4 TDD  CCR.3.6 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| Config 2 | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.1 |
| Config 2 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 KHz |
| Config 2 | 120 KHz |
| CSI-RS for RLM | Config 1, 2 |  | Resource #4 in TRS.2.1 TDD  Resource #4 in TRS.2.2 TDD |
| TRS configuration | |  | TRS.2.1 TDD  TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | |  | TCI.State.2 |
| TCI configuration for PDCCH#2 | |  | TCI.State.3 |
| OCNG parameters | |  | OP.5 |
| CP length | |  | Normal |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | *OFF* |
| Gap pattern ID | |  | *gp0* |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | *0* |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for CSI reporting | Config 1 |  | CSI-RS.3.1 TDD |
| Config 2 | CSI-RS.3.1 TDD |
| reportConfigType | |  | periodic |
| reportQuantity | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.35 |
| T3 | | s | 0.35 |
| D1 | | s | 0.31 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test. | | | |

Table A.5.5.1.5.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in non-DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| AoA setup | |  | Setup 3 defined in A.3.15 | | | | | |
| AoA1 | | | AoA2 | | |
| Assumption for UE beamsNote 10 | |  | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| 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 on RLM-RS1 | Config 1, 2 | dB | 2Note 11 | -6Note 11 | -15 |
| SNR on RLM-RS2 | Config 1, 2 |  | Not sent | | | 2Note 11 | -14 | -15 |
|  | Config 1, 2 | dBm/ 15kHz | -92.1 | | | -92.1 | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | TDL-A 30ns 75Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.1.5.1-1.  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 A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | |

**Table A.5.5.1.5.1-3A: Measurement gap configuration for FR2 CSI-RS out-of-sync radio link monitoring in non-DRX mode**

|  |  |
| --- | --- |
| **Field** | **Test 1** |
| **Value** |
| gapOffset | 0 |
| Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap) | |

**Table A.5.5.1.5.1-4: Void**

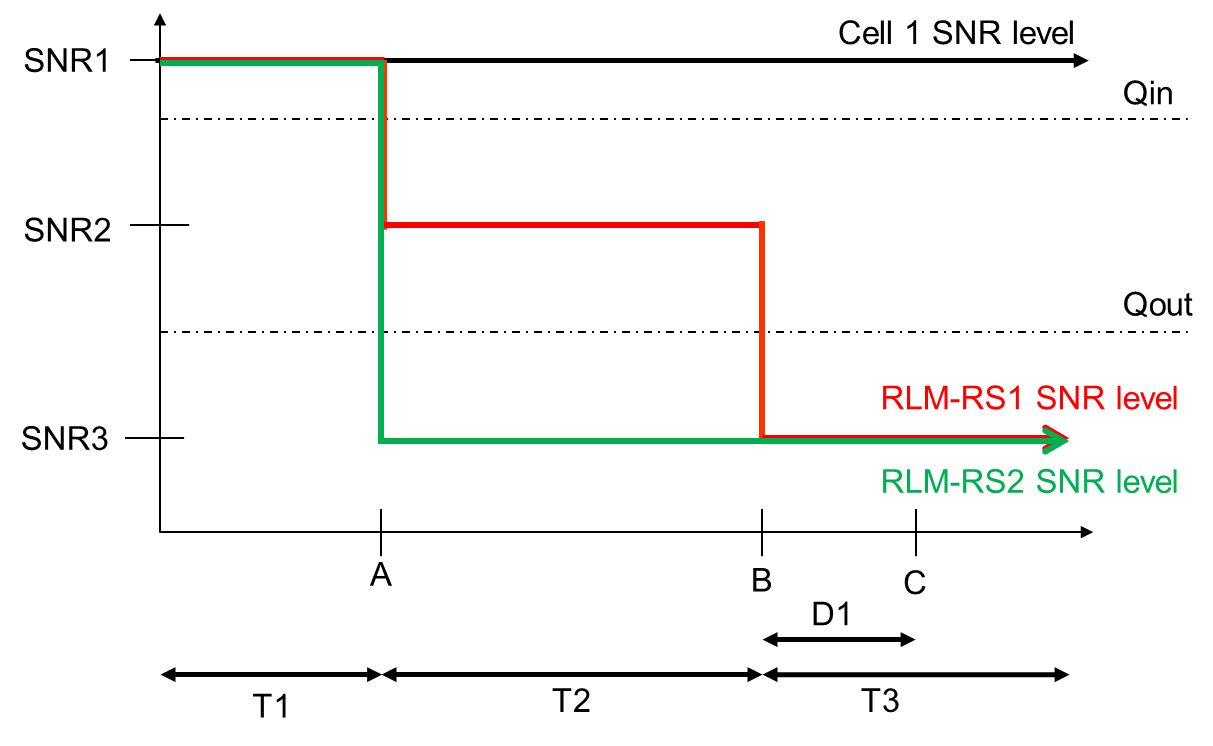


Figure A.5.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing

A.5.5.1.5.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C (D1 after the start of the time duration T3) on the PSCell.

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

#### A.5.5.1.6 EN-DC Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in non-DRX mode

##### A.5.5.1.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when no DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.6.1-1, A.5.5.1.6.1-2, and A.5.5.1.6.1-3 below. There are two cells, cell 1which is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.6.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. In the test, SSB0 and SSB1 are configured as BFD-RS.

Table A.5.5.1.6.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Table A.5.5.1.6.1-2: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode

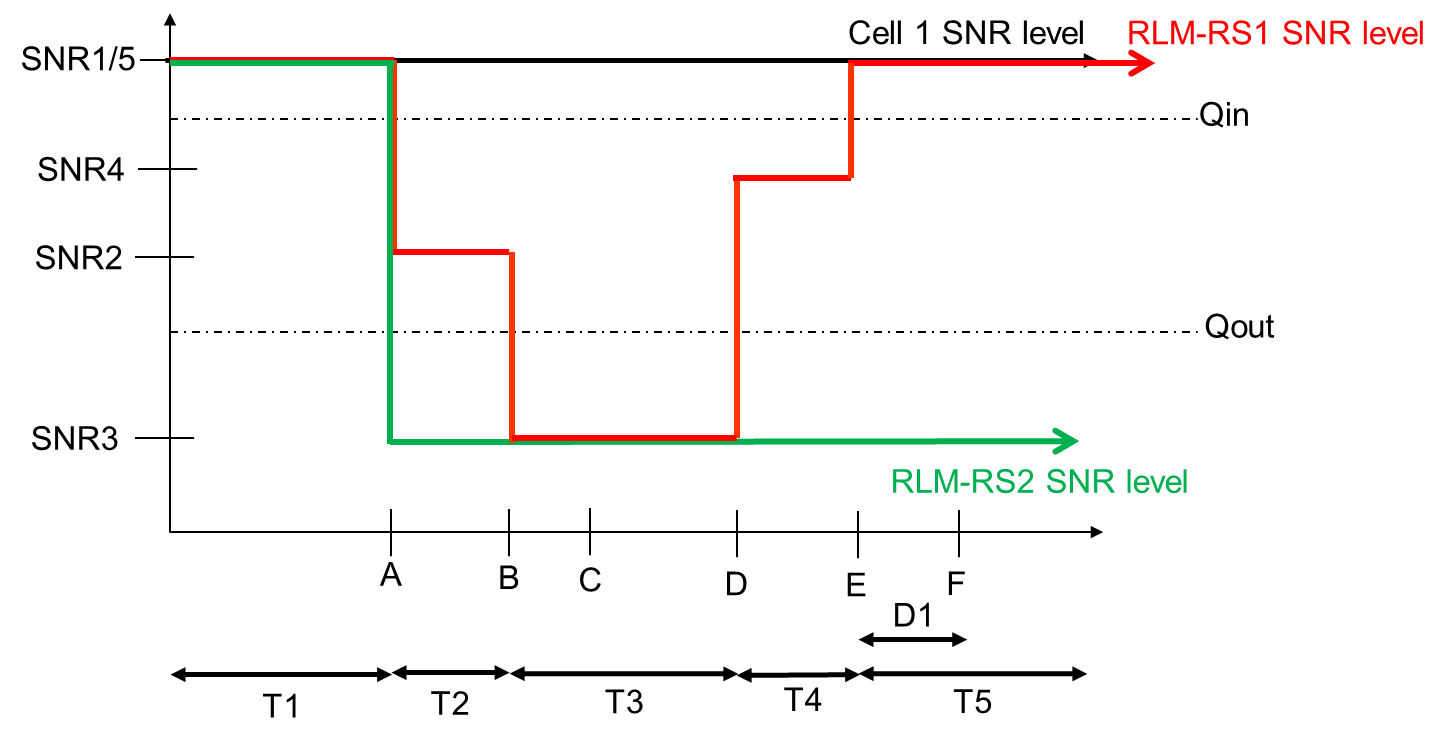
|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | |  | Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| Active PSCell | |  | Cell 2 |
| RF Channel Number | |  | 2 |
| Duplex Mode | |  | TDD |
| BWchannel | Config 1, 2 |  | 100: NRB,c = 66 |
| Data RBs allocated | Config 1, 2 |  | 24 |
| BWoccupied | Config 1, 2 |  | 24 |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| Config 2 | TDDConf.3.1 |
| DL initial BWP configuration | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 |  | DLBWP.1.4 |
| UL initial BWP configuration | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 |  | ULBWP.1.4 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD |
|  | Config 2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.3.1 TDD  CCR.3.3 TDD |
| Config 2 | CCR.3.1 TDD  CCR.3.3 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| Config 2 | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.1 |
| Config 2 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 KHz |
| Config 2 | 120 KHz |
| CSI-RS for RLM | Config 1, 2 |  | Resource #4 in TRS.2.1 TDD  Resource #4 in TRS.2.2 TDD |
| OCNG parameters | |  | OP.5 |
| TRS configuration | |  | TRS.2.1 TDD  TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | |  | TCI.State.2 |
| TCI configuration for PDCCH#2 | |  | TCI.State.3 |
| CP length | |  | Normal |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| In sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | *OFF* |
| Gap pattern ID | |  | N.A. |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | 1000 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for CSI reporting | Config 1 |  | CSI-RS.3.1 TDD |
| Config 2 | CSI-RS.3.1 TDD |
| reportConfigType | |  | periodic |
| reportQuantity | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 0.24 |
| T4 | | s | 0.2 |
| T5 | | s | 0.88 |
| D1 | | s | 0.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test. | | | |

Table A.5.5.1.6.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in non-DRX mode

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | | | | | | |
| T1 | T2 | T3 | T4 | T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 3 defined in A.3.15 | | | | | | | | | |
| AoA1 | | | | | AoA2 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| 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 on RLM-RS1 | Config 1, 2 | dB | 2Note 11 | -6Note 11 | -15 | -4.5 | 2Note 11 |
| SNR on RLM-RS2 | Config 1, 2 |  | Not sent | | | | | 2Note 11 | -14 | -15 | -15 | -14 |
|  | Config 1, 2 | dBm/ 15KHz | -92.1 | | | | | -92.1 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.5.5.1.6.1-1.  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 A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | | | | | | |

**Table A.5.5.1.6.1-3A: Void**

**Table A.5.5.1.6.1-4: Void**

****

**Figure A.5.5.1.6.1-1: SNR variation for CSI-RS in-sync testing**

##### A.5.5.1.6.2 Test Requirements

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

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

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

#### A.5.5.1.7 EN-DC Radio Link Monitoring Out-of-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode

##### A.5.5.1.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS Out-of-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.7.1-1, A.5.5.1.7.1-2, and A.5.5.1.7.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.5.5.1.7.1-1 shows the variation of the downlink SNR in the E-UTRAN PCell and the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. 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. In the test, SSB0 and SSB1 are configured as BFD-RS and are not same as RLM-RS to avoid triggering the beam failure during the RLM test.

Table A.5.5.1.7.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Table A.5.5.1.7.1-2: General test parameters for FR2 PSCell for CSI-RS out-of-sync testing in DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | | |  | Cell 1 |
| E-UTRA RF Channel Number | | |  | 1 |
| Active PSCell | | |  | Cell 2 |
| RF Channel Number | | |  | 2 |
| Duplex Mode | | |  | TDD |
| TDD Configuration | | Config 1 |  | TDDConf.3.1 |
| Config 2 | TDDConf.3.1 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1 |  | CR. 3.1 TDD |
|  | | Config 2 |  | CR. 3.1 TDD |
| Dedicated CORESET Reference Channel | | Config 1 |  | CCR. 3.4 TDD  CCR.3.6 TDD |
| Config 2 | CCR. 3.4 TDD  CCR.3.6 TDD |
| SSB Configuration | | Config 1 |  | SSB.1 FR2 |
| Config 2 | SSB.1 FR2 |
| SMTC Configuration | | Config 1 |  | SMTC.1 |
| Config 2 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1 |  | 120 KHz |
| Config 2 | 120 KHz |
| CSI-RS for RLM | | Config 1, 2 |  | Resource #4 in TRS.2.1 TDD  Resource #4 in TRS.2.2 TDD |
| SSB index for BFD-RS | | Config 1, 2 |  | 0, 1 |
| TRS configuration | | |  | TRS.2.1 TDD  TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | |  | TCI.State.2 |
| TCI configuration for PDCCH#2 | | |  | TCI.State.3 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
| Number of Control OFDM symbols | |  | 2 |
| Aggregation level | | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 4 |
| DMRS precoder granularity | |  | REG bundle size |
| REG bundle size | |  | 6 |
| DRX | | |  | DRX.3 |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS for CSI reporting | Config 1 | |  | CSI-RS.3.1 TDD |
| Config 2 | | CSI-RS.3.1 TDD |
| reportConfigType | | |  | periodic |
| reportQuantity | | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | | slot | 40 |
| CSI reporting offset | | | slot | 4 |
| T1 | | | s | 0.2 |
| T2 | | | s | 1.28 |
| T3 | | | s | 1.28 |
| D1 | | | s | 1.24 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test. | | | | |

Table A.5.5.1.7.1-3: Cell specific test parameters for FR2 for CSI-RS out-of-sync radio link monitoring in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test 1** | | |
| **T1** | **T2** | **T3** |
| AoA setup | |  | Setup 1 defined in A.3.15 | | |
| Assumption for UE beamsNote 10 | |  | Rough | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| 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 on RLM-RS1 | Config 1, 2 | dB | 2Note 11 | -6Note 11 | -15 |
| SNR on RLM-RS2 | Config 1, 2 | 2Note 11 | -14 | -15 |
|  | Config 1 | dBm/15KHz | -104.7 | | |
| Config 2 | -104.7 | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.1.7.1-1.  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 A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | |

**Table A.5.5.1.7.1-3A: Void**

**Table A.5.5.1.7.1-4: Void**

**Table A.5.5.1.7.1-5: Void**

**Table A.5.5.1.7.1-6: Void**

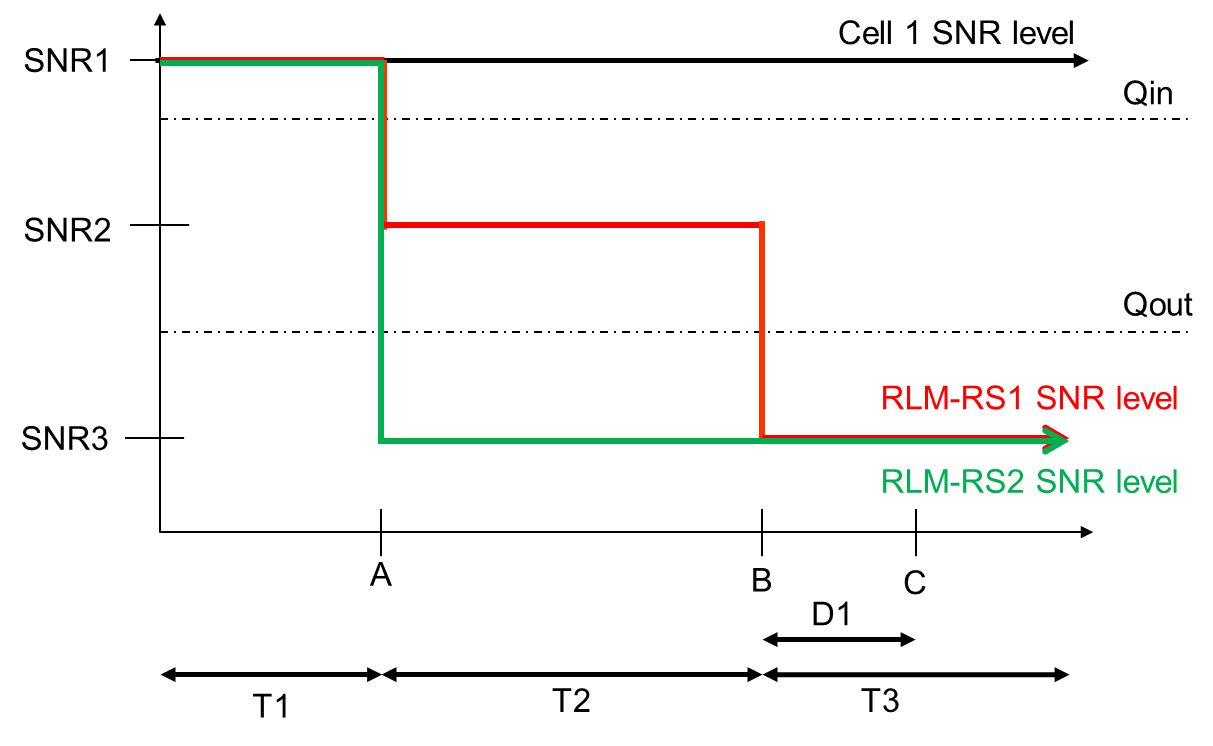


Figure A.5.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing

##### A.5.5.1.7.2 Test Requirements

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

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 2 (PSCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 2.

The UE shall stop transmitting uplink signal in Cell 2 (PSCell) no later than time point C (D1 after the start of the time duration T3) on the PSCell.

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

#### A.5.5.1.8 EN-DC Radio Link Monitoring In-sync Test for FR2 PSCell configured with CSI-RS-based RLM in DRX mode

##### A.5.5.1.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PSCell when DRX is used. This test will partly verify the FR2 TDD PSCell CSI-RS In-sync radio link monitoring requirements in clause 8.1.

The test parameters are given in Tables A.5.5.1.8.1-1, A.5.5.1.8.1-2, A.5.5.1.8.1-3 and A.5.5.1.8.1-3A below. There are two cells, cell 1which is the E-UTRAN PCell, and cell 2 is the NR PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.1.8.1-1 shows the variation of the downlink SNR in the PSCell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms). In the test, SSB0 and SSB1 are configured as BFD-RS and are not same with RLM-RS to avoid triggering the beam failure during the RLM test.

Table A.5.5.1.8.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

Table A.5.5.1.8.1-2: General test parameters for FR2 PSCell for CSI-RS in-sync testing in non-DRX mode

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** |
| **Test 1** |
| Active E-UTRA PCell | |  | Cell 1 |
| E-UTRA RF Channel Number | |  | 1 |
| Active PSCell | |  | Cell 2 |
| RF Channel Number | |  | 2 |
| Duplex Mode | |  | TDD |
| TDD Configuration | Config 1 |  | TDDConf.3.1 |
| Config 2 | TDDConf.3.1 |
| DL initial BWP configuration | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD |
|  | Config 2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.3.1 TDD  CCR.3.3 TDD |
| Config 2 | CCR.3.1 TDD  CCR.3.3 TDD |
| SSB Configuration | Config 1 |  | SSB.1 FR2 |
| Config 2 | SSB.1 FR2 |
| SMTC Configuration | Config 1 |  | SMTC.1 |
| Config 2 | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1 |  | 120 KHz |
| Config 2 | 120 KHz |
| CSI-RS for RLM | Config 1, 2 |  | Resource #4 in TRS.2.1 TDD  Resource #4 in TRS.2.2 TDD |
| SSB index for BFD-RS | Config 1, 2 |  | 0, 1 |
| TRS configuration | |  | TRS.2.1 TDD  TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | |  | TCI.State.2 |
| TCI configuration for PDCCH#2 | |  | TCI.State.3 |
| OCNG parameters | |  | OP.1 |
| CP length | |  | Normal |
| Out of sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 8 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 4 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 4 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| In sync transmission parameters | DCI format |  | 1-0 |
| Number of Control OFDM symbols |  | 2 |
| Aggregation level | CCE | 4 |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | dB | 0 |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | dB | 0 |
| DMRS precoder granularity |  | REG bundle size |
| REG bundle size |  | 6 |
| DRX | |  | DRX.3 |
| Gap pattern ID | |  | *gp0* |
| Layer 3 filtering | |  | *Enabled* |
| T310 timer | | ms | 2000 |
| T311 timer | | ms | 1000 |
| N310 | |  | 1 |
| N311 | |  | 1 |
| CSI-RS for CSI reporting | Config 1 |  | CSI-RS.3.1 TDD |
| Config 2 | CSI-RS.3.1 TDD |
| reportConfigType | |  | periodic |
| reportQuantity | |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | | slot | 40 |
| CSI reporting offset | | slot | 4 |
| T1 | | s | 0.2 |
| T2 | | s | 0.2 |
| T3 | | s | 1.64 |
| T4 | | s | 0.2 |
| T5 | | s | 1.88 |
| D1 | | s | 1.84 |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts.  Note 2: E-UTRAN is in non-DRX mode under test. | | | |

Table A.5.5.1.8.1-3: Cell specific test parameters for FR2 for CSI-RS in-sync radio link monitoring in DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
| T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | | | | |
| 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 | 0 | | | | |
| 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 on RLM-RS1 | Config 1, 2 | dB | 2Note 11 | -6Note 11 | -15 | -4.5 | 2Note 11 |
| SNR on RLM-RS2 | Config 1, 2 | dB | 2Note 11 | -14 | -15 | -15 | -14 |
|  | Config 1, 2 | dBm/15KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 2 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in figure A.5.5.1.8.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is A.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

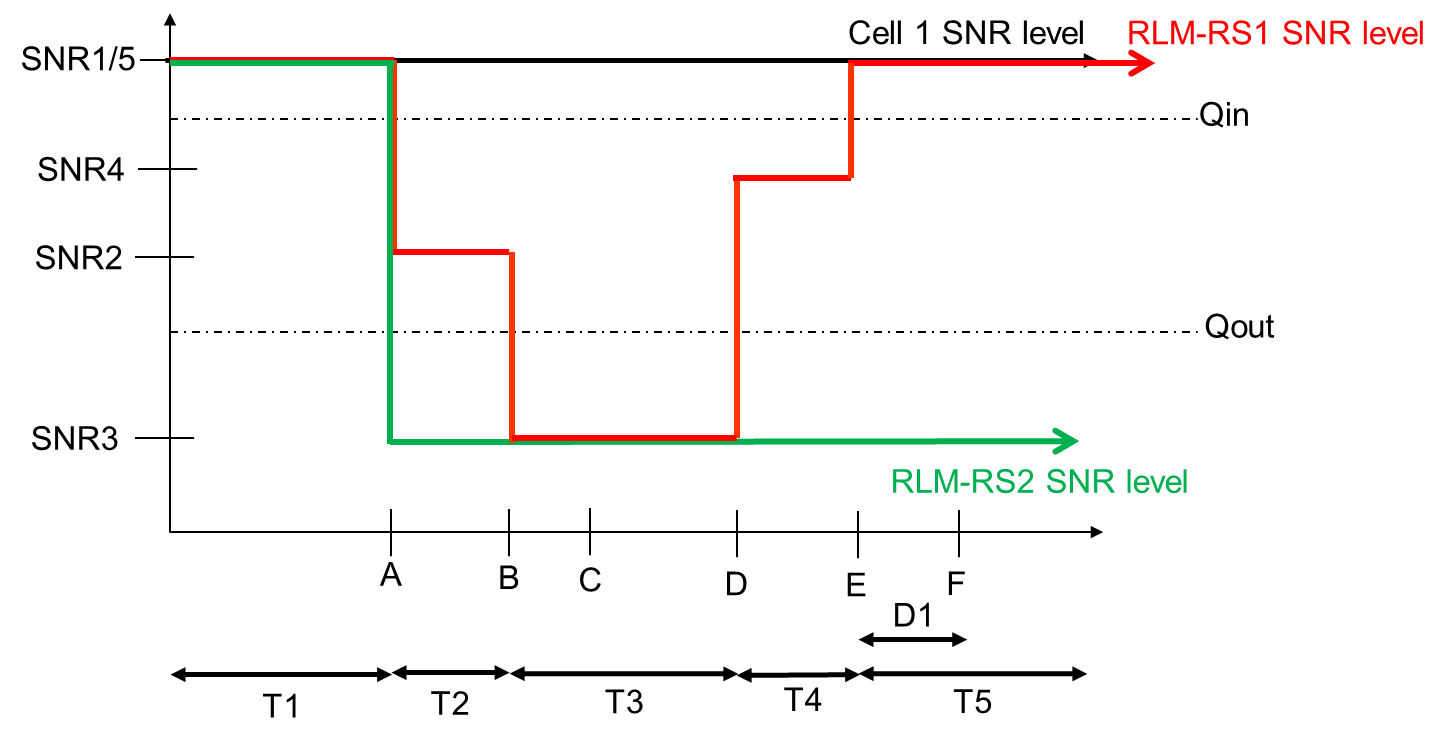
Table A.5.5.1.8.1-3A: Measurement gap configuration for FR2 CSI-RS in-sync radio link monitoring in DRX mode

|  |  |
| --- | --- |
| **Field** | **Test 1** |
| **Value** |
| gapOffset | 0 |
| Note 1: E-UTRAN PCell and PSCell are SFN-synchronous and frame boundary aligned. (Ensure that RLM RS is partially overlapped with measurement gap) | |

**Table A.5.5.1.8.1-4: Void**

**Table A.5.5.1.8.1-5: Void**

**Table A.5.5.1.8.1-6: Void**

****

**Figure A.5.5.1.8.1-1: SNR variation for CSI-RS in-sync testing**

##### A.5.5.1.8.2 Test Requirements

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

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PSCell.

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

#### A.5.5.1.9 EN-DC Radio Link Monitoring UE Scheduling Restrictions on FR2

##### A.5.5.1.9.1 Test Purpose and Environment

The purpose is to verify that the NR UE correctly follows the RLM scheduling restrictions requirements defined in clause 8.1.7. This test verifies that the UE correctly receive the PDCCH scheduled on the symbols right before the RLM SSB symbols without overlap so that it sends ACK/NACK correctly. The test case is only applicable to UE which supports pdcch-MonitoringAnyOccasions or pdcch-MonitoringAnyOccasionsWithSpanGap.

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and NR FR2 PSCell (Cell 2). The test parameters for NR PSCell are given in table A.5.5.1.9.1-1, table A.5.5.1.9.1-2 and table A.5.5.1.9.1-3 below and the parameters and applicability for the E-UTRAN cell are defined in A.3.7.2. The UE is required during time period T1 to transmit ACK/NACK correctly upon scheduling of PDSCH.

Table A.5.5.1.9.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE, 120 kHz SSB SCS, 120 kHz RMC SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

Table A.5.5.1.9.1-2: General test parameters for RLM scheduling restriction test case in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2 | 1 and 2 | 1 for NR PSCell and 2 for LTE PCell |
| SSB configuration |  | 1, 2 | SSB.1 FR2 |  |
| SMTC configuration |  | 1, 2 | SMTC pattern 1 |  |
| DRX cycle length | s | 1, 2 | OFF |  |
| T1 | s | 1, 2 | 5 | During T1 the UE is required to correctly transmit ACK/NACK |

Table A.5.5.1.9.1-3: Cell specific test parameters for RLM scheduling restriction test case in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 2** | |
| AoA setup |  | 1, 2 | Setup 3 defined in A.3.15.3 | |
| **AoA1** | **AoA2** |
| Assumption for UE beamsNote 1 |  |  | Rough | Rough |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1, 2 | 24 | |
| PDSCH Reference measurement channel |  | 1, 2 | SR.3.2 TDD | Not sent |
| RMSI CORESET RMC configuration |  | 1, 2 | CR.3.1 TDD | Not sent |
| Dedicated CORESET RMC configuration |  | 1, 2 | CCR.3.2 TDD | Not sent |
| TRS configuration |  | 1, 2 | TRS.2.1 TDD | TRS.2.2 TDD |
| PDCCH/PDSCH TCI state |  | 1, 2 | TCI.State.2 | Not sent |
| OCNG Pattern |  | 1, 2 | OP.5 defined in A.3.2.1 | Not sent |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | |
| RLM-RS |  | 1, 2 | SSB with index 0 | SSB with index 1 |
|  | dBm/15kHz | 1, 2 | -92.1 | -92.1 |
| Note2 | dBm/SCS | 1, 2 | -83.1 | -83.1 |
|  | dB | 1, 2 | 2 | 2 |
| BB Note 4 | dB | 1, 2 | 1 | 1 |
| SSB\_RP Note3 | dBm/SCS | 1, 2 | -81.1 | -81.1 |
| Io | dBm/95.04 MHz | 1, 2 | -54.35 | -54.35 |
| Time multiplexing of the downlink transmissions from each AoA | | 1, 2 | Defined in Figure A.5.5.1.9.1-1 | |
| Propagation Condition |  | 1, 2 | AWGN | AWGN |
| Note 1: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  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: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | |



Figure A.5.5.1.9.1-1: Time multiplexed downlink transmissions

##### A.5.5.1.9.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.1.7.3.

### A.5.5.2 Interruption

#### A.5.5.2.1 E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

##### A.5.5.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that when E-UTRA PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.1.1-1.

The general test parameters are given in Table A.5.5.2.1.1-2, and NR cell specific test parameters are given in Table A.5.5.2.1.1-3 and A.5.5.2.1.1-4. The E-UTRAN PCell DRX configuration parameters are given in Table A.5.5.2.1.1-5 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell on and Cell2 is NR FR2 PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

Table A.5.5.2.1.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

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

Table A.5.5.2.1.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to cell1 and cell 2 |
| DRX |  | DRX.4 | DRX related parameters are defined in Table A.3.3.4-1 |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 6.25 |  |

Table A.5.5.2.1.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 |
| Frequency Range | |  | FR2 |
| Duplex mode | Config 1,2 |  | TDD |
| TDD configuration | Config 1,2 |  | TDDConf.3.1 |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | Config 1,2 |  | 66 |
| Downlink initial BWP Configuration | Config 1,2 |  | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 |  | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 |  | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 |  | ULBWP.1.1 |
| TRS configuration | Config 1,2 |  | TRS.2.1 TDD |
| TCI state | Config 1,2 |  | TCI.State.0 |
| PDSCH Reference measurement channel | Config 1,2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD |
| RMC CORESET Reference Channel | Config 1,2 |  | CCR.3.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | |  | SSB.3 FR2 |
| SMTC Configuration | Config 1,2 |  | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Ês/Noc | | dB | 17 |
| Propagation Condition | |  | AWGN |
| Time offset to cell1 Note 2 | | μs | 3 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

Table A.5.5.2.1.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in synchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beamsNote 6 |  | Fine |
| Note1 | dBm/15kHzNote4 | -112 |
| Note1 | dBm/SCSNote3 | -102.97 |
|  | dB | 17 |
| SSB\_RPNote2 | dBm/SCS Note4 | -85.97 |
|  | dB | 17 |
| IoNote2 | dBm/95.04 MHz Note4 | -56.90 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | |

Table A.5.5.2.1.1-5: Void

##### A.5.5.2.1.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in clause 8. 2.1.

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

#### A.5.5.2.2 E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

##### A.5.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when LTE PCell is in DRX and NR PSCell is in non-DRX, NR PSCell interruptions due to transitions from active to non-active and from non-active to active during LTE PCell DRX the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.2.1-1.

The general test parameters are given in Table A.5.5.2.2.1-2, and NR cell specific test parameters are given in Table A.5.5.2.2.1-3 and A.5.5.2.2.1-4. The E-UTRAN PCell DRX configuration parameters are given in Table A.5.5.2.2.1-5 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1. In the test there are two cells: Cell1 and Cell2. Cell1 is LTE PCell and Cell2 is NR PSCell. The test consists of one time period, with duration of T1. During T1, NR PSCell is continuously scheduled in DL while LTE PCell is not scheduled and has DRX configured. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. Prior to start of T1 the DRX inactivity timer for the LTE PCell has already expired. During T1 the UE shall be continuously scheduled on NR PSCell while not scheduled on LTE PCell. PDCCH indicating a new transmission on PSCell shall be sent continuously during the entire time duration to ensure UE would not enter DRX state on PSCell.

Table A.5.5.2.2.1-1: Interruption at transitions between active and non-active during DRX supported test configurations

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

Table A.5.5.2.2.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to cell1 and cell 2 |
| DRX |  | DRX.6 | DRX related parameters are defined in Table A.3.3.6-1 |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 6.25 |  |

Table A.5.5.2.2.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 |
| Frequency Range | |  | FR2 |
| Duplex mode | Config 1,2 |  | TDD |
| TDD configuration | Config 1,2 |  | TDDConf.3.1 |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | Config 1,2 |  | 66 |
| Downlink initial BWP Configuration | Config 1,2 |  | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 |  | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 |  | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 |  | ULBWP.1.1 |
| TRS configuration | Config 1,2 |  | TRS.2.1 TDD |
| TCI state | Config 1,2 |  | TCI.State.0 |
| PDSCH Reference measurement channel | Config 1,2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD |
| RMC CORESET Reference Channel | Config 1,2 |  | CCR.3.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | |  | SSB.3 FR2 |
| SMTC Configuration | Config 1,2 |  | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Ês/Noc | | dB | 17 |
| Propagation Condition | |  | AWGN |
| Time offset to cell1 Note 2 | | μs | 62.5 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

Table A.5.5.2.2.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beamsNote 6 |  | Fine |
| Note1 | dBm/15kHzNote4 | -112 |
| Note1 | dBm/SCSNote3 | -102.97 |
|  | dB | 17 |
| SSB\_RPNote2 | dBm/SCS Note4 | -85.97 |
|  | dB | 17 |
| IoNote2 | dBm/95.04 MHz Note4 | -56.90 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | |

Table A.5.5.2.2.1-5: Void

##### A.5.5.2.2.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell during the entire length of T1. UE shall not be scheduled in LTE PCell during T1. During the time duration T1 the UE shall transmit at least 99% of ACK/NACK on NR PSCell.

Interruption on NR PSCell shall not exceed 0.625ms (5 slots) as defined in clause 8. 2.1.

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

#### A.5.5.2.3 E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

##### A.5.5.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that for NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.3.1-1.

The general test parameters are given in Table A.5.5.2.3.1-2, and NR cell specific test parameters are given in Table A.5.5.2.3.1-3 and A.5.5.2.3.1-4 below. The E-UTRAN cell specific test parameters can be found in Table A.3.7.2.1-2. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 are NR FR2 PSCell and NR FR2 deactivated SCell, respectively. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.3.1-1: Interruption during measurements on deactivated NR SCC supported test configurations

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

Table A.5.5.2.3.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on NR RF channel number 3. |
| CP length |  | Normal | Applicable to cell1, cell 2 and cell3 |
| AoA number |  | 1 | Applicable to cell2 and cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |

Table A.5.5.2.3.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | Cell 3 |
| Frequency Range | |  | FR2 | FR2 |
| Duplex mode | Config 1,2 |  | TDD | TDD |
| TDD configuration | Config 1,2 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Data RBs allocated | Config 1,2 |  | 66 | 66 |
| Downlink initial BWP Configuration | Config 1,2 |  | DLBWP.0.1 | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 |  | DLBWP.1.1 | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 |  | ULBWP.0.1 | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 |  | ULBWP.1.1 | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,2 |  | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 |  | CCR 3.1 TDD | CCR 3.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 |
| SSB Configuration | Config 1,2 |  | SSB.1 FR2 | SSB.1 FR2 |
| SMTC Configuration | Config 1,2 |  | SMTC.1 | SMTC.1 |
| TRS configuration | Config 1,2 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| TCI state | Config 1,2 |  | TCI.State.0 | TCI.State.0 |
| EPRE ratio of PSS to SSS | | 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 | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Propagation Condition | |  | AWGN | AWGN |
| Time offset to cell1 Note 2 | | μs | 3 | 3+ Time offset to cell2 |
| Time offset to cell2 Note 3 | | μs | - | 3 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells  Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells | | | | |

Table A.5.5.2.3.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in synchronous EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** | **Cell 3** |
| Angle of arrival configuration | |  | Setup 1 defined in clause A.3.15.1 | |
| Assumption for UE beamsNote 6 | |  | Fine | Rough |
| Note1 | NR\_TDD\_FR2\_A | dBm/15kHz | -111.7 | -104.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note1 | NR\_TDD\_FR2\_A | dBm/SCSNote3 | -102.7 | -95.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| SSB\_RPNote2 | NR\_TDD\_FR2\_A | dBm/SCS Note4 | -90.7 | -90.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
|  | NR\_TDD\_FR2\_A | dB | 12 | 5 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Ês/Noc | NR\_TDD\_FR2\_A | dB | 12 | 5 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| IoNote2 | NR\_TDD\_FR2\_A | dBm/95.04 MHz Note4 | -61.45 | -60.52 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

##### A.5.5.2.3.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.3.2-1.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 4 slot before an SMTC and no later than 4 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.3.2-2.

Table A.5.5.2.3.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 3 | 0.125 | 4 |

Table A.5.5.2.3.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 3 | 0.125 | 8 + SMTC duration |

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

#### A.5.5.2.4 E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

##### A.5.5.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that for NR PSCell interruptions during the measurement on the deactivated NR SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.4.1-1.

The general test parameters are given in Table A.5.5.2.4.1-2, and NR cell specific test parameters are given in Table A.5.5.2.4.1-3 and A.5.5.2.4.1-4 below. The E-UTRAN cell specific test parameters can be found inTable A.3.7.2.1-2. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 and Cell 3 are NR FR2 PSCell and NR FR2 deactivated SCell, respectively. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* for the deactivated NR SCells is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.4.1-1: Interruption during measurements on deactivated NR SCC supported test configurations

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

Table A.5.5.2.4.1-2: General test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other two are NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on NR RF channel number 2. |
| CP length |  | Normal | Applicable to cell1, cell 2 and cell3 |
| AoA number |  | 1 | Applicable to cell2 and cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.5.5.2.4.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | Cell 3 |
| Frequency Range | |  | FR2 | FR2 |
| Duplex mode | Config 1,2 |  | TDD | TDD |
| TDD configuration | Config 1,2 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Data RBs allocated | Config 1,2 |  | 66 | 66 |
| Downlink initial BWP Configuration | Config 1,2 |  | DLBWP.0.1 | |
| Downlink dedicated BWP Configuration | Config 1,2 |  | DLBWP.1.1 | |
| Uplink initial BWP configuration | Config 1,2 |  | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | Config 1,2 |  | ULBWP.1.1 | |
| PDSCH Reference measurement channel | Config 1,2 |  | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 |
| SSB Configuration |  |  | SSB.1 FR2 | SSB.1 FR2 |
| SMTC Configuration | Config 1,2 |  | SMTC.1 FR2 | SMTC.1 FR2 |
| TRS configuration | Config 1,2 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| TCI state | Config 1,2 |  | TCI.State.0 | TCI.State.0 |
| EPRE ratio of PSS to SSS | | 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 | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Propagation Condition | |  | AWGN | AWGN |
| Time offset to cell1 Note 2 | | μs | 62.5 | 62.5+ Time offset to cell2 |
| Time offset to cell2 Note 3 | | μs | - | 3 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells  Note 3: Receive time difference of signals received between slot timing boundary from two NR Cells including time alignment error between the two cells | | | | |

Table A.5.5.2.4.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated NR SCC in asynchronous EN-DC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** | **Cell 3** |
| Angle of arrival configuration | |  | Setup 1 defined in clause A.3.15.1 | |
| Assumption for UE beamsNote 6 | |  | Fine | Rough |
| Note1 | NR\_TDD\_FR2\_A | dBm/15kHz | -111.7 | -104.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note1 | NR\_TDD\_FR2\_A | dBm/SCSNote3 | -102.7 | -95.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| SSB\_RPNote2 | NR\_TDD\_FR2\_A | dBm/SCS Note4 | -90.7 | -90.7 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
|  | | dB | 12 | 5 |
| Ês/Noc | | dB | 12 | 5 |
| IoNote2 | NR\_TDD\_FR2\_A | dBm/95.04 MHz Note4 | -61.45 | -60.52 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

##### A.5.5.2.4.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell.

If the NR PSCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PSCell immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.4.2-1.

If the NR PSCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PSCell no earlier than 4 slot before an SMTC and no later than 4 slot after the SMTC. the interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.4.2-2.

Table A.5.5.2.4.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 3 | 0.125 | 4 |

Table A.5.5.2.4.2-2: Interruption duration if the NR PSCell is in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 3 | 0.125 | 8 + SMTC duration |

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

#### A.5.5.2.5 E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

##### A.5.5.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that for NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8.2.1.2. Supported test configurations are shown in table A.5.5.2.5.1-1.

The general test parameters are given in Table A.5.5.2.5.1-2, and NR cell specific test parameters are given in Table A.5.5.2.5.1-3 and A.5.5.2.5.1-4 below. The E-UTRAN cell specific test parameters can be found in Table A.3.7.2.1-2. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 are LTE PCell and LTE deactivated SCell, respectively, and Cell2 is NR FR2 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRA SCell is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.5.1-1: Interruption during measurements on deactivated E-UTRAN SCC supported test configurations

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

Table A.5.5.2.5.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is NR RF channel and two are E-UTRAN RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on E-UTRAN RF channel number 3. |
| CP length |  | Normal | Applicable to cell1, cell 2 and cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.5.5.2.5.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 |
| Frequency Range | |  | FR2 |
| Duplex mode | Config 1,2 |  | TDD |
| TDD configuration | Config 1,2 |  | TDDConf.3.1 |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | Config 1,2 |  | 66 |
| Downlink initial BWP Configuration | Config 1,2 |  | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 |  | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 |  | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 |  | CCR.3.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | Config 1,2 |  | SMTC.1 FR2 |
| SSB Configuration | Config 1,2 |  | SSB.1 FR2 |
| TRS configuration | Config 1,2 |  | TRS.2.1 TDD |
| TCI state | Config 1,2 |  | TCI.State.0 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Propagation Condition | |  | AWGN |
| Time offset to cell1 Note 2 | | μs | 3 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

Table A.5.5.2.5.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in synchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beamsNote 6 |  | Fine |
| Note1 | dBm/15kHzNote4 | -112 |
| Note1 | dBm/SCSNote3 | -102.97 |
|  | dB | 17 |
| SSB\_RPNote2 | dBm/SCS Note4 | -85.97 |
|  | dB | 17 |
| IoNote2 | dBm/95.04 MHz Note4 | -56.90 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | |

##### A.5.5.2.5.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.5.2-1.

Table A.5.5.2.5.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 3 | 0.125 | 5 |

Table A.5.5.2.5.2-2: Void

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

#### A.5.5.2.6 E-UTRAN – NR FR2 interruptions during measurements on deactivated E-UTRAN SCC in asynchronous EN-DC

##### A.5.5.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that for NR PSCell interruptions during the measurement on the deactivated E-UTRAN SCC, the UE missed ACK/NACK does not exceed the limits. This test will verify the missed ACK/NACK rate for NR PSCell in EN-DC specified in clause 8. 2.1.2. Supported test configurations are shown in table A.5.5.2.6.1-1.

The general test parameters are given in Table A.5.5.2.6.1-2, and NR cell specific test parameters are given in Table A.5.5.2.6.1-3 and A.5.5.2.6.1-4 below. The E-UTRAN cell specific test parameters can be found in Table A.3.7.2.1-2. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 and Cell3 are LTE PCell and LTE deactivated SCell, respectively, and Cell2 is NR FR2 PSCell. Cell1 shall be configured as LTE PCell and Cell2 shall be configured as NR PSCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE is connected to Cell1 and Cell2. The point in time at which the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated E-UTRA SCell is received by the UE, defines the start of time period T1. During T1, LTE PCell and NR PSCell are continuously scheduled in DL.

Table A.5.5.2.6.1-1: Interruption during measurements on deactivated E-UTRAN SCC supported test configurations

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

Table A.5.5.2.6.1-2: General test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2, 3 | One is NR RF channel and two are E-UTRAN RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell3 | Deactivated SCell on E-UTRAN RF channel number 3. |
| CP length |  | Normal | Applicable to cell1, cell 2 and cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| SCell measurement cycle (measCycleSCell) | ms | 640 |  |
| T1 | s | 10 |  |

Table A.5.5.2.6.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in asynchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 |
| Frequency Range | |  | FR2 |
| Duplex mode | Config 1,2 |  | TDD |
| TDD configuration | Config 1,2 |  | TDDConf.3.1 |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | Config 1,2 |  | 66 |
| Downlink initial BWP Configuration | Config 1,2 |  | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 |  | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 |  | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | Config 1,2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD |
| PDCCH CORESET parameters | Config 1,2 |  | CCR.3.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | Config 1,2 |  | SMTC.1 FR2 |
| SSB Configuration | Config 1,2 |  | SSB.1 FR2 |
| TRS configuration | Config 1,2 |  | TRS.2.1 TDD |
| TCI state | Config 1,2 |  | TCI.State.0 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Propagation Condition | |  | AWGN |
| Time offset to cell1 Note 2 | | μs | 62.5 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

Table A.5.5.2.6.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions during measurements on deactivated E\_UTRAN SCC in asynchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beamsNote 6 |  | Fine |
| Note1 | dBm/15kHzNote4 | -112 |
| Note1 | dBm/SCSNote3 | -102.97 |
|  | dB | 17 |
| SSB\_RPNote2 | dBm/SCS Note4 | -85.97 |
|  | dB | 17 |
| IoNote2 | dBm/95.04 MHz Note4 | -56.90 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.2.1.3, and does not limit UE implementation or test system implementation | | |

##### A.5.5.2.6.2 Test Requirements

The UE shall be continuously scheduled in LTE PCell and NR PSCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on NR PSCell. The UE is only allowed to cause interruptions immediately before and immediately after an SMTC. Each interruption on NR PSCell shall not exceed the value defined in Table A.5.5.2.6.2-1.

Table A.5.5.2.6.2-1: Interruption duration if the NR PSCell is not in the same band as the deactivated SCell

|  |  |  |
| --- | --- | --- |
|  | NR Slot length (ms) | Interruption length  (slot) |
| 3 | 0.125 | 5 |

Table A.5.5.2.6.2-2: Void

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

A.5.5.3 SCell Activation and Deactivation Delay

#### A.5.5.3.1 SCell Activation and deactivation of SCell in FR2 intra-band

##### A.5.5.3.1.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1 except the SCell is in FR2 intra-band.

The supported test configurations are shown in table A.5.5.3.1.1-1 below. The general and cell specific test parameters are the same except those described in the following clause. The listed parameter values in Tables A.5.5.3.1.1-2 and A.5.5.3.1.1-3 will replace the values of corresponding parameters in Tables A.4.5.3.1.1-2 and A.4.5.3.1.1-3. In this case, OTA related test parameters are shown in table A.5.5.3.1.1-4 below.

In this test it is assumed that the UE is receiving RRC messages pertaining to the SCell in SCG via signaling on SRB3.

**Table A.5.5.3.1.1-1: Supported test configurations for FR2 SCell activation case with FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

**Table A.5.5.3.1.1-2: General test parameters for FR2 SCell activation case with FR2 PSCell**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| Active PCell |  | Cell 1 | Primary cell on E-UTRAN RF channel number 1.  As specified in clause A.3.7.2.2 |

**Table A.5.5.3.1.1-3: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **ParameterNote 5** | **Unit** | **Cell 2** | | | **Cell 3** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| SSB ARFCN |  | freq1 | | | freq2 | | |
| Duplex mode |  | TDD | | | TDD | | |
| TDD configuration |  | TDDConf.3.1 | | | TDDConf.3.1 | | |
| BWchannel | MHz | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 66 | | | 66 | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC CORESET Reference Channel |  | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| DL initial BWP configuration |  | DLBWP.0.1 | | | | | |
| DL dedicated BWP configuration |  | DLBWP.1.1 | | | | | |
| UL initial BWP configuration |  | ULBWP.0.1 | | | | | |
| UL dedicated BWP configuration |  | ULBWP.1.1 | | | | | |
| OCNG Patterns |  | OP.1 | | | | | |
| SMTC configuration |  | SMTC.1 | | | | | |
| SSB configuration |  | SSB.1 FR2 | | | | | |
| TCI state |  | TCI.State.0 | | | | | |
| TRS configuration |  | TRS.2.1 TDD | | | | | |
| CSI-RS configuration for CSI reporting |  | CSI-RS.3.1 TDD | | | | | |
| reportConfigType |  | periodic | | | N/A | | |
| reportQuantity |  | cri-RI-PMI-CQI | | | N/A | | |
| CSI reporting periodicity | slot | 40 | | | N/A | | |
| CSI reporting offset | slot | 4 | | | N/A | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | | | | | |
| EPRE ratio of PSS to SSS | dB | 0 | | | | | |
| EPRE ratio of PBCH\_DMRS to SSS |
| EPRE ratio of PBCH to PBCH\_DMRS |
| EPRE ratio of PDCCH\_DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH\_DMRS |
| EPRE ratio of PDSCH\_DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH\_DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Propagation conditions |  | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: All parameters apply for configuration 1 and 2 | | | | | | | |

**Table A.5.5.3.1.1-4: OTA related test parameters for FR2 SCell activation case with FR2 PSCell**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **ParameterNote 6** | **Unit** | **Cell 2** | | | **Cell 3** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Angle of arrival configuration |  | Setup 1 according to A.3.15.1 | | | | | |
| Assumption for UE beamsNote 7 |  | Rough | | | Rough | | |
| Note1 | dBm/15kHzNote4 | -104.7 | | | -104.7 | | |
| Note1 | dBm/SCSNote3 | -95.7 | | | -95.7 | | |
|  | dB | 7 | | | 7 | | |
| SSB\_RPNote2 | dBm/SCS Note4 | -88.7 | | | -88.7 | | |
|  | dB | 7 | | | 7 | | |
| IoNote2 | dBm/95.04 MHz Note4 | -58.92 | | | -58.92 | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: All parameters apply for configuration 1 and 2  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

##### A.5.5.3.1.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case.

#### A.5.5.3.2 SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle

##### A.5.5.3.2.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.1.1, except PSCell is in FR2.

The supported test configurations are shown in table A.5.5.3.2.1-1 below. The general test parameters are the same in Tables A.4.5.3.1.1-2. The cell specific test parameters are given in Tables A.5.5.3.2.1-2. In this case, OTA related test parameters are the same as in table A.5.5.3.2.1-3.

**Table A.5.5.3.2.1-1: Supported test configurations for FR1 SCell activation case with PSCell is FR2**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | FDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Cell 3 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Cell 3 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | TDD LTE PCell, Cell 2 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode  Cell 3 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 | |

**Table A.5.5.3.2.1-2: Cell specific test parameters for FR1 SCell activation case with FR2 PSCell**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | Cell 2 | | | Cell 3 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| SSB ARFCN | |  | freq2 | | | freq1 | | |
| Duplex mode | Config 1,4 |  | TDD | | | FDD | | |
| Config 2,3,5,6 | TDD | | | TDD | | |
| TDD configuration | Config 1,4 |  | TDDConf.3.1 | | | Not Applicable | | |
| Config 2,5 | TDDConf.1.1 | | |
| Config 3,6 | TDDConf.2.1 | | |
| BWchannel | Config 1,4 | MHz | 100: NRB,c = 66 | | | 10: NRB,c = 52 | | |
| Config 2,5 | 10: NRB,c = 52 | | |
| Config 3,6 | 40: NRB,c = 106 | | |
| Data RBs allocated | Config 1,4 |  | 66 | | | 52 | | |
| Config 2,5 | 52 | | |
| Config 3,6 | 106 | | |
| DL initial BWP configuration | Config 1,2,3,4,5,6 |  | DLBWP.0.1 | | | | | |
| DL dedicated BWP configuration | Config 1,2,3,4,5,6 |  | DLBWP.1.1 | | | | | |
| UL initial BWP configuration | Config 1,2,3,4,5,6 |  | ULBWP.0.1 | | | | | |
| UL dedicated BWP configuration | Config 1,2,3,4,5,6 |  | ULBWP.1.1 | | | | | |
| DRX Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.3.1 TDD | | | SR.1.1 FDD | | |
| Config 2,5 | SR.1.1 TDD | | |
| Config 3,6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1,4 |  | CR.3.1 TDD | | | CR.1.1 FDD | | |
| Config 2,5 | CR.1.1 TDD | | |
| Config 3,6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | Config 1,4 |  | CCR.3.1 TDD | | | CCR.1.1 FDD | | |
| Config 2,5 |  | CCR.1.1 TDD | | |
| Config 3,6 |  | CCR.2.1 TDD | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| SMTC configuration | |  | SMTC.1 | | | | | |
| TCI state | |  | TCI.State.0 | | | NA | | |
| TRS configuration | Config 1,4 |  | TRS.2.1 TDD | | | TRS.1.1 FDD | | |
| Config 2,5 | TRS.1.1 TDD | | |
| Config 3,6 | TRS.1.2 TDD | | |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR2 | | | SSB.1 FR1 | | |
| Config 3,6 | SSB.2 FR1 | | |
|  | Config 1,4 |  |  | | | CSI-RS.1.1 FDD | | |
| CSI-RS configuration for CSI reporting | Config 2,5 |  | CSI-RS.3.1 TDD | | | CSI-RS.1.1 TDD | | |
|  | Config 3,6 |  |  | | | CSI-RS.2.1 TDD | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 120kHz | | | 15kHz | | |
| Config 3,6 | 30kHz | | |
| reportConfigType | Config 1-6 |  | periodic | | | N/A | | |
| reportQuantity | Config 1-6 |  | cri-RI-PMI-CQI | | | N/A | | |
| CSI reporting periodicity | Config 1,2,3,4,5,6 | slot | 40 | | | N/A | | |
| CSI reporting offset | Config 1,2,3,4,5,6 | slot | 4 | | | N/A | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Propagation condition | | - | AWGN | | | NA  Link only, see clause A.3.7A | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.] | | | | | | | | |

**Table A.5.5.3.2.1-3: OTA related test parameters for FR1 SCell activation case with FR2 PSCell**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** | | | **Cell 3** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| Angle of arrival configuration | |  | Setup 1 according to clause A.3.15.1 | | | NA  Link only, see clause A.3.7A | | |
| Assumption for UE beamsNote 7 | |  | Rough | | |
| Note1 | | dBm/15kHz | -104.7 | | |
| Note1 | Config 1,2,4,5 | dBm/SCS | -95.7 | | |
| Config 3,6 |
| SSB\_RPNote2 | Config 1,2,4,5 | dBm/SCS Note3 | -88.7 | | |
| Config 3,6 |
|  | Config 1,2,3,4,5,6 | dB | 7 | | |
|  | | dB | 7 | | |
| IoNote2 | Config 1,2,4,5 | dBm/ChBwNote4,Note6 | -58.92 | | |
| Config 3,6 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: ChBW is 95.04 MHz for Cell2, 9.36 MHz for Cell 3 in configurations 1,2,4,5, 38.1 MHz in configurations 3,6  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | |

##### A.5.5.3.2.2 Test Requirements

The test requirements defined in clause A.4.5.3.1.2 shall apply to this test case, with the following exceptions:

- Placement of interruptions is only verified in NR PSCell.

#### A.5.5.3.3 Void

#### A.5.5.3.4 Void

#### A.5.5.3.5 SCell Activation and deactivation of SCell in FR2

##### A.5.5.3.5.1 Test Purpose and Environment

The purpose of this test is to verify that the SCell activation and deactivation times are within the requirements stated in clause 8.3, when the SCell is in FR2.

The supported test configurations are shown in table A.5.5.3.5.1-1 below. The test parameters are the same as in clause A.4.5.3.3.1 except those described in the following clause. The listed parameter values in Tables A.5.5.3.5.1-2 will replace the values of corresponding parameters in Tables A.4.5.3.3.1-2. The listed parameter values in Tables A.5.5.3.5.1-3 will replace the values of corresponding parameters in Tables A.4.5.3.3.1-3. In this case, OTA related test parameters are shown in table A.5.5.3.5.1-4 below.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, E-UTRA has one cell (Cell 1), NR has two cells, PSCell (Cell 2) in FR1 and SCell (Cell 3) in FR2. Cell 1 and Cell 2 have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRAN and Cell 2 (PSCell) on NR, but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes configured on NR. During T1 the SCell is powered off and UE is not aware of SCell.

A MAC message for activation of SCell is sent by the test equipment 100ms after the RRC message, in a slot # denoted m. The point in time at which the MAC message for activation of SCell is received at the UE antenna connector defines the start of time period T2.

During T2, the test equipment monitors the L1-RSRP measurement reporting for the SCell. The time when test equipment receives a valid L1-RSRP report is denoted as slot m+TL1-RSRP. In the next DL slot after slot m+TL1-RSRP, the test equipment sends a MAC message for the activation of the TCI state of the RMC CORESET of the SCell. In the same slot, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell.

Time period T3 starts when a MAC message for deactivation of the SCell, sent from the test equipment to the UE in a slot # denoted n, is received at the UE antenna connector.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PCell and PSCell during activation of SCell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the SCell activation command is sent until a CSI report with other than CQI index 0 is received.

The test equipment verifies the deactivation time by counting the slots from the time when the SCell1 deactivation command is sent until CSI reporting for SCell1 is discontinued.

Table A.5.5.3.5.1-1: FR2 SCell activation in non-DRX test configurations with FR1 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD PCell, Cell 2 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 5 | LTE TDD PCell, Cell 2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD PCell, Cell 2 NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Cell 3 NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.5.5.3.5.1-2: General test parameters for FR2 SCell activation case with FR1 PSCell

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| Active PCell |  | Cell 1 | Primary cell on E-UTRAN RF channel number 1.  As specified in clause A.3.7.2.2 |
| T2 | s | 2 | During this time the UE shall activate the SCell. |

Table A.5.5.3.5.1-3: Cell specific test parameters for FR2 SCell activation case with FR1 PSCell

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 | | | Cell 3 | | | |
| T1 | T2 | T3 | T1 | T2 | | T3 |
| SSB ARFCN | |  | freq1 | | | freq2 | | | |
| Duplex mode | Config 1,4 |  | FDD | | | TDD | | | |
| Config 2,3,5,6 | TDD | | | TDD | | | |
| TDD configuration | Config 1,4 |  | Not Applicable | | | TDDConf.3.1 | | | |
| Config 2,5 | TDDConf.1.1 | | |
| Config 3,6 | TDDConf.2.1 | | |
| BWchannel | Config 1,4 | MHz | 10: NRB,c = 52 | | | 100: NRB,c = 66 | | | |
| Config 2,5 | 10: NRB,c = 52 | | |
| Config 3,6 | 40: NRB,c = 106 | | |
| Data RBs allocated | Config 1,4 |  | 52 | | | 66 | | | |
|  | Config 2,5 |  | 52 | | |  | | | |
|  | Config 3,6 |  | 106 | | |  | | | |
| BWP BW | Config 1,4 |  | 10: NRB,c = 52 | | | 100: NRB,c = 66 | | | |
| Config 2,5 | 10: NRB,c = 52 | | |
| Config 3,6 | 40: NRB,c = 106 | | |
| DRx Cycle | | ms | Not Applicable | | | | | | |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD | | | SR.3.1 TDD | | | |
| Config 2,5 | SR.1.1 TDD | | |
| Config 3,6 | SR.2.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1,4 |  | CR.1.1 FDD | | | CR.3.1 TDD | | | |
| Config 2,5 | CR.1.1 TDD | | |
| Config 3,6 | CR.2.1 TDD | | |
| RMC CORESET Reference Channel | Config 1,4 |  | CCR.1.1 FDD | | | CCR.3.1 TDD | | | |
| Config 2,5 |  | CCR.1.1 TDD | | |
| Config 3,6 |  | CCR.2.1 TDD | | |
| OCNG Patterns | |  | OP.1 | | | | | | |
| SMTC configuration | |  | SMTC.1 | | | | | | |
| TCI state | |  | NA | | | TCI.State.0 | | | |
| TRS configuration | Config 1,4 |  | TRS.2.1 TDD | | | TRS.2.1 TDD | | | |
| Config 2,5 |  | TRS.1.1 TDD | | |
| Config 3,6 |  | TRS.1.2 TDD | | |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR1 | | | SSB.1 FR2 | | | |
| Config 3,6 | SSB.2 FR1 | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | | | 120 kHz | | | |
| Config 3,6 | 30 kHz | | |
| CSI-RS configuration | Config 1~6 |  | NA | | | NA | | CSI-RS.3.1 TDD Note 5 | |
| reportConfigType | Config 1~6 |  | periodic | | | NA | | | |
| reportQuantity | Config 1~6 |  | cri-RI-PMI-CQI | | | NA | | | |
| CSI reporting periodicity Note 6 | Config 1~6 | slot | 40 | | | NA | | | |
| CSI reporting offset | Config 1~6 | slot | 4 | | | NA | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Propagation condition | | - | N/A  Link only, see clause A.3.7A | | | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.  Note 5: CSI-RS for CSI measurement is (re)configured in the next DL slot after slot m+TL1-RSRP during T2.  Note 6: L1-RSRP measurement and reporting are configured to the the UE prior to the start of time period T1. | | | | | | | | | |

Table A.5.5.3.5.1-4: OTA related test parameters for FR2 SCell activation case with FR1 PSCell

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 2** | | | **Cell 3** | | | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | | **T3** | |
| Angle of arrival configuration | | |  | NA | | | Setup 1 according to clause A.3.15.1 | | | | |
| Assumption for UE beamsNote 7 | | |  | NA | | | Rough | | | | |
| Note1 | | | dBm/15kHz | Link only, see clause A.3.7A | | | -104.7 | | | | |
| Note1 | | Config 1,2,4,5 | dBm/SCS | -95.7 | | | | |
| Config 3,6 |
| SSB\_RPNote2 | | Config 1,2,4,5 | dBm/SCS Note3 | -∞ | | -88.7 | | -88.7 |
| Config 3,6 |
|  | Config 1,2,3,4,5,6 | | dB | -∞ | | 7 | | 7 |
|  | | | dB | -∞ | | 7 | | 7 |
| IoNote2, Note 4 | Config 1,2,4,5 | | dBm/95.04 MHz | -66.68 | | -58.92 | | -58.92 |
| Config 3,6 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Void  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | | | | | | | | |

##### A.5.5.3.5.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available UL resource if an available uplink resource is subject to interruption. Whether CSI report in a slot was interrupted is checked by monitoring ACK/NACK sent in PSCell in the slot.

During T2 the UE shall start sending valid L1-RSRP report for the SCell in the configured slots for CSI reporting after slot (m+TL1-RSRP), where TL1-RSRP is no larger than

3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report

as defined in clause 8.3.2. For this test case, TFirstSSB\_MAX=TSMTC\_MAX=Trs=20ms; TL1-RSRP, measure=480ms and TL1-RSRP, measure=5ms, which allows TL1-RSRP 1000ms.

During T2 the UE shall start sending CSI reports for the SCell with non-zero CQI index in the configured slots for CSI reporting no later than slot , where

- THARQ is defined in Table A.5.5.3.1.1-2

- Tactivation\_time = 3ms + TFirstSSB\_MAX + 15\*TSMTC\_MAX + 8\*Trs + TL1-RSRP, measure + TL1-RSRP, report + max {(THARQ + Tuncertainty\_MAC + 5ms + TFineTiming), (Tuncertainty\_RRC + TRRC\_delay)}, which allows 1030ms

- TCSI\_Reporting = 10ms

- NR slot length is 0.125ms for this test case.

During T3 the UE shall stop sending CSI reports for both SCells no later than slot , as defined in clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot to , and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe to subframe, as defined in clause 8.3, where TX =20ms, and and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m.

During T3 the starting point of interruption of PSCell during SCell deactivation shall not happen outside the slot to , as defined in clause 8.3 and the starting point of interruption of E-UTRA PCell during SCell deactivation shall not happen outside the subframe to subframe , where and are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

The interruption of PSCell due to activation of SCell1 and SCell2 shall not be more than the values specified for EN-DC in Clause 8.2.1.2.10.

The interruption of PCell due to activation of SCell1 and SCell2 shall not be more than the values specified for EN-DC in Clause 7.32.2.5 of TS 36.133 [50].

### A.5.5.4 Void

### A.5.5.5 Beam Failure Detection and Link recovery procedures

#### A.5.5.5.1 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with SSB-based BFD and LR in non-DRX mode

##### A.5.5.5.1.1 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 candicate 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 FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.1.1-1, A.5.5.5.1.1-2, A.5.5.5.1.1-3 and A.5.5.5.1.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.1.1-1 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.5.5.5.1.1-1 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 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1.

**Table A.5.5.5.1.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 3 | LTE FDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| 4 | LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

**Table A.5.5.5.1.1-2: General test parameters for FR2 PCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active E-UTRA PCell | | 1-4 |  | Cell 1 |  |
| E-UTRA RF Channel Number | | 1-4 |  | 1 |  |
| Active PCell | | 1-4 |  | Cell 2 |  |
| RF Channel Number | | 1-4 |  | 2 |  |
| Duplex mode | | 1-4 |  | TDD |  |
| TDD Configuration | | 1-4 |  | TDDConf.3.1 |  |
| BWchannel | | 1-4 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-4 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-4 | kHz | 120 |  |
| DL initial BWP configuration | | 1-4 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1-4 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1-4 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1-4 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1-2 |  | SR.3.2 TDD |  |
| 3-4 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1-2 |  | CR.3.1 TDD |  |
| 3-4 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1-2 |  | CCR.3.1 TDD |  |
| 3-4 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-4 |  | OP.1 |  |
| CP length | | 1-4 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-4 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1-4 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1-2 |  | SSB.1 FR2 |  |
| 3-4 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-4 |  | SMTC.3 |  |
| PRACH Configuration | | 1-4 |  | FR2 PRACH configuration 2 | A.3.8.3.2 |
| DRX configuration | | 1-4 |  | OFF |  |
| SSB index assigned as BFD RS (q0) | | 1-4 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-4 |  | 1 |  |
| SSB index assigned as RLM RS | | 1-4 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1-4 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-4 |  | 2 |  |
| Aggregation level | 1-4 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-4 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4 | dB | 0 |  |
| DMRS precoder granularity | 1-4 |  | REG bundle size |  |
| REG bundle size | 1-4 |  | 6 |  |
| Gap pattern ID | | 1-4 |  | gp0 |  |
| gapOffset | | 1-4 | ms | 0 |  |
| rlmInSyncOutOfSyncThreshold | | 1-4 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| 3-4 | -92 |
| powerControlOffsetSS | | 1-4 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-4 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1-4 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-4 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | | 1-4 |  | periodic |  |
| reportQuantity | | 1-4 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-4 | slot | 40 |  |
| CSI reporting offset | | 1-4 | slot | 4 |  |
| T310 | | 1-4 | ms | 1000 |  |
| N310 | | 1-4 |  | 2 |  |
| T1 | | 1-4 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-4 | s | 2.61 |  |
| T3 | | 1-4 | s | 1.64 |  |
| T4 | | 1-4 | s | 0 |  |
| T5 | | 1-4 | s | 1.01 |  |
| D1 | | 1-4 | s | 0.97 |  |
| 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.5.5.5.1.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | | | | |
| 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 1-4 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-4 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of set q1 | Config 1-2 | dBm/SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 3-4 |  | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1-4 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.1.1-1.  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.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

**Table A.5.5.5.1.1-4: Void**

****

**Figure A.5.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

##### A.5.5.5.1.2 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 = 960+10 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.

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.5.5.5.2 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with SSB-based BFD and LR in DRX mode

##### A.5.5.5.2.1 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 FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.2.1-1, A.5.5.5.2.1-2, A.5.5.5.2.1-3, A.5.5.5.2.1-4 and A.5.5.5.2.1-5 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.2.1-1 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.5.5.5.2.1-1 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 5 ms. In the test, DRX configuration is enabled in PCSell 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.5.5.5.2.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| 3 | LTE FDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| 4 | LTE TDD, TDD duplex mode, 240 kHz SSB SCS, 100 MHz bandwidth |
| Note: The UE is only required to pass in one of the supported test configurations in FR2 | |

**Table A.5.5.5.2.1-2: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active E-UTRA PCell | | 1-4 |  | Cell 1 |  |
| E-UTRA RF Channel Number | | 1-4 |  | 1 |  |
| Active PCell | | 1-4 |  | Cell 2 |  |
| RF Channel Number | | 1-4 |  | 2 |  |
| Duplex mode | | 1-4 |  | TDD |  |
| TDD Configuration | | 1-4 |  | TDDConf.3.1 |  |
| BWchannel | | 1-4 | MHz | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-4 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-4 | kHz | 120 |  |
| DL initial BWP configuration | | 1-4 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1-4 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1-4 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1-4 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1-2 |  | SR.3.2 TDD |  |
| 3-4 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1-2 |  | CR.3.1 TDD |  |
| 3-4 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1-2 |  | CCR.3.1 TDD |  |
| 3-4 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-4 |  | OP.1 |  |
| CP length | | 1-4 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-4 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1-4 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1-2 |  | SSB.1 FR2 |  |
| 3-4 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-4 |  | SMTC.3 |  |
| PRACH Configuration | | 1-4 |  | FR2 PRACH configuration 2 | A.3.8.3.2 |
| DRX configuration | | 1-4 |  | DRX.3 | A.3.3.3 |
| SSB index assigned as BFD RS (q0) | | 1-4 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-4 |  | 1 |  |
| SSB index assigned as RLM RS | | 1-4 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1-4 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-4 |  | 2 |  |
| Aggregation level | 1-4 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-4 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4 | dB | 0 |  |
| DMRS precoder granularity | 1-4 |  | REG bundle size |  |
| REG bundle size | 1-4 |  | 6 |  |
| Gap pattern ID | | 1-4 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1-4 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| 3-4 | -92 |
| powerControlOffsetSS | | 1-4 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-4 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1-4 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-4 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | | 1-4 |  | periodic |  |
| reportQuantity | | 1-4 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-4 | slot | 40 |  |
| CSI reporting offset | | 1-4 | slot | 4 |  |
| T310 | | 1-4 | ms | 1000 |  |
| N310 | | 1-4 |  | 2 |  |
| T1 | | 1-4 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-4 | s | 3.37 |  |
| T3 | | 1-4 | s | 2.8 |  |
| T4 | | 1-4 | s | 0 |  |
| T5 | | 1-4 | s | 0.61 |  |
| D1 | | 1-4 | s | 0.57 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

**Table A.5.5.5.2.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | | | | |
| 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 1-4 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-4 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of set q1 | Config 1-2 | dBm/ | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 3-4 | SCS | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1-4 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.2.1-1.  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.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

**Table A.5.5.5.2.1-4: Void**

**Table A.5.5.5.2.1-5: Void**

****

**Figure A.5.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

##### A.5.5.5.2.2 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 = 560+10 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.

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.5.5.5.3 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with CSI-RS-based BFD and LR in non-DRX mode

##### A.5.5.5.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate 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 CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.3.1-1, A.5.5.5.3.1-2, and A.5.5.5.3.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.3.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the CSI-RS in set q0 in the active PSCell to emulate CSI-RS based beam failure. Figure A.5.5.5.3.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS 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 5 ms. In the test, DRX configuration is not enabled.

Table A.5.5.5.3.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | LTE TDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

Table A.5.5.5.3.1-2: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active E-UTRA PCell | | 1-2 |  | Cell 1 |  |
| E-UTRA RF Channel Number | | 1-2 |  | 1 |  |
| Active PCell | | 1-2 |  | Cell 2 |  |
| RF Channel Number | | 1-2 |  | 2 |  |
| Duplex mode | | 1-2 |  | TDD |  |
| TDD Configuration | | 1-2 |  | TDDConf.3.1 |  |
| BWchannel | | 1-2 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | | 1-2 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1-2 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1-2 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1-2 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1-2 |  | SR.3.2 TDD |  |
| RMSI CORESET Reference Channel | | 1-2 |  | CR.3.1 TDD |  |
| Dedicated CORESET Reference Channel | | 1-2 |  | CCR.3.1 TDD |  |
| OCNG parameters | | 1-2 |  | OP.1 |  |
| CP length | | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-2 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1-2 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1-2 |  | SSB.1 FR2 |  |
| SMTC Configuration | | 1-2 |  | SMTC.3 |  |
| PRACH Configuration | | 1-2 |  | FR2 PRACH configuration 4 | A.3.8.3.4 |
| DRX configuration | | 1-2 |  | OFF |  |
| CSI-RS configuration for BFD/CBD/RLM | | 1-2 |  | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS index assigned as BFD RS (q0) | | 1-2 |  | 0 |  |
| CSI-RS index assigned as CBD RS (q1) | | 1-2 |  | 1 |  |
| CSI-RS index assigned as RLM RS | | 1-2 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | | 1-2 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1-2 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 |  | CSI-RS.3.1 TDD | A.3.14.2 |
| reportConfigType | | 1-2 |  | periodic |  |
| reportQuantity | | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-2 | slot | 40 |  |
| CSI reporting offset | | 1-2 | slot | 4 |  |
| T310 | | 1-2 | ms | 1000 |  |
| N310 | | 1-2 |  | 2 |  |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 1.17 |  |
| T3 | | 1-2 | s | 0.9 |  |
| T4 | | 1-2 | s | 0 |  |
| T5 | | 1-2 | s | 0.31 |  |
| D1 | | 1-2 | s | 0.27 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

**Table A.5.5.5.3.1-3: Cell specific test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | | | | |
| 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\_CSI-RS of set q0 | Config 1-2 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1-2 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS\_RP of set q1 | Config 1-2 | dBm/SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 1-2 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  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 REs carrying CSI-RS.Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.3.1-1.  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.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

**Table A.5.5.5.3.1-4: Void**

**Table A.5.5.5.3.1-5: Void**

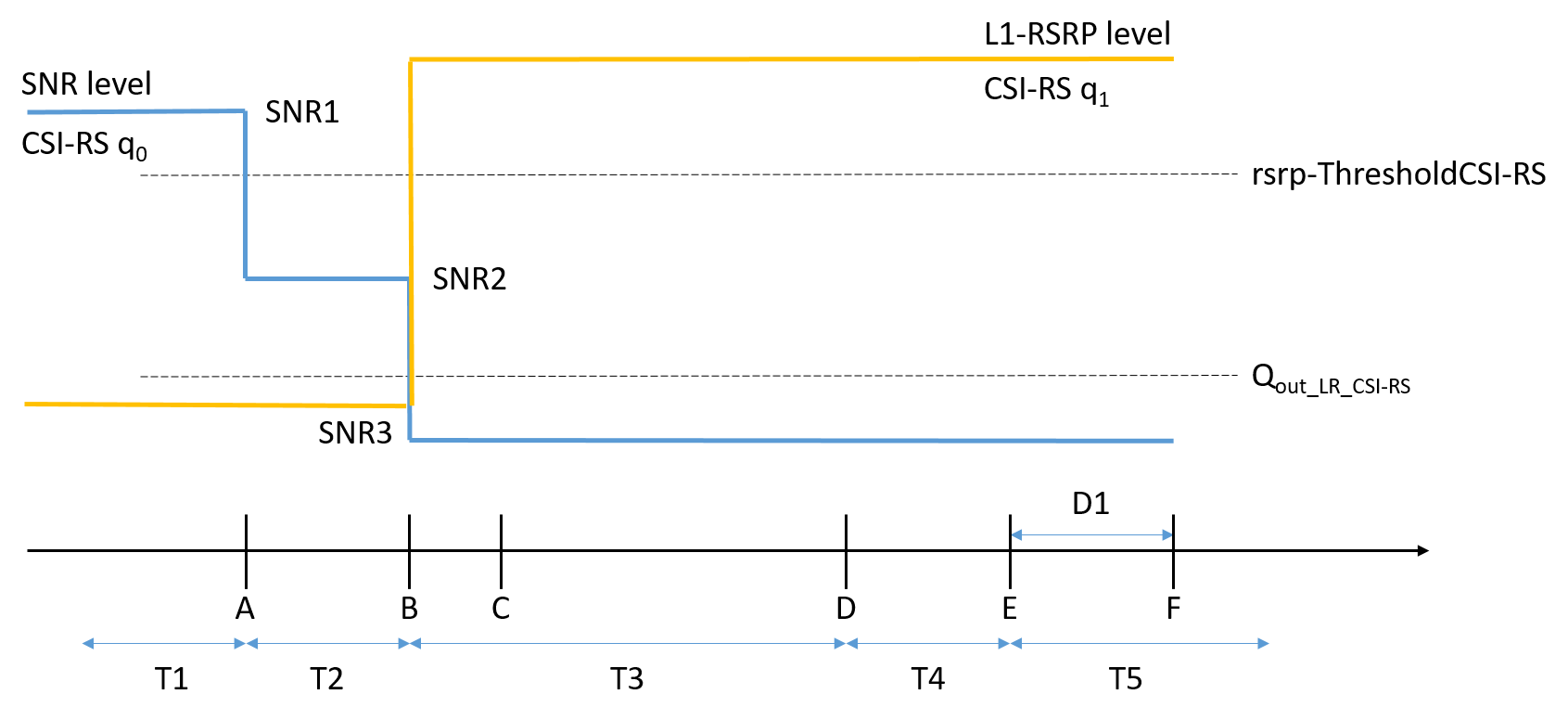


Figure A.5.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode

##### A.5.5.5.3.2 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 initiat 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 = 260+10 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.

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.5.5.5.4 EN-DC Beam Failure Detection and Link Recovery Test for FR2 PSCell configured with CSI-RS-based BFD and LR in DRX mode

##### A.5.5.5.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate 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 CSI-RS based beam failure detection and link recovery for an FR2 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.4.1-1, A.5.5.5.4.1-2, A.5.5.5.4.1-3, and A.5.5.5.4.1-4 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.4.1-1 shows the variation of the downlink SNR of the PCell and the SNR of the CSI-RS in set q0 in the active PSCell to emulate CSI-RS based beam failure. Figure A.5.5.5.4.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS 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 5 ms. 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.5.5.5.4.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |
| 2 | LTE TDD, FDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.5.5.5.4.1-2: General test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active E-UTRA PCell | | 1-2 |  | Cell 1 |  |
| E-UTRA RF Channel Number | | 1-2 |  | 1 |  |
| Active PCell | | 1-2 |  | Cell 2 |  |
| RF Channel Number | | 1-2 |  | 2 |  |
| Duplex mode | | 1-2 |  | TDD |  |
| TDD Configuration | | 1-2 |  | TDDConf.3.1 |  |
| BWchannel | | 1-2 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-2 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-2 | kHz | 120 |  |
| DL initial BWP configuration | | 1-2 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1-2 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1-2 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1-2 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1-2 |  | SR.3.2 TDD |  |
| RMSI CORESET Reference Channel | | 1-2 |  | CR.3.1 TDD |  |
| Dedicated CORESET Reference Channel | | 1-2 |  | CCR.3.1 TDD |  |
| OCNG parameters | | 1-2 |  | OP.1 |  |
| CP length | | 1-2 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-2 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1-2 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1-2 |  | SSB.1 FR2 |  |
| SMTC Configuration | | 1-2 |  | SMTC.3 |  |
| PRACH Configuration | | 1-2 |  | FR2 PRACH configuration 4 | A.3.8.3.4 |
| DRX configuration | | 1-2 |  | DRX.3 | A.3.3.3 |
| CSI-RS configuration for BFD/CBD/RLM | | 1-2 |  | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS index assigned as BFD RS (q0) | | 1-2 |  | 0 |  |
| CSI-RS index assigned as CBD RS (q1) | | 1-2 |  | 1 |  |
| CSI-RS index assigned as RLM RS | | 1-2 |  | 0,1 |  |
| Beam failure detection transmission parameters | DCI format | 1-2 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-2 |  | 2 |  |
| Aggregation level | 1-2 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-2 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-2 | dB | 0 |  |
| DMRS precoder granularity | 1-2 |  | REG bundle size |  |
| REG bundle size | 1-2 |  | 6 |  |
| Gap pattern ID | | 1-2 |  | N/A |  |
| rlmInSyncOutOfSyncThreshold | | 1-2 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| powerControlOffsetSS | | 1-2 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-2 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1-2 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-2 |  | CSI-RS.3.1 TDD | A.3.14.2 |
| reportConfigType | | 1-2 |  | periodic |  |
| reportQuantity | | 1-2 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-2 | slot | 40 |  |
| CSI reporting offset | | 1-2 | slot | 4 |  |
| T310 | | 1-2 | ms | 1000 |  |
| N310 | | 1-2 |  | 2 |  |
| T1 | | 1-2 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-2 | s | 5.43 |  |
| T3 | | 1-2 | s | 5.16 |  |
| T4 | | 1-2 | s | 0 |  |
| T5 | | 1-2 | s | 0.31 |  |
| D1 | | 1-2 | s | 0.27 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

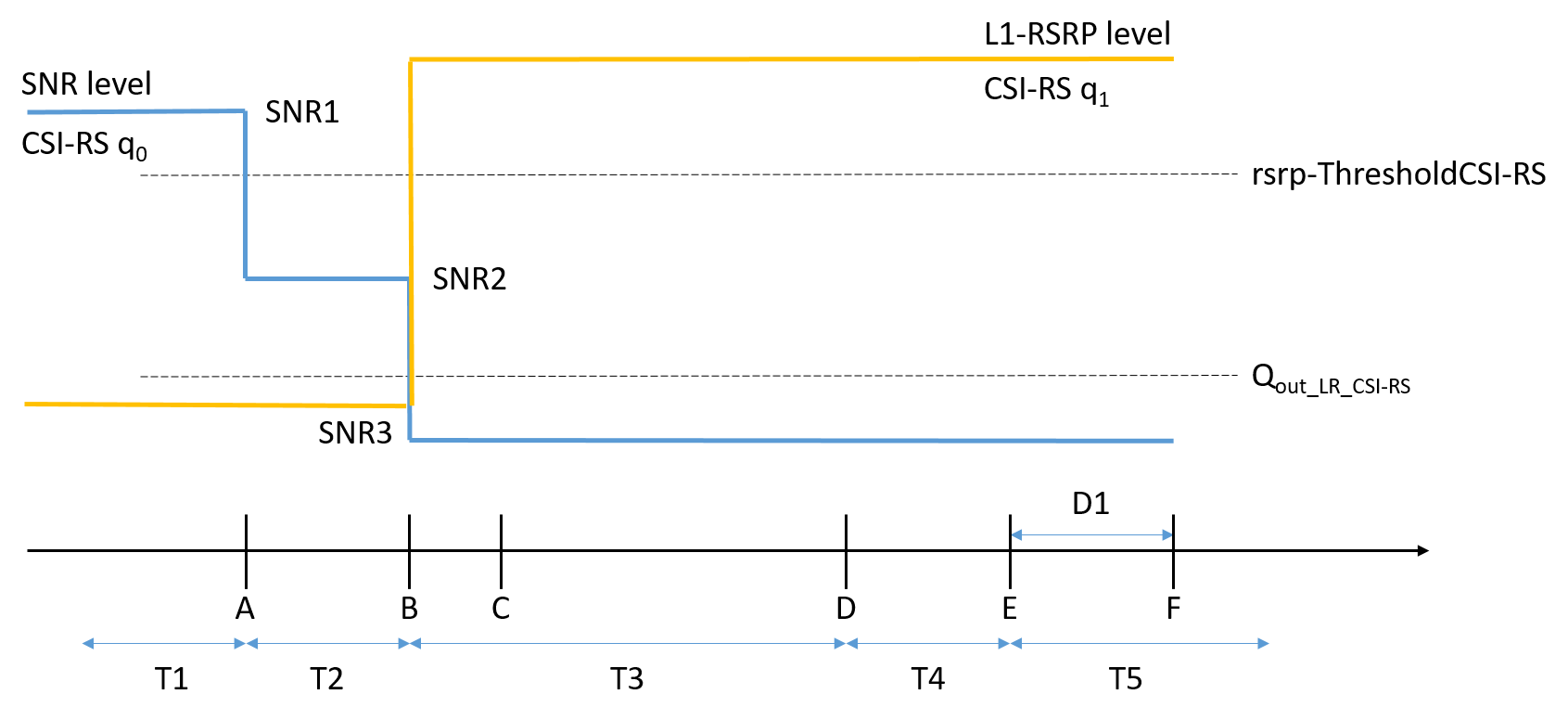
**Table A.5.5.5.4.1-3: Cell specific test parameters for FR2 PSCell for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | | | | |
| 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\_CSI-RS of set q0 | Config 1-2 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_CSI-RS of set q1 | Config 1-2 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS\_RP of set q1 | Config 1-2 | dBm/SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 1-2 | dBm/120 KHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  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 REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.4.1-1.  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.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

Table A.5.5.5.4.1-4: Void

Table A.5.5.5.4.1-5: Void

Table A.5.5.5.4.1-6: Void

****

**Figure A.5.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

##### A.5.5.5.4.2 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 initiat 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 = 260+10 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.

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.5.5.5.5 EN-DC scheduling availability restriction during Beam Failure Detection and Link Recovery for FR2 PSCell configured with SSB-based BFD and LR in non-DRX mode

##### A.5.5.5.5.1 Test Purpose and Environment

The purpose is to test scheduling availability restrictions when the UE is performing beam failure detection or when the UE is performing L1-RSRP measurement for candidate beam detection, when no DRX is used. This test will verify the scheduling availability restriction requirements for SSB based beam failure detection and link recovery for an FR2 serving cell in clause 8.5.7 and 8.5.8.

The test parameters are given in Tables A.5.5.5.5.1-1, A.5.5.5.5.1-2 and A.5.5.5.5.1-3 below. There are two cells, cell 1 is the E-UTRAN PCell, and cell 2 is the PSCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.5.1-3 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.5.5.5.5.1-3 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 5ms. This test will focus on the scheduling availability during beam failure detection and candidate beam detection. In the test, DRX configuration is not enabled. Test is to test the scheduling availability restriction of UE performing beam failure detection and candidate beam detection when SSB RS configured for Beam failure detection and candidate beam detection. During the test the UE is scheduled to transmit continuously in UL.

**Table A.5.5.5.5.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.5.5.5.5.1-2: General test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Test**  **Config.** | **Unit** | **Value** | **Comment** |
|  | |  |  | **Test 1** |  |
| Active E-UTRA PCell | | 1-4 |  | Cell 1 |  |
| E-UTRA RF Channel Number | | 1-4 |  | 1 |  |
| Active PCell | | 1-4 |  | Cell 2 |  |
| RF Channel Number | | 1-4 |  | 2 |  |
| Duplex mode | | 1-4 |  | TDD |  |
| TDD Configuration | | 1-4 |  | TDDConf.3.1 |  |
| BWchannel | | 1-4 |  | 100: NRB,c = 66 |  |
| Data RBs allocated | | 1-4 |  | 66 |  |
| PDSCH/PDCCH subcarrier spacing | | 1-4 | kHz | 120 |  |
| DL initial BWP configuration | | 1-4 |  | DLBWP.0.1 |  |
| DL dedicated BWP configuration | | 1-4 |  | DLBWP.1.1 |  |
| UL initial BWP configuration | | 1-4 |  | ULBWP.0.1 |  |
| UL dedicated BWP configuration | | 1-4 |  | ULBWP.1.1 |  |
| PDSCH Reference Channel | | 1-2 |  | SR.3.2 TDD |  |
| 3-4 | SR.3.3 TDD |  |
| RMSI CORESET Reference Channel | | 1-2 |  | CR.3.1 TDD |  |
| 3-4 | CR.3.2 TDD |  |
| Dedicated CORESET Reference Channel | | 1-2 |  | CCR.3.1 TDD |  |
| 3-4 | CCR.3.7 TDD |  |
| OCNG parameters | | 1-4 |  | OP.1 |  |
| CP length | | 1-4 |  | Normal |  |
| PDSCH/PDCCH TCI state | | 1-4 |  | TCI.State.0 |  |
| CSI-RS for tracking | | 1-4 |  | TRS.2.1 TDD |  |
| SSB Configuration | | 1-2 |  | SSB.1 FR2 |  |
| 3-4 | SSB.2 FR2 |  |
| SMTC Configuration | | 1-4 |  | SMTC.1 |  |
| PRACH Configuration | | 1-4 |  | FR2 PRACH configuration 2 | A.3.8.3.2 |
| DRX configuration | | 1-4 |  | OFF |  |
| SSB index assigned as BFD RS (q0) | | 1-4 |  | 0 |  |
| SSB index assigned as CBD RS (q1) | | 1-4 |  | 1 |  |
| Beam failure detection transmission parameters | DCI format | 1-4 |  | 1-0 |  |
| Number of Control OFDM symbols | 1-4 |  | 2 |  |
| Aggregation level | 1-4 | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average SSS RE energy | 1-4 | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | 1-4 | dB | 0 |  |
| DMRS precoder granularity | 1-4 |  | REG bundle size |  |
| REG bundle size | 1-4 |  | 6 |  |
| Gap pattern ID | | 1-4 |  | N/A | No measurement gap is configured |
| rlmInSyncOutOfSyncThreshold | | 1-4 |  | absent | Value 0 is applied. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | 1-2 | dBm/SCS | -95 | Threshold used for Qin\_LR\_SSB |
| 3-4 | -92 |
| powerControlOffsetSS | | 1-4 |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | 1-4 |  | n1 | see TS 38.321 [7], clause 5.17 |
| beamFailureDetectionTimer | | 1-4 |  | pbfd4 | see TS 38.321 [7], clause 5.17 |
| CSI-RS configuration for CSI reporting | | 1-4 |  | CSI-RS.3.1 TDD |  |
| reportConfigType | | 1-4 |  | periodic |  |
| reportQuantity | | 1-4 |  | cri-RI-PMI-CQI |  |
| CSI reporting periodicity | | 1-4 | slot | 40 |  |
| CSI reporting offset | | 1-4 | slot | 4 |  |
| T310 | | 1-4 | ms | 1000 |  |
| N310 | | 1-4 |  | 2 |  |
| T1 | | 1-4 | s | 1 | The UE shall be fully synchronized to cell 1 during T1 |
| T2 | | 1-4 | s | 2.6 |  |
| T3 | | 1-4 | s | 1.64 |  |
| T4 | | 1-4 | s | 0 |  |
| T5 | | 1-4 | s | 1.01 |  |
| D1 | | 1-4 | s | 0.97 |  |
| 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.5.5.5.5.1-3: Cell specific test parameters for FR2 PSCell for SSB-based beam failure detection and link recovery testing in non-DRX mode**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beamsNote 10 | |  | Rough | | | | |
| 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 1-4 | dB | 5Note 11 | -3Note 11 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1-4 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB\_RP of set q1 | Config 1-2 | dBm/ | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
|  | Config 3-4 | SCS | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
|  | Config 1-4 | dBm/120 kHz | -104.7 | | | | |
| Propagation condition | |  | TDL-A 30ns 75Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.5.5.5.5.1-1.  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.3.6.  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 11: This value allows up to 1dB degradation from applied SNR to UE baseband | | | | | | | |

****

**Figure A.5.5.5.5.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

##### A.5.5.5.5.2 Test Requirements

The UE behaviour during time duration T3 follows the requirements defined in clause 8.5.7.3:

* The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on BFD-RS symbols to be measured for beam failure detection.

The UE behaviour during time durations T4 and T5 follows the requirements defined in clause 8.5.8.3:

* The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on reference symbols to be measured for candidate beam detection.

### A.5.5.6 Active BWP switch

#### A.5.5.6.1 DCI-based and Timer-based Active BWP Switch

##### A.5.5.6.1.1 E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC

###### A.5.5.6.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6. Supported test configurations are shown in Table A.5.5.6.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one PSCell (Cell 2) as given in Table A.5.5.6.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of PSCell is specified in Table A.5.5.6.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.6.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 in PSCell.

- UE is configured with a *bwp-InactivityTimer* timer value for PSCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for PSCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in PSCell’s slot # denoted *i*. The UE should switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of PSCell’s DL slot (*i+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than the first UL slot that occurs after the beginning of slot (*i+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on PSCell’s BWP-2 starting from the first DL slot that occurs after the beginning of slot (*i+TBWPswitchDelay*).

During T2, the test equipment won’t transmit DCI format for PDSCH reception on PSCell(Cell 2).

During T3,

The time period T3 starts from the slot #*j*, where j is the first slot of the half subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of PSCell’s DL slot (*j+TBWPswitchDelay*) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest on the first UL slot that occurs after the beginning of slot (*j+TBWPswitchDelay+k1*). The UE shall be continuously scheduled on PSCell’s BWP-1 starting from the first DL slot that occurs after the beginning of slot (*j+TBWPswitchDelay*).

The test equipment verifies the DL BWP switch time in PSCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

Table A.5.5.6.1.1.1-1: DL BWP switch supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: A UE which fulfils the requirements in test case A.5.5.2.2 can skip the test cases in A.5.5.2.1. | |

Table A.5.5.6.1.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

Table A.5.5.6.1.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 2 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Active BWP ID |  | 1, 2 |
| Initial DL BWP Configuration |  | DLBWP.0.2 Note 2 |
| Active DL BWP-1 Configuration |  | DLBWP.1.1 Note 2 |
| Active DL BWP-2 Configuration |  | DLBWP.1.3 Note 2 |
| Initial UL BWP Configuration |  | ULBWP.0.2 Note 2 |
| Active UL BWP-1 Configuration |  | ULBWP.1.1 Note 2 |
| Active UL BWP-2 Configuration |  | ULBWP.1.3 Note 2 |
| PDSCH Reference measurement channel |  | SR.3.1 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.1 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State |  | TCI.State.0 |
| TRS Configuration |  | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation Condition |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | |

Table A.5.5.6.1.1.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beamsNote 6 |  | Fine |
| NocNote 1 | dBm/15 kHz | -112 |
| NocNote 1 | dBm/SCS | -103 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 |
| Ês/Iot | dB | 18 |
| IoNote2 | dBm/95.04 MHz Note4 | -55.94 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | |

###### A.5.5.6.1.1.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (*i+TBWPswitchDelay*+*k1*).

During T3, the UE shall start to send the ACK/NACK for PSCell from the first UL slot that occurs after the beginning of DL slot (*j+TBWPswitchDelay*+*k1*).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration *TBWPswitchDelay* defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (*i+ TBWPswitchDelay*+*k1*), (*j+ TBWPswitchDelay*+*k1*), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

##### A.5.5.6.1.2 E-UTRAN – NR PSCell FR2 with FR2 SCell DL active BWP switch in non-DRX in synchronous EN-DC

###### A.5.5.6.1.2.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement defined in clause 8.6.2, and interruption requirements for NR victim cell defined in clause 8.2.1.2. 7. Supported test configurations are shown in Table A.5.5.6.1.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one PSCell (Cell 2) and one SCell (Cell 3) as given in Table A.5.5.6.1.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of PSCell and SCell are specified in Table A.5.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) and SCell (Cell 3) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 3 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3 (SCell) on radio channel 3 (SCC).

- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 3 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.

- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-0 in Cell 2 before starting the test.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 in SCell.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-0 in PSCell.

- UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

During T1,

Time period T1 starts when a DCI format 1\_1 command for SCell DL BWP switch, sent from the test equipment to the UE, is received at the UE side in SCell’s slot # denoted *i*. The UE shall switch its bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of SCell’s DL slot (*i+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell no later than the first UL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-2 starting from the first DL slot that occurs after the beginning of slot (*i+*TBWPswitchDelay).

PSCell(Cell 2) interruption due to BWP switch on SCell shall occur within the BWP switch delay.

During T2, the test equipment won’t transmit DCI format for PDSCH reception on SCell(Cell 3).

During T3,

The time period T3 starts from the slot #*j*, where j is the first slot of the half subframe immediately after *bwp-InactivityTimer* timer expires. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1.

The UE shall be able to receive PDSCH on the first DL slot that occurs after the beginning of SCell’s DL slot (*j+*TBWPswitchDelay) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell at latest on the first UL slot that occurs after the beginning of slot (*j+*TBWPswitchDelay+k1). The UE shall be continuously scheduled on SCell’s BWP-1 starting from the first DL slot that occurs after the beginning of slot (*j+TBWPswitchDelay*).

PSCell(Cell 2) interruption due to BWP switch of SCell shall occur within the BWP switch delay.

The test equipment verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The test equipment verifies that potential interruption to NR PSCell is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during BWP switch of SCell.

**Table A.5.5.6.1.2.1-1: DL BWP switch supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: A UE which fulfils the requirements in test case A.5.5.6.1.2 can skip the test cases in A.5.5.6.1.1.  Note 3: NR configuration is the same for PSCell and SCells. | |

**Table A.5.5.6.1.2.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2, 3 | Two NR radio channels are used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| Active SCell |  | Cell 3 | SCell on RF channel number 3. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| *bwp-InactivityTimer* | ms | 200 |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on SCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| Cell3 timing offset to cell2 | μs | 3 | Synchronous cells |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |
| T3 | s | 0.2 |  |

**Table A.5.5.6.1.2.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 2** | **Cell 3** |
| Frequency Range |  | FR2 | |
| Duplex mode |  | TDD | |
| TDD configuration |  | TDDConf.3.1 | |
| BWchannel |  | 100 MHz: NRB,c = 66 | |
| Active BWP ID |  | 0 | 1,2 |
| Initial DL BWP Configuration |  | DLBWP.0.2 | DLBWP.0.2 |
| Active DL BWP-0 Configuration |  | DLBWP.0.2 | N.A. |
| Active DL BWP-1 Configuration |  | N.A. | DLBWP.1.3 |
| Active DL BWP-2 Configuration |  | N.A. | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 | N.A. |
| Active UL BWP-0 Configuration |  | ULBWP.0.2 | N.A. |
| Active UL BWP-1 Configuration |  | N.A. | N.A. |
| Active UL BWP-2 Configuration |  | N.A. | N.A. |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | |
| RMSI CORESET parameters |  | CR.3.1 TDD | |
| Dedicated CORESET parameters |  | CCR.3.1 TDD | |
| OCNG Patterns |  | OP.1 | |
| SSB Configuration |  | SSB.1 FR2 | |
| SMTC Configuration |  | SMTC.1 | |
| TCI State |  | TRS.2.1 TDD | |
| TRS Configuration |  | TCI.State.0 | |
| Antenna Configuration |  | 1x2 | |
| Propagation Condition |  | AWGN | |
| EPRE ratio of PSS to SSS | 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 |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc 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: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3. | | | |

**Table A.5.5.6.1.2.1-4: OTA related test parameters for DL BWP switch in synchronous EN-DC**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 2** | **Cell 3** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15 | |
| Assumption for UE beamsNote 6 |  | Fine | |
| NocNote 1 | dBm/15 kHz | -112 | -112 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 | -85 |
| Ês/Iot | dB | 18 | 18 |
| IoNote2 | dBm/95.04 MHz Note4 | -55.94 | -55.94 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | |

###### A.5.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK/NACK for SCell from the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay+k1).

During T3, the UE shall start to send the ACK/NACK for SCell from the first UL slot that occurs after the beginning of DL slot (*j+*TBWPswitchDelay+k1).

Where, k1 is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* [2], UE shall finish BWP switch within the time duration TBWPswitchDelay defined in Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

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

During T1, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PSCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PSCell shall not be longer than the interruption duration specified for active BWP switch in Clause 8.6.2.

All of the above test requirements shall be fulfilled in order for the observed active BWP switch interruption to be counted as correct.

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

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (*i+*TBWPswitchDelay+k1), (*j+*TBWPswitchDelay+k1), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### A.5.5.6.2 RRC-based Active BWP Switch

##### A.5.5.6.2.1 E-UTRAN – NR PSCell FR2 DL active BWP switch with non-DRX in synchronous EN-DC

###### A.5.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in clause 8.6.3. Supported test configurations are shown in Table A.5.5.6.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one PSCell (Cell 2) as given in Table A.5.5.6.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of PSCell are specified in Table A.5.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on E-UTRA PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) and to Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell).

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWPis BWP-1 of initial condition in PSCell.

All cells have constant signal levels throughout the test.

The test consists of 1 time period, with duration of T1.

During T1,

If the *RRCReconfiguration* is embedded in E-UTRA RRC message, time period T1 starts when a E-UTRA RRC message *RRCConnectionReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side from PCell in PSCell’s slot # denoted *i*. Otherwise, i.e., if the *RRCReconfiguration* is not embedded in E-UTRA RRC message, time period T1 starts when a *RRCReconfiguration* with updated bandwidth part configuration, sent from the test equipment to the UE, is completely received at the UE side in from PSCell in PSCell’s slot # denoted *i*. The UE shall reconfigure its bandwidth part with the updated bandwidth part BWP-1 of final condition.

The UE shall be able to completely receive PDSCH on PSCell from the first DL slot occurs right after the beginning of PSCell’s DL slot as defined in clause 8.6.3 and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot.. The UE shall be continuously scheduled on PSCell’s BWP-1 starting from the first DL slot that occurs right after the beginning of DL slot .

*TRRCprocessingDelay* and *TBWPswitchDelayRRC* are defined in clause 8.6.3.

The test equipment verifies the DL BWP switch time in PSCell by counting the time from the time when the RRCReconfiguration message including updated BWP configurationis is sent till the time when a vaild ACK/NACK is received.

Table A.5.5.6.2.1.1-1: DL BWP switch supported test configurations

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

**Table A.5.5.6.2.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 |  |

**Table A.5.5.6.2.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** |
| Frequency Range | |  | FR2 |
| Duplex mode | |  | TDD |
| TDD configuration | |  | TDDConf.3.1 |
| BWchannel | |  | 100 MHz: NRB,c = 66 |
| Active BWP ID | |  | 1, 2 |
| Initial DL BWP Configuration | |  | DLBWP.0.2 |
| Initial UL BWP Configuration | |  | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration |  | DLBWP.1.3 |
| Active UL BWP-1 Configuration |  | ULBWP.1.3 |
| Final  Condition | Active DL BWP-1 Configuration |  | DLBWP.1.1 |
| Active UL BWP-1 Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD |
| RMSI CORESET parameters | |  | CR.3.1 TDD |
| Dedicated CORESET parameters | |  | CCR.3.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | |  | SSB.1 FR2 |
| SMTC Configuration | |  | SMTC.1 |
| TCI State | |  | TCI.State.0 |
| TRS Configuration | |  | TRS.2.1 TDD |
| Antenna Configuration | |  | 1x2 |
| Propagation Condition | |  | AWGN |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc 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: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3]. | | | |

Table A.5.5.6.2.1.1-4: OTA related test parameters for BWP switching test case

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | | Unit | Cell 2 |
| Angle of arrival configuration | |  | Setup 1 according to A.3.15 |
| Assumption for UE beamsNote 5 | |  | Fine |
| Note1 | NR\_TDD\_FR2\_A | dBm/15kHz | -112 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note1 | NR\_TDD\_FR2\_A | dBm/SCS | -103 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| SS-RSRPNote2 | NR\_TDD\_FR2\_A | dBm/SCS Note3 | -85 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
|  | | dB | 18 |
| IoNote2 | NR\_TDD\_FR2\_A | dBm/95.04 MHz Note4 | -55.94 |
| NR\_TDD\_FR2\_B |
| NR\_TDD\_FR2\_F |
| NR\_TDD\_FR2\_G |
| NR\_TDD\_FR2\_T |
| NR\_TDD\_FR2\_Y |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | |

###### A.5.5.6.2.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell from the first DL slot that occurs right after the beginning of DL slot and starts to report valid ACK/NACK for the PSCell from the first UL slot that occurs after the beginning of DL slot.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

All of the above test requirements shall be fulfilled in order for the observed PSCell active BWP switch delay to be counted as correct.

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

### A.5.5.7 PSCell addition and release delay

#### A.5.5.7.1 Addition and Release Delay of NR PSCell

##### A.5.5.7.1.1 Test purpose and environment

The purpose of this test is to verify that the NR PSCell addition and release delays under EN-DC are within the requirements stated in clause 7.31.2 of TS 36.133 [15] for the case when the PSCell is unknown by the UE at the time of addition.

Supported test configurations are shown in A.5.5.7.1.1-1. The test parameters for the E-UTRA cell are given in Table A.3.7.2.2-1. The E-UTRA cell once set up is not changed across time.

The test parameters for NR cell are given in Tables A.5.5.7.1.1-2, cell-specific parameters in A.5.5.7.1.1-3 and OTA parameters in A.5.5.7.1.1-4 below. The test consists of four successive time periods with duration of T1, T2, T3 and T4. There are two carriers each with one cell. Before the test starts the UE is connected to Cell 1 (E-UTRA PCell) on radio channel 1 (PCC) but is not aware of Cell 2 (NR PSCell) on radio channel 2. The UE is only monitoring the PCC. During T1 only Cell1 is known to the UE.

The test system shall send a RRC message to the UE to add PSCell (Cell 2) on radio channel 2. The RRC message (to add PSCell) also includes a request for the UE to start periodic CSI reporting for the PSCell after the PSCell has been successfully added. The RRC message to add PSCell shall be sent to the UE during period T1. The point in time at which the RRC message to add PSCell (Cell2) is received at the UE antenna connector defines the start of period T2.

The test system shall observe the periodic reporting of CSI for PSCell during T3. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T3.

The test system shall send a RRC message to the UE to release PSCell (Cell 2) on radio channel 2. The RRC message to release PSCell (Cell2) shall be sent to the UE during period T3, after the UE has sent at least one CQI report with non-zero CQI index for PSCell (Cell 2). The point in time at which the RRC message to release PSCell (Cell2) is received at the UE antenna connector defines the start of period T4.

Table A.5.5.7.1.1-1: Supported test configurations for FR2 PSCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.5.5.7.1.1-2: General Test Parameters for PSCell Addition and Release

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1, 2 | Two radio channels are used for this test. One for E-UTRA cell and second for NR Cell |
| Initial Condition | Active PCell |  | Cell1 | PCell on RF channel number 1. |
| Neighbour cell | Cell2 | Neighbour cell on RF channel number 2. |
| Final Condition | Active PCell | Cell1 | PCell on RF channel number 1. |
| Neighbour Cell | Cell2 | PSCell released on RF channel number 2. |
| B1 | Hysteresis | dB | 0 | Hysteresis for evaluation of event B1. |
| Threshold RSRP | dBm | -118 | Actual RSRP threshold for event B1. Needs to take absolute accuracy tolerance in clause 9.1.11.1 into account plus margin. |
| Time to Trigger | s | 0 |  |
| DRX | |  | OFF | Continuous monitoring of primary cell |
| PRACH configuration on cell2 | |  | FR2 configuration 2 | Captured in A.3.8.3.2 |
| Cell-individual offset for cells on RF channel number 1 | | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on RF channel number 2 | | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| T1 | | s | 1 | During this time the PCell shall be known and cell2 shall be unknown. |
| T2 | | s | 1 | During this time the UE adds the PSCell. |
| T3 | | s | 1 | During this time the UE sends CSI reports for PSCell. |
| T4 | | s | 1 | During this time the UE releases the PSCell. |

Table A.5.5.7.1.1-3: Cell Specific Parameters for PSCell Addition and Release

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Test | | | |
| T1 | T2 | T3 | T4 |
| E-UTRA Channel Number |  | 1,2 | 1 | | | |
| NR Channel Number |  | 1,2 | 2 | | | |
| Duplex Mode |  | 1,2 | TDD | | | |
| TDD configuration |  | 1,2 | TDDConf.3.1 | | | |
| BWchannel | MHz | 1,2 | 100: NRB,c = 66 | | | |
| Data RBs allocated |  | 1,2 | 48 | | | |
| Initial BWP Configuration |  | 1,2 | DLBWP.0.1  ULBWP.0.1 | | | |
| Dedicated BWP Configuration |  | 1,2 | DLBWP.1.1  ULBWP.1.1 | | | |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 | | | |
| PDSCH Reference measurement channel |  | 1,2 | SR.3.3 TDD | | | |
| RMSI CORESET Reference Channel |  | 1,2 | CR.3.2 TDD | | | |
| Dedicated CORESET Reference Channel |  | 1,2 | CCR.3.7 TDD | | | |
| OCNG Patterns |  | 1,2 | OP.3 | | | |
| SSB configuration |  | 1,2 | SSB.2 FR2 | | | |
| SMTC configuration |  | 1,2 | SMTC.2 | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 | | | |
| TRS Configuration |  | 1,2 | TRS.2.1 TDD | | | |
| CSI-RS configuration for CSI reporting |  | 1,2 | CSI-RS.3.1 TDD | | | |
| reportConfigType |  | 1,2 | periodic | | | |
| reportQuantity |  | 1,2 | cri-RI-PMI-CQI | | | |
| CSI reporting periodicity | slot | 1,2 | 40 | | | |
| CSI reporting offset | slot | 1,2 | 4 | | | |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation condition |  | 1,2 | AWGN | | | |

Table A.5.5.7.1.1-4: OTA related test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | | | | | |
|  |  | T1 | | T2 | T3 | | T4 |
| Angle of arrival configuration |  | Setup 2a according to clause A.3.15.2.1 | | | | | |
| Assumption for UE beamsNote 6 |  | Rough | | | | | |
| Ês Note2 | dBm/SCS | -∞ |  | | -81 |  | |
| SSB\_RPNote 2, Note 4 | dBm/SCS | -∞ |  | | -81 |  | |
| BB Note 2, Note 7 | dB | -∞ |  | | 4.88 |  | |
| IoNote 2, Note 4 | dBm/95.04 MHz | N/A |  | | -56.41 |  | |
| Note 1: Void  Note 2: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

##### A.5.5.7.1.2 Test Requirements

The UE shall transmit the PRACH to PSCell at latest 582 msNote1 into T2.

The UE shall send at least one CSI report for PSCell with non-zero CQI index during T3.

The UE shall periodically send CSI reports for PSCell after the UE has sent first CQI report with non-zero CQI index during T3.

The UE shall stop sending CSI reports for PSCell in at latest 20 ms into T4.

All the above test requirements shall be fulfilled for the observed PSCell addition delay and PSCell release delay to be counted as correct. The rate of correct observed PSCell addition delay and PSCell release delay during repeated tests shall be at least 90%.

Note1: The PSCell addition delay can be expressed as follows as specified in clause 7.31.2 of TS 36.133 [15]:

Tconfig\_PSCell = TRRC\_delay + Tprocessing + Tsearch + T∆ + TPSCell\_ DU + 2ms

Where:

TRRC\_delay = 20ms

Tprocessing = 40ms

Tsearch = 8\*3\*20 = 480 ms

T∆ = 20ms

TPSCell\_ DU = 1\*10+10 = 20 ms

### A.5.5.8 Active TCI state switch delay

#### A.5.5.8.1 MAC-CE based active TCI state switch

##### A.5.5.8.1.1 E-UTRAN – NR PSCell FR2 active TCI state switch for a known TCI state

###### A.5.5.8.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3Supported test configurations are shown in Table A.5.5.8.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.8.1.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.8.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.8.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 2 different TCI states for PSCell, PDCCH TCI state 0 (QCL’d to SSB0) and TCIstate 1 (QCL’d to SSB1), in Cell 2 before starting the test.

- UE is indicated in TCI state 0 as the active PDCCH TCI state

The test consists of two time periods, T1 and T2. Figure A.5.5.8.1.1.1-1 and Figure A.5.5.8.1.1.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which PDCCH-TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI state 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a MAC-CE command indicating a switch to TCI state 1. *tci-PresentInDCI* is not configured in the PDSCH configuration, i.e. TCI state for the PDSCH is identical to the PDCCH TCI state.

The test equipment verifies that UE can be scheduled on PSCell on TCI state 0 till n+ THARQ +3 ms.The test equipment also verifies the TCI state switch time in PSCell by scheduling the UE on TCI state 1 after n+ THARQ +3 ms + (Tfirst-SSB + TSSB-proc) .

Table A.5.5.8.1.1.1-1: Supported test configurations

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

Table A.5.5.8.1.1.1-2: General test parameters for TCI state switch

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 |  |

Table A.5.5.8.1.1.1-3: NR Cell specific test parameters for TCI state switch

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 2 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Initial DL BWP Configuration |  | DLBWP.0.2 |
| Dedicated DL BWP Configuration |  | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 |
| Dedicated UL BWP Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3.2 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.5 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State 0 |  | TCI.State.2 |
| TCI State 1 |  | TCI.State.3 |
| TRS Configuration |  | TRS.2.1 TDD  TRS.2.2 TDD |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation Condition |  | AWGN |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

Table A.5.5.8.1.1.1-4: OTA related test parameters for TCI state switch

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | | | |
| SSB0 | | SSB1 | |
| T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  | Setup 3 according to clause A.3.15.3 | | | |
| AoA1 | | AoA2 | |
| Assumption for UE beams Note 6 |  | Rough | | Rough | |
| Ês | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SSB-RP Note 2 | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| BB Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | -56.0 |
| Note 1: Void  Note 2: SSB-RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation.  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | |



Figure A.5.5.8.1.1.1-1: Time multiplexed downlink transmissions during T1



Figure A.5.5.8.1.1.1-2: Time multiplexed downlink transmissions during T2

###### A.5.5.8.1.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with results for both SSB0 and SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to receive on TCI state 0 till n+ THARQ +3 ms

- be able to start receiving on TCI state 1 after n+ THARQ +5 ms + Tfirst-SSB

#### A.5.5.8.2 RRC based active TCI state switch

##### A.5.5.8.2.1 E-UTRAN – NR PSCell FR2 active TCI state switch for a known TCI state

###### A.5.5.8.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the active TCI state switch delay requirement defined in clause 8.10.3Supported test configurations are shown in Table A.5.5.8.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.8.2.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell is specified in Table A.5.5.8.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.8.2.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (PSCell) on radio channel 2 (PSCC).

- UE is configured with 1 TCI state for PSCell, PDCCH-TCI-state0 (QCL’d to SSB0)

- UE is indicated in TCI state0 as the active TCI state

The test consists of two time periods, T1 and T2. Figure A.5.5.8.2.1.1-1 and Figure A.5.5.8.2.1.1-2 show the Time multiplexed (allocation in Frequency is symbolic) downlink transmissions from each Angle of Arrival. During T1 only SSB to which TCI-state0 is QCL’d is transmitted. At the beginning of T2, the SSB corresponding to TCI-state1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. In slot n which is within 1280 ms of UE providing L1-RSRP report with results for both SSB0 and SSB1, UE receives a RRC command indicating a switch to TCI-state1.

The test equipment verifies the TCI state switch time in PSCell by scheduling the UE on TCI state 1 after n+ TRRC\_processing  + Tfirst-SSB + 2ms.

Table A.5.5.8.2.1.1-1: Supported test configurations

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

Table A.5.5.8.2.1.1-2: General test parameters for TCI state switch

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| E-UTRA RF Channel Number |  | 1 | One E-UTRA radio channel is used for this test |
| NR RF Channel Number |  | 2 | One NR radio channel is used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1. |
| Active PSCell |  | Cell 2 | PSCell on RF channel number 2. |
| CP length |  | Normal |  |
| DRX |  | OFF | For both PCell and PSCell |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on PCC. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on PSCC. |
| Cell2 timing offset to cell1 | μs | 3 | Synchronous EN-DC |
| T1 | s | 0.2 |  |
| T2 | s | 2 |  |

Table A.5.5.8.2.1.1-3: NR Cell specific test parameters for TCI state switch

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Cell 2 |
| Frequency Range |  | FR2 |
| Duplex mode |  | TDD |
| TDD configuration |  | TDDConf.3.1 |
| BWchannel |  | 100 MHz: NRB,c = 66 |
| Initial DL BWP Configuration |  | DLBWP.0.2 |
| Dedicated DL BWP Configuration |  | DLBWP.1.1 |
| Initial UL BWP Configuration |  | ULBWP.0.2 |
| Dedicated UL BWP Configuration |  | ULBWP.1.1 |
| PDSCH Reference measurement channel |  | SR.3.2 TDD |
| RMSI CORESET parameters |  | CR.3.1 TDD |
| Dedicated CORESET parameters |  | CCR.3.1 TDD |
| OCNG Patterns |  | OP.5 |
| SSB Configuration |  | SSB.1 FR2 |
| SMTC Configuration |  | SMTC.1 |
| TCI State 0 |  | TC. State.2 |
| TCI State 1 |  | TCI.State.3 |
| TRS Configuration |  | TRS.2.1 TDD  TRS.2.2 TDD |
| reportConfigType |  | ssb-Index-RSRP |
| reportConfigType |  | periodic |
| Number of reported RS |  | 2 |
| L1-RSRP reporting period | slot | 640 |
| timeRestrictionForChannelMeasurements |  | configured |
| Correlation Matrix and Antenna Configuration |  | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |
| Propagation Condition |  | AWGN |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

Table A.5.5.8.2.1.1-4: OTA related test parameters for TCI state switch

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | | | |
| SSB0 | | SSB1 | |
| T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  | Setup 3 according to clause A.3.15.3 | | | |
| AoA1 | | AoA2 | |
| Assumption for UE beamsNote 6 |  | Rough | | Rough | |
| Ês | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SSB-RP Note 2 | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| BB Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | -56.0 |
| Note 1: Void  Note 2: SSB-RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 7: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | |



Figure A.5.5.8.2.1.1-1: Time multiplexed downlink transmissions during T1



Figure A.5.5.8.2.1.1-2: Time multiplexed downlink transmissions during T2

###### A.5.5.8.2.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with both SSB0 and SSB1.

After receiving RRC command in slot n, UE shall be able to start receiving on TCI state 1 after n+ TRRC\_processing  + Tfirst-SSB + 2ms.

## A.5.6 Measurement procedure

### A.5.6.1 Intra-frequency Measurements

#### A.5.6.1.1 EN-DC event triggered reporting test without gap under non-DRX

##### A.5.6.1.1.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.1.1-1.

Table A.5.6.1.1.1-1: supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.1.1-2, A.5.6.1.1.1-3 and A.5.6.1.1.1-4 below.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.5.6.1.1.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Value | Comment |
| Active cell |  | 1~4 | E-UTRAN PCell (Cell 1)  PSCell (Cell 2) |  |
| Neighbour cell |  | 1~4 | Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1~4 | 1: Cell 1  2: Cell 2 and Cell 3 | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| SMTC configuration |  | 1~4 | SMTC.1 |  |
| A3-Offset | dB | 1~4 | -11 |  |
| CP length |  | 1~4 | Normal |  |
| Hysteresis | dB | 1~4 | 0 |  |
| Time To Trigger | s | 1~4 | 0 |  |
| Filter coefficient |  | 1~4 | 0 | L3 filtering is not used |
| DRX |  | 1~4 | OFF |  |
| Time offset between Cell 1 and Cell 2 |  | 1~4 | 3 μs | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 |  | 1~4 | 3 μs | Synchronous cells |
| T1 | s | 1~4 | 5 |  |
| T2 | s | 1~4 | 5 |  |

Table A.5.6.1.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1~4 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1~4 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1,2 | 24 | | 24 | |
| 3,4 | 48 | | 48 | |
| Intial BWP configuration |  | 1~4 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1~4 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1~4 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1~4 | SSB | | SSB | |
| PDSCH RMC configuration |  | 1,2 | SR.3.2 TDD | | N/A | |
| 3,4 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1,2 | CR.3.1 TDD | | N/A | |
| 3,4 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1,2 | CCR.3.1 TDD | | N/A | |
| 3,4 | CCR.3.7 TDD | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1~4 | 120 | | 120 | |
| OCNG Patterns |  | 1~4 | OP.5 | | N/A | |
| TRS configuration |  | 1~4 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state |  | 1~4 | TCI.State.2 | | N/A | |
| cellIndividualOffset | dB | 1~4 | N/A | | 16 | |
| SSB configuration |  | 1, 2 | SSB.3 FR2 | | SSB.7 FR2 | |
| 3, 4 | SSB.4 FR2 | | SSB.8 FR2 | |
| Propagation Condition |  | 1~4 | AWGN | | AWGN | |

**Table A.5.6.1.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap without DRX**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 2 | | | Cell 3 | |
|  |  |  | T1 | T2 | | T1 | T2 |
| AoA setup |  | 1~4 | Setup 3 defined in A.3.15.3 | | | | |
|  |  |  | **AoA1** | | | **AoA2** | |
| Assumption for UE beamsNote 4 |  | 1~4 | Rough | | | Rough | |
| Es | dBm/SCS | 1, 2 | -89 | -89 | -Infinity | | -89 |
| 3, 4 | -86 | -86 | -Infinity | | -86 |
| BB Note 5 | dB | 1~4 | -0.12 | -0.12 | | -Infinity | -0.12 |
| SSB\_RP | dBm/SCS | 1, 2 | -89 | -89 | | -Infinity | -89 |
|  |  | 3, 4 | -86 | -86 | | -Infinity | -86 |
|  | dBm/95.04MHz | 1,2 | -64.41 | -64.41 | | -Infinity | -64.41 |
| 3,4 | -61.41 | -61.41 | | -Infinity | -61.41 |
| Time multiplexing of the downlink transmissions from each AoA | | 1~4 | Defined in Figure A.5.6.1.1.1-1 | | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Void  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |



Figure A.5.6.1.1.1-1: Time multiplexed downlink transmissions (Config 1,2 example)

##### A.5.6.1.1.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 2.4s for a UE supporting power class 1,

- 1.44s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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.5.6.1.2 EN-DC event triggered reporting test without gap under DRX

##### A.5.6.1.2.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.2.1-1.

**Table A.5.6.1.2.1-1: supported test configurations**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.2.1-2 ~ Table A.5.6.1.2.1-6 below.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.5.6.1.2.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Value | | Comment |
| Test 1 | Test 2 |
| Active cell |  | 1~4 | E-UTRAN PCell (Cell 1)  PSCell (Cell 2) | |  |
| Neighbour cell |  | 1~4 | Cell 3 | | Cell to be identified. |
| RF Channel Number |  | 1~4 | 1: Cell 1  2: Cell 2 and Cell 3 | | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| SMTC configuration |  | 1~4 | SMTC.1 | |  |
| A3-Offset | dB | 1~4 | -6 | |  |
| CP length |  | 1~4 | Normal | |  |
| Hysteresis | dB | 1~4 | 0 | |  |
| Time To Trigger | s | 1~4 | 0 | |  |
| Filter coefficient |  | 1~4 | 0 | | L3 filtering is not used |
| DRX |  | 1~4 | DRX.1 | DRX.7 | DRX related parameters are defined in Table A.5.6.1.2.1-4 |
| Time offset between Cell 1 and Cell 2 |  | 1~4 | 3 μs | | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 |  | 1~4 | 3 μs | | Synchronous cells |
| T1 | s | 1~4 | 5 | |  |
| T2 | s | 1~4 | 10 | 52 |  |

Table A.5.6.1.2.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1~4 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1~4 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1~4 | 66 | | 66 | |
| Intial BWP configuration |  | 1~4 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1~4 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1~4 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS |  | 1~4 | SSB | | SSB | |
| PDSCH RMC configuration |  | 1,2 | SR.3.2 TDD | | N/A | |
| 3,4 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1,2 | CR.3.1 TDD | | N/A | |
| 3,4 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1,2 | CCR.3.1 TDD | | N/A | |
| 3,4 | CCR.3.7 TDD | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1~4 | 120 | | 120 | |
| OCNG Patterns |  | 1~4 | OP.1 | | OP.1 | |
| PDSCH/PDCCH TCI state |  | 1~4 | TCI.State.2 | | N/A | |
| CSI-RS for tracking |  |  | TRS.2.1 TDD | | N/A | |
|  |  | TRS.2.1 TDD | | N/A | |
| SSB configuration |  | 1, 2 | SSB.3 FR2 | | SSB.3 FR2 | |
| 3, 4 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition |  | 1~4 | AWGN | | AWGN | |

Table A.5.6.1.2.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 without gap with DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|  |  |  | T1 | T2 | T1 | T2 |
| AoA setup |  | 1~4 | Setup 1 defined in A.3.15.1 | | | |
| Assumption for UE beamsNote 4 |  | 1~4 | Rough | | | |
| BB Note 5 | dB | 1~4 | 3.77 | -1.52 | -Infinity | -1.52 |
| Note 2 | dBm/15 KHz | 1~4 | -98 | | | |
| Note 2 | dBm/SCS | 1, 2 | -89 | | | |
|  |  | 3, 4 | -86 | | | |
| SSB\_RP | dBm/SCS | 1, 2 | -85 | -85 | -Infinity | -85 |
|  |  | 3, 4 | -82 | -82 | -Infinity | -82 |
|  | dB | 1~4 | 4 | 4 | -Infinity | 4 |
|  | dBm/95.04MHz | 1~4 | -54.53 | -52.18 | See Cell 2 columns | |
| 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: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.5.6.1.2.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,

- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.2s for a UE supporting power class 1,

- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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.5.6.1.3 EN-DC event triggered reporting test with per-UE gaps under non-DRX

##### A.5.6.1.3.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.3.1-1.

**Table A.5.6.1.3.1-1: supported test configurations**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.3.1-2 ~ 4 below.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

Table A.5.6.1.3.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Value | Comment |
| Active cell |  | 1~4 | E-UTRAN PCell (Cell 1)  PSCell (Cell 2) |  |
| Neighbour cell |  | 1~4 | Cell 3 | Cell to be identified. |
| RF Channel Number |  | 1~4 | 1: Cell 1  2: Cell 2 and Cell 3 | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| Gap type |  | 1~4 | Per-UE gaps |  |
| Measurement gap repitition periodicity | ms | 1~4 | 40 |  |
| Measurement gap length | ms | 1~4 | 6 |  |
| Measurement gap offset | ms | 1~4 | 39 |  |
| SMTC configuration |  | 1~4 | SMTC.1 |  |
| CSI-RS parameters |  | 1~4 | CSI-RS.3.2 TDD resource #0 | Resource #1 is not used |
| A3-Offset | dB | 1~4 | -11 |  |
| CP length |  | 1~4 | Normal |  |
| Hysteresis | dB | 1~4 | 0 |  |
| Time To Trigger | s | 1~4 | 0 |  |
| Filter coefficient |  | 1~4 | 0 | L3 filtering is not used |
| DRX |  | 1~4 | OFF |  |
| Time offset between Cell 1 and Cell 2 |  | 1~4 | 3 μs | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 |  | 1~4 | 3 μs | Synchronous cells |
| T1 | s | 1~4 | 5 |  |
| T2 | s | 1~4 | 5 |  |

Table A.5.6.1.3.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 2 | | | Cell 3 | |
| T1 | T2 | | T1 | T2 |
| TDD configuration |  | 1~4 | TDDConf.3.1 | | | TDDConf.3.1 | |
| BWchannel | MHz | 1~4 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1,2 | 24 | | | 24 | |
| 3,4 | 48 | | | 48 | |
| Intial BWP configuration |  | 1~4 | DLBWP.0.1  ULBWP.0.1 | | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1~4 | DLBWP.1.2 | | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1~4 | ULBWP.1.2 | | | ULBWP.1.1 | |
| RLM-RS |  | 1~4 | CSI-RS | | | SSB | |
| PDSCH RMC configuration |  | 1,2 | SR.3.2 TDD | | | N/A | |
| 3,4 | SR.3.3 TDD | | |
| RMSI CORESET RMC configuration |  | 1,2 | CR.3.1 TDD | | | N/A | |
| 3,4 | CR.3.2 TDD | | | N/A | |
| Dedicated CORESET RMC configuration |  | 1,2 | CCR.3.1 TDD | | | N/A | |
| 3,4 | CCR.3.7 TDD | | | N/A | |
| TRS configuration |  | 1~4 | TRS.2.1 TDD | | | N/A | |
| PDSCH/PDCCH TCI state |  | 1~4 | TCI.State.2 | | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1~4 | 120 | | | 120 | |
| OCNG Patterns |  | 1~4 | OP.5 | | | N/A | |
| cellIndividualOffset | dB | 1~4 | N/A | | | 16 | |
| SSB |  | 1, 2 | SSB.3 FR2 | | | SSB.7 FR2 | |
| 3, 4 | SSB.4 FR2 | | | SSB.8 FR2 | |
| Propagation Condition |  | 1~4 | AWGN | | AWGN | | |

Table A.5.6.1.3.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps without DRX

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 2 | | | Cell 3 | | | |
|  |  |  | T1 | T2 | | T1 | | T2 | |
| AoA setup |  | 1~4 | Setup 3 defined in A.3.15.3 | | | | | | |
|  |  |  | **AoA1** | | | **AoA2** | | | |
| Assumption for UE beamsNote 4 |  | 1~4 | Rough | | | Rough | | | |
| Es | dBm/SCS | 1, 2 | -89 | | -89 | | -Infinity | | -89 |
| 3, 4 | -86 | | -86 | | -Infinity | | -86 |
| BB Note 5 | dB | 1~4 | -0.12 | -0.12 | | -Infinity | | -0.12 | |
| SSB\_RP | dBm/SCS | 1, 2 | -89 | -89 | | -Infinity | | -89 | |
|  |  | 3, 4 | -86 | -86 | | -Infinity | | -86 | |
|  | dBm/95.04MHz | 1,2 | -64.41 | -64.41 | | -Infinity | | -64.41 | |
| 3,4 | -61.41 | -61.41 | | -Infinity | | -61.41 | |
| Time multiplexing of the downlink transmissions from each AoA | | 1~4 | Defined in Figure A.5.6.1.3.1-1 | | | | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Void  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | | |



Figure A.5.6.1.3.1-1: Time multiplexed downlink transmissions (Config 1,2 example)

##### A.5.6.1.3.2 Test Requirements

In the test, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 3.2s for a UE supporting power class 1,

- 1.92s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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.5.6.1.4 EN-DC event triggered reporting test with per-UE gaps under DRX

##### A.5.6.1.4.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the TDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2. Supported test configurations are shown in table A.5.6.1.4.1-1.

Table A.5.6.1.4.1-1: supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on the same frequency as the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.6.1.4.1-2 ~ 6.

During the test, Cell 2 and Cell 3 are transmitted from the direction determined according to A3.8.

There are two BWPs configured in Cell 2, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 2. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

In the measurement control information, a measurement object is configured for the frequency of the PSCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of cell 3.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.5.6.1.4.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Value | | Comment |
| Test 1 | Test 2 |
| Active cell |  | 1~4 | E-UTRAN PCell (Cell 1)  PSCell (Cell 2) | |  |
| Neighbour cell |  | 1~4 | Cell 3 | | Cell to be identified. |
| RF Channel Number |  | 1~4 | 1: Cell 1  2: Cell 2 and Cell 3 | | One TDD carrier frequency is used for the NR cells and one TDD or FDD carrier frequency is used for E-UTRAN cell. |
| Gap type |  | 1~4 | Per-UE gaps | |  |
| Measurement gap repitition periodicity | ms | 1~4 | 40 | |  |
| Measurement gap length | ms | 1~4 | 6 | |  |
| Measurement gap offset | ms | 1~4 | 39 | |  |
| SMTC configuration |  | 1~4 | SMTC.1 | |  |
| CSI-RS parameters |  | 1~4 | CSI-RS.3.2 TDD resource #0 | | Resource #1 is not used |
| A3-Offset | dB | 1~4 | -6 | |  |
| CP length |  | 1~4 | Normal | |  |
| Hysteresis | dB | 1~4 | 0 | |  |
| Time To Trigger | s | 1~4 | 0 | |  |
| Filter coefficient |  | 1~4 | 0 | | L3 filtering is not used |
| DRX |  | 1~4 | DRX.1 | DRX.7 | DRX related parameters are defined in Table A.5.6.1.4.1-5 |
| Time offset between Cell 1 and Cell 2 |  | 1~4 | 3 μs | | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 |  | 1~4 | 3 μs | | Synchronous cells |
| T1 | s | 1~4 | 5 | |  |
| T2 | s | 1~4 | 10 | 52 |  |

Table A.5.6.1.4.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1~4 | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 1~4 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 1~4 | 66 | | 66 | |
| Intial BWP configuration |  | 1~4 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration |  | 1~4 | DLBWP.1.2 | | DLBWP.1.1 | |
| Active UL BWP configuration |  | 1~4 | ULBWP.1.2 | | ULBWP.1.1 | |
| RLM-RS |  | 1~4 | CSI-RS | | SSB | |
| PDSCH RMC configuration |  | 1,2 | SR.3.2 TDD | | N/A | |
| 3,4 | SR.3.3 TDD | |
| RMSI CORESET RMC configuration |  | 1,2 | CR.3.1 TDD | | N/A | |
| 3,4 | CR.3.2 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1,2 | CCR.3.1 TDD | | N/A | |
| 3,4 | CCR.3.7 TDD | | N/A | |
| TRS configuration |  | 1~4 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state |  | 1~4 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | kHz | 1~4 | 120 | | 120 | |
| OCNG Patterns |  | 1~4 | OP.1 | | OP.1 | |
| SSB |  | 1, 2 | SSB.3 FR2 | | SSB.3 FR2 | |
| 3, 4 | SSB.4 FR2 | | SSB.4 FR2 | |
| Propagation Condition |  | 1~4 | AWGN | | AWGN | |

Table A.5.6.1.4.1-4: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with TDD PSCell in FR2 with per-UE gaps with DRX

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|  |  |  | T1 | T2 | T1 | T2 |
| AoA setup |  | 1~4 | Setup 1 defined in A.3.15.1 | | | |
| Assumption for UE beamsNote 4 |  | 1~4 | Rough | | Rough | |
| BB Note 5 | dB | 1~4 | 3.77 | -1.52 | -Infinity | -1.52 |
| Note 2 | dBm/15 KHz | 1~4 | -98 | | | |
| Note 2 | dBm/SCS | 1, 2 | -89 | | | |
|  |  | 3, 4 | -86 | | | |
| SSB\_RP | dBm/SCS | 1, 2 | -85 | -85 | -Infinity | -85 |
|  |  | 3, 4 | -82 | -82 | -Infinity | -82 |
|  | dB | 1~4 | 4 | 4 | -Infinity | 4 |
|  | dBm/95.04MHz | 1~4 | -54.53 | -52.18 | See Cell 2 columns | |
| 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: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

**Table A.5.6.1.4.1-5: Void**

**Table A.5.6.1.4.1-6: Void**

##### A.5.6.1.4.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 7.2s for a UE supporting power class 1,

- 4.32s for a UE supporting power class 2, 3 and 4

In test 2, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

- 51.20s for a UE supporting power class 1,

- 30.72s for a UE supporting power class 2, 3 and 4

The UE is not required to read the neighbour cell SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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.5.6.2 Inter-frequency Measurements

#### A.5.6.2.1 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is not used

##### A.5.6.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.1.1-1, A.5.6.2.1.1-2, and A.5.6.2.1.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.1.1-2 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.1.1-1.

Table A.5.6.2.1.1-1 EN-DC event triggered reporting tests without SSB index reading for FR2-FR2

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Table A.5.6.2.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | Config 1,2 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | | Two FR2 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 39 | 39 |  |
| SMTC-SSB parameters |  | Config 1,2 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1,2 | 16 | | Applied to NR Cell 3 measurement object |
| A3-Offset | dB | Config 1,2 | -11 | |  |
| Hysteresis | dB | Config 1,2 | 0 | |  |
| CP length |  | Config 1,2 | Normal | |  |
| TimeToTrigger | s | Config 1,2 | 0 | |  |
| Filter coefficient |  | Config 1,2 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2 | OFF | | DRX is not used |
| Time offset between PCell and PSCell |  | Config 1,2 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,2 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | |  |
| T2 | s | Config 1,2 | 5.2 for PC1; 3.5 for other PC | 5.2 for PC1; 3.5 for other PC |  |

Table A.5.6.2.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | Config 1,2 | Setup 3 as specified in clause A.3.15 | | | |
| AoA1 | | AoA2 | |
| Assumption for UE beamsNote 7 |  | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number |  | Config 1,2 | 1 | | 2 | |
| Duplex mode |  | Config 1,2 | TDD | | TDD | |
| BWchannel | MHz | Config 1,2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| TDD configuration |  | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP |  | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 |  | Config 1,2 | OP.1 | | OP.1 | |
| TRS configuration |  | Config 1,2 | TRS.2.1 TDD | | NA | |
| PDSCH/PDCCH TCI state |  | Config 1,2 | TCI.State.2 | | NA | |
| PDSCH Reference measurement channel |  | Config 1,2 | SR.3.1 TDD | | - | |
| RMSI CORESET Reference Channel |  | Config 1,2 | CR.3.1 TDD | | - | |
| Dedicated CORESET Reference Channel |  | Config 1,2 | CCR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11 |  | Config 1,2 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| EPRE ratio of PSS to SSS |  | Config 1,2 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Ês | dBm/SCS | Config 1,2 | -87 | -87 | -Infinity | -87 |
| SSB\_RP Note 3 | dBm/SCS Note5 | Config 1,2 | -87 | -87 | -Infinity | -87 |
| BB Note 8 | dB | Config 1,2 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition |  | Config 1,2 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.5.6.2.1.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. 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.5.6.2.2 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is used

##### A.5.6.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.2.1-1, A.5.6.2.2.1-2, and A.5.6.2.2.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.2.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.2.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.2.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.5.6.2.2.1-1 EN-DC event triggered reporting tests without SSB index reading for FR2-FR2

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Table A.5.6.2.2.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | Config 1,2 | 1 | | | | One E-UTRAN TDD carrier frequenciy is used. |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | | | | Two FR2 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 | | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 39 | | 39 | |  |
| SMTC-SSB parameters |  | Config 1,2 | SSB.3 FR2 | | | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1,2 | -6 | | | |  |
| Hysteresis | dB | Config 1,2 | 0 | | | |  |
| CP length |  | Config 1,2 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2 | 0 | | | |  |
| Filter coefficient |  | Config 1,2 | 0 | | | | L3 filtering is not used |
| DRX |  | Config 1,2 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between PCell and PSCell |  | Config 1,2 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,2 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | | | |  |
| T2 | s | Config 1,2 | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC |  |

Table A.5.6.2.2.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | Config 1,2 | Setup 1 as specified in clause A.3.15 | | | |
| Assumption for UE beamsNote 7 |  | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number |  | Config 1,2 | 1 | | 2 | |
| Duplex mode |  | Config 1,2 | TDD | | TDD | |
| BWchannel | MHz | Config 1,2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| TDD configuration |  | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP |  | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2 | ULBWP.0.1 | |  | |
| Dedicated DL BWP |  | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2 | OP.1 | | OP.1 | |
| TRS configuration |  | Config 1,2 | TRS.2.1 TDD | | NA | |
| PDSCH/PDCCH TCI state |  | Config 1,2 | TCI.State.2 | | NA | |
| PDSCH Reference measurement channel |  | Config 1,2 | SR.3.1 TDD | | - | |
| RMSI CORESET Reference Channel |  | Config 1,2 | CR.3.1 TDD | | - | |
| Dedicated CORESET Reference Channel |  | Config 1,2 | CCR.3.1 TDD | | - | |
| SMTC configuration defined in A.3.11 |  | Config 1,2 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| EPRE ratio of PSS to SSS |  | Config 1,2 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz Note5 |  | -104.7 | | -104.7 | |
| Note2 | dBm/SCS Note4 | Config 1,2 | -95.7 | | -95.7 | |
| SSB\_RP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
|  | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
|  | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| IoNote3 | dBm/95.04 MHz Note5 | Config 1,2 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition |  | Config 1,2 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | | | |

##### A.5.6.2.2.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. 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.5.6.2.3 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is not used

##### A.5.6.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.3.1-1, A.5.6.2.3.1-2, and A.5.6.2.3.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.3.1-1 is provided for UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.3.1-1 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.3.1-1.

Table A.5.6.2.3.1-1 EN-DC event triggered reporting tests with SSB index reading for FR2-FR2

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Table A.5.6.2.3.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | Config 1,2 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | | Two FR2 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 39 | 39 |  |
| SMTC-SSB parameters |  | Config 1,2 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| offsetMO | dB | Config 1,2 | 16 | | Applied to NR Cell 3 measurement object |
| A3-Offset | dB | Config 1,2 | -11 | |  |
| Hysteresis | dB | Config 1,2 | 0 | |  |
| CP length |  | Config 1,2 | Normal | |  |
| TimeToTrigger | s | Config 1,2 | 0 | |  |
| Filter coefficient |  | Config 1,2 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2 | OFF | | DRX is not used |
| Time offset between PCell and PSCell |  | Config 1,2 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,2 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | |  |
| T2 | s | Config 1,2 | 7 for PC1; 4.5 for other PC | 7 for PC1; 4.5 for other PC |  |

Table A.5.6.2.3.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | Config 1,2 | Setup 3 as specified in clause A.3.15 | | | |
| AoA1 | | AoA2 | |
| Assumption for UE beamsNote 7 |  | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number |  | Config 1,2 | 1 | | 2 | |
| Duplex mode |  | Config 1,2 | TDD | | TDD | |
| BWchannel | MHz | Config 1,2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| TDD configuration |  | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP |  | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2 | DLBWP.0.1 | | N/A | |
| Dedicated DL BWP |  | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 |  | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,2 | SR.3.1 TDD | | - | |
| RMSI CORESET Reference Channel |  | Config 1,2 | CR.3.1 TDD | | - | |
| Dedicated CORESET Reference Channel |  | Config 1,2 | CCR.3.1 TDD | | - | |
| TRS configuration |  | Config 1,2 | TRS.2.1 TDD | | NA | |
| PDSCH/PDCCH TCI state |  | Config 1,2 | TCI.State.2 | | NA | |
| SMTC configuration defined in A.3.11 |  | Config 1,2 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| EPRE ratio of PSS to SSS |  | Config 1,2 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Ês | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSB\_RP Note 3 | dBm/SCS Note5 | Config 1,2 | -87 | -87 | -Infinity | -87 |
| BB Note 8 | dB | Config 1,2 | 1.89 | 1.89 | -Infinity | 1.89 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2 | -58.01 | -58.01 | -Infinity | -58.01 |
| Propagation Condition |  | Config 1,2 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SSB-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.5.6.2.3.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. 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.5.6.2.4 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is used

##### A.5.6.2.4.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR2 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.4.1-1, A.5.6.2.4.1-2, and A.5.6.2.4.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.4.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.4.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.2.4.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.5.6.2.4.1-1: EN-DC event triggered reporting tests with SSB index reading for FR2-FR2

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations  Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

Table A.5.6.2.4.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | Config 1,2 | 1 | | | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number |  | Config 1,2 | 1, 2 | | | | Two FR2 NR carrier frequencies are used. |
| Active cell |  | Config 1,2 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2 | 0 | | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2 | 39 | | 39 | |  |
| SMTC-SSB parameters |  | Config 1,2 | SSB.3 FR2 | | | | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1,2 | -6 | | | |  |
| Hysteresis | dB | Config 1,2 | 0 | | | |  |
| CP length |  | Config 1,2 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2 | 0 | | | |  |
| Filter coefficient |  | Config 1,2 | 0 | | | | L3 filtering is not used |
| DRX |  | Config 1,2 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between PCell and PSCell |  | Config 1,2 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,2 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2 | 5 | | | |  |
| T2 | s | Config 1,2 | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC |  |

Table A.5.6.2.4.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | Config 1,2 | Setup 1 as specified in clause A.3.15 | | | |
| Assumption for UE beamsNote 7 |  | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number |  | Config 1,2 | 1 | | 2 | |
| Duplex mode |  | Config 1,2 | TDD | | TDD | |
| BWchannel | MHz | Config 1,2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| TDD configuration |  | Config 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| Initial DL BWP |  | Config 1,2 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2 | ULBWP.0.1 | |  | |
| Dedicated DL BWP |  | Config 1,2 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 |  | Config 1,2 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,2 | SR.3.1 TDD | | - | |
| RMSI CORESET Reference Channel |  | Config 1,2 | CR.3.1 TDD | | - | |
| Dedicated CORESET Reference Channel |  | Config 1,2 | CCR.3.1 TDD | | - | |
| TRS configuration |  | Config 1,2 | TRS.2.1 TDD | | NA | |
| PDSCH/PDCCH TCI state |  | Config 1,2 | TCI.State.2 | | NA | |
| SMTC configuration defined in A.3.11 |  | Config 1,2 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| EPRE ratio of PSS to SSS |  | Config 1,2 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz Note5 |  | -104.7 | | -104.7 | |
| Note2 | dBm/SCS Note4 | Config 1,2 | -95.7 | | -95.7 | |
| SSB\_RP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
|  | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
|  | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| IoNote3 | dBm/95.04 MHz Note5 | Config 1,2 | -59.7 | -59.7 | -66.7 | -57.2 |
| Propagation Condition |  | Config 1,2 | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | | | |

A.5.6.2.4.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. 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.5.6.2.5 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is not used

##### A.5.6.2.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.5.1-1, A.5.6.2.5.1-2, and A.5.6.2.5.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.5.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.5.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.5.1-1.

Table A.5.6.2.5.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

|  |  |  |
| --- | --- | --- |
| Config | Description of serving cell | Description of target cell |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Table A.5.6.2.5.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | One FR1 and one FR2 NR carrier frequency is used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 39 | 39 |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1,4 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 2,5 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 3,6 | SSB.2 FR1 | | As specified in clause A.3.10.1 |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3,4,5,6 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| CSI-RS for tracking |  | Config 1,4 | TRS.1.1 FDD | |  |
|  | Config 2,5 | TRS.1.1 TDD | |  |
|  | Config 3,6 | TRS.1.2 TDD | |  |
| *offsetMO* | dB | Config 1,2,3,4,5,6 | 6 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |  |
| T2 | s | Config 1,2,3,4,5,6 | 5.2 for PC1; 3.5 for other PC | 5.2 for PC1; 3.5 for other PC |  |

Table A.5.6.2.5.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | Config 1,2,3,4,5,6 | N/A | | Setup 1 as specified in clause A.3.15 | |
| Assumption for UE beamsNote 7 |  | Config 1,2,3,4,5,6 | N/A | | Rough | |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | TDD | |
|  | Config 2,3,5,6 | TDD | | TDD | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2,5 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3,6 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2,5 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3,6 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | Config 1,4 | 52 | | 66 | |
|  |  | Config 2,5 | 52 | | 66 | |
|  |  | Config 3,6 | 106 | | 66 | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.3.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference  Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | - | |
|  |  | Config 2,5 | CCR.1.1 TDD | |  | |
|  |  | Config 3,6 | CCR.2.1 TDD | |  | |
| SMTC configuration defined in A.3.11 |  | Config 1,4 | SMTC.2 | | SMTC.2 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | 120 | |
| Config 3,6 | 30 | | 120 | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 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 |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  | |  | |
| Ês | dBm/SCS | Config 1,2,3,4,5,6 |  | | -Infinity | -87 |
| SSB\_RP Note 3 | dBm/SCS  Note5 | Config 1,2,3,4,5,6 |  | | -Infinity | -87 |
| BB Note 8 | dB | Config 1,2,3,4,5,6 | Link only, see clause A.3.7A | | -Infinity | 14.69 |
| IoNote3 | dBm/95.04 MHz Note5 | Config 1,2,3,4,5,6 |  | | -Infinity | -58.01 |
| Propagation Condition |  | Config 1,2,3,4,5,6 |  | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SSB\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void.  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.5.6.2.5.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

5120 for UE supporting power class 1, or

3200 for UE supporting other power class.

In test 1 and 2 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. 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.5.6.2.6 EN-DC event triggered reporting tests for FR2 cell without SSB time index detection when DRX is used

##### A.5.6.2.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.6.1-1, A.5.6.2.6.1-2, and A.5.6.2.6.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.6.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.6.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.6.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.5.6.2.6.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

|  |  |  |
| --- | --- | --- |
| Config | Description of serving cell | Description of target cell |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Table A.5.6.2.6.1-2: General test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | | | One FR1 and one FR2 NR carrier frequency is used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 39 | | 39 | |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1,4 | SSB.1 FR1 | | | | As specified in clause A.3.10.1 |
|  | Config 2,5 | SSB.1 FR1 | | | | As specified in clause A.3.10.1 |
|  | Config 3,6 | SSB.2 FR1 | | | | As specified in clause A.3.10.1 |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3,4,5,6 | SSB.3 FR2 | | | | As specified in clause A.3.10.2 |
| CSI-RS for tracking |  | Config 1,4 | TRS.1.1 FDD | | | |  |
|  | Config 2,5 | TRS.1.1 TDD | | | |  |
|  | Config 3,6 | TRS.1.2 TDD | | | |  |
| *offsetMO* | dB | Config 1,2,3,4,5,6 | 6 | | | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | | |  |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | | | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | | | L3 filtering is not used |
| DRX |  | Config 1,2,3,4,5,6 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | | |  |
| T2 | s | Config 1,2,3,4,5,6 | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC | 8 for PC1;  5 for other PC | 82 for PC1; 52 for other PC |  |

Table A.5.6.2.6.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting without SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | Config 1,2,3,4,5,6 | N/A | | Setup 1 as specified in clause A.3.15 | |
| Assumption for UE beamsNote 7 |  | Config 1,2,3,4,5,6 | N/A | | Rough | |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | TDD | |
|  | Config 2,3,5,6 | TDD | | TDD | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2,5 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3,6 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2,5 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3,6 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | Config 1,4 | 52 | | 66 | |
|  |  | Config 2,5 | 52 | | 66 | |
|  |  | Config 3,6 | 106 | | 66 | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.3.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference  Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | - | |
|  |  | Config 2,5 | CCR.1.1 TDD | |  | |
|  |  | Config 3,6 | CCR.2.1 TDD | |  | |
| SMTC configuration defined in A.3.11 |  | Config 1,4 | SMTC.2 | | SMTC.2 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | 120 | |
| Config 3,6 | 30 | | 120 | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz Note5 |  | N/A  Link only, see clause A.3.7A | | -104.7 | |
| Note2 | dBm/SCS Note4 | Config 1,2,4,5 | -95.7 | |
| Config 3,6 | -95.7 | |
| SSB\_RP Note 3 | dBm/SCS Note5 | Config 1,2,4,5 | -Infinity | -86.7 |
| Config 3,6 | -Infinity | -86.7 |
|  | dB | Config 1,2,3,4,5,6 | -Infinity | 9 |
|  | dB | Config 1,2,3,4,5,6 | -Infinity | 9 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | - | - |
| dBm/38.16MHz | Config 3,6 | - | - |
| dBm/95.04 MHz Note5 | Config 1,2,3,4,5,6 | -66.7 | -57.2 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.5.6.2.6.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

7680 for UE supporting power class 1, or

4800 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

81920 for UE supporting power class 1, or

51200 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is not required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. 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.5.6.2.7 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is not used

##### A.5.6.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.7.1-1, A.5.6.2.7.1-2, and A.5.6.2.7.1-3.

In test 1 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.7.1-2 is provided for a UE that does not support per-FR gap and in test 2 measurement gap pattern configuration #13 as defined in Table A.5.6.2.7.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 2. Otherwise it is only required to pass test 1.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.7.1-1.

Table A.5.6.2.7.1-1: EN-DC event triggered reporting tests with SSB index reading for FR1-FR2

|  |  |  |
| --- | --- | --- |
| Config | Description of serving cell | Description of target cell |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Table A.5.6.2.7.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | Comment |
| Test 1 | Test 2 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | One FR1 and one FR2 NR carrier frequency is used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | 13 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 39 | 39 |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1,4 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 2,5 | SSB.1 FR1 | | As specified in clause A.3.10.1 |
|  | Config 3,6 | SSB.2 FR1 | | As specified in clause A.3.10.1 |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3,4,5,6 | SSB.3 FR2 | | As specified in clause A.3.10.2 |
| CSI-RS for tracking |  | Config 1,4 | TRS.1.1 FDD | |  |
|  | Config 2,5 | TRS.1.1 TDD | |  |
|  | Config 3,6 | TRS.1.2 TDD | |  |
| *offsetMO* | dB | Config 1,2,3,4,5,6 | 6 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |  |
| T2 | s | Config 1,2,3,4,5,6 | 7 for PC1; 4.5 for other PC | 7 for PC1; 4.5 for other PC |  |

Table A.5.6.2.7.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | Config 1,2,3,4,5,6 | N/A | | Setup 1 as specified in clause A.3.15 | |
| Assumption for UE beamsNote 7 |  | Config 1,2,3,4,5,6 | N/A | | Rough | |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | TDD | |
|  | Config 2,3,5,6 | TDD | | TDD | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2,5 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3,6 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2,5 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3,6 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | Config 1,4 | 52 | | 66 | |
|  |  | Config 2,5 | 52 | | 66 | |
|  |  | Config 3,6 | 106 | | 66 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference  Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | - | |
|  |  | Config 2,5 | CCR.1.1 TDD | |  | |
|  |  | Config 3,6 | CCR.2.1 TDD | |  | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.3.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| SMTC configuration defined in A.3.11 |  | Config 1,4 | SMTC.2 | | SMTC.2 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | 120 | |
| Config 3,6 | 30 | | 120 | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 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 |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  | |  | |
| Ês | dBm/SCS | Config 1,2,3,4,5,6 |  | | -Infinity | -87 |
| SSB\_RP Note 3 | dBm/SCS  Note5 | Config 1,2,3,4,5,6 |  | | -Infinity | -87 |
| BB Note 8 | dB | Config 1,2,3,4,5,6 | Link only, see clause A.3.7A | | -Infinity | 14.69 |
| IoNote3 | dBm/95.04 MHz Note5 | Config 1,2,3,4,5,6 |  | | -Infinity | -58.01 |
| Propagation Condition |  | Config 1,2,3,4,5,6 |  | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: SS-RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Void  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.5.6.2.7.2 Test Requirements

In test 1 with per-UE gap and in test 2 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X ms from the beginning of time period T2, where X is

6720 for UE supporting power class 1, or

4160 for UE supporting other power class.

In test 1 and 2 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. 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.5.6.2.8 EN-DC event triggered reporting tests for FR2 cell with SSB time index detection when DRX is used

##### A.5.6.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR2 on NR RF channel 2. The test parameters and configurations are given in Tables A.5.6.2.8.1-1, A.5.6.2.8.1-2, and A.5.6.2.8.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.2.8.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #13 as defined in Table A.5.6.2.8.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A4 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.5.6.2.8.1-1.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

Table A.5.6.2.8.1-1: EN-DC event triggered reporting tests without SSB index reading for FR1-FR2

|  |  |  |
| --- | --- | --- |
| Config | Description of serving cell | Description of target cell |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

Table A.5.6.2.8.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | | | | Comment |
| Test 1 | Test 2 | Test 3 | Test 4 |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | | | One E-UTRAN TDD carrier frequency is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | | | One FR1 and one FR2 NR carrier frequency is used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | | 13 | | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 39 | | 39 | |  |
| SMTC-SSB parameters on NR RF Channel 1 |  | Config 1,4 | SSB.1 FR1 | | | | As specified in clause A.3.10.1 |
|  | Config 2,5 | SSB.1 FR1 | | | | As specified in clause A.3.10.1 |
|  | Config 3,6 | SSB.2 FR1 | | | | As specified in clause A.3.10.1 |
| SMTC-SSB parameters on NR RF Channel 2 |  | Config 1,2,3,4,5,6 | SSB.3 FR2 | | | | As specified in clause A.3.10.2 |
| CSI-RS for tracking |  | Config 1,4 | TRS.1.1 FDD | | | |  |
|  | Config 2,5 | TRS.1.1 TDD | | | |  |
|  | Config 3,6 | TRS.1.2 TDD | | | |  |
| *offsetMO* | dB | Config 1,2,3,4,5,6 | 6 | | | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | | | |  |
| *a4-Threshold* | dBm | Config 1,2,3,4,5,6 | -105 | | | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | | | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | | | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | | | L3 filtering is not used |
| DRX |  | Config 1,2,3,4,5,6 | DRX.1 | DRX.7 | DRX.1 | DRX.7 | As specified in clause A.3.3 |
| Time offset between PCell and PSCell |  | Config 1,2,3,4,5,6 | 3 μs | | | | Synchronous EN-DC |
| Time offset between serving and neighbour cells |  | Config 1,4 | 3ms | | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  | Config 2,3,5,6 | 3μs | | | | Synchronous cells. |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | | |  |
| T2 | s | Config 1,2,3,4,5,6 | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC | 11 for PC1; 6.5 for other PC | 108 for PC1; 67 for other PC |  |

Table A.5.6.2.8.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
| T1 | T2 | T1 | T2 |
| AoA setup |  | Config 1,2,3,4,5,6 | N/A | | Setup 1 as specified in clause A.3.15 | |
| Assumption for UE beamsNote 7 |  | Config 1,2,3,4,5,6 | N/A | | Rough | |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | TDD | |
|  | Config 2,3,5,6 | TDD | | TDD | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2,5 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3,6 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 2,5 | 10: NRB,c = 52 | | 100: NRB,c = 66 | |
| Config 3,6 | 40: NRB,c = 106 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | Config 1,4 | 52 | | 66 | |
|  |  | Config 2,5 | 52 | | 66 | |
|  |  | Config 3,6 | 106 | | 66 | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel |  | Config 1,4 | SR.1.1 FDD | | - | |
|  | Config 2,5 | SR.1.1 TDD | |
|  | Config 3,6 | SR2.1 TDD | |
| RMSI CORESET Reference Channel |  | Config 1,4 | CR.1.1 FDD | | - | |
|  | Config 2,5 | CR.1.1 TDD | |
|  | Config 3,6 | CR2.1 TDD | |
| Dedicated CORESET Reference Channel |  | Config 1,4 | CCR.1.1 FDD | | - | |
|  |  | Config 2,5 | CCR.1.1 TDD | |  | |
|  |  | Config 3,6 | CCR.2.1 TDD | |  | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | TDDConf.3.1 | |
|  | Config 3,6 | TDDConf.2.1 | | TDDConf.3.1 | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| SMTC configuration defined in A.3.11 |  | Config 1,4 | SMTC.2 | | SMTC.2 | |
|  | Config 2,3,5,6 | SMTC.1 | | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | 120 | |
| Config 3,6 | 30 | | 120 | |
| EPRE ratio of PSS to SSS |  | Config 1,2,3,4,5,6 | 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 |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |
| Note2 | dBm/15kHz Note5 |  | N/A  Link only, see clause A.3.7A | | -104.7 | |
| Note2 | dBm/SCS Note4 | Config 1,2,4,5 | -95.7 | |
| Config 3,6 | -95.7 | |
| SSB\_RP Note 3 | dBm/SCS Note5 | Config 1,2,4,5 | -Infinity | -86.7 |
| Config 3,6 | -Infinity | -86.7 |
|  | dB | Config 1,2,3,4,5,6 | -Infinity | 9 |
|  | dB | Config 1,2,3,4,5,6 | -Infinity | 9 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | - | - |
| dBm/38.16MHz | Config 3,6 | - | - |
| dBm/95.04 MHz Note5 | Config 1,2,3,4,5,6 | -66.7 | -57.2 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SSB\_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.5.6.2.8.2 Test Requirements

In test 1 with per-UE gap and in test 3 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X1 ms from the beginning of time period T2, where X1 is

10080 for UE supporting power class 1, or

6240 for UE supporting other power class.

In test 2 with per-UE gap and in test 4 with per-FR gap, the UE shall send one Event A4 triggered measurement report, with a measurement reporting delay less than X2 ms from the beginning of time period T2, where X2 is

107520 for UE supporting power class 1, or

66560 for UE supporting other power class.

In test 1, 2, 3 and 4 UE is required to report SSB time index. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. 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.5.6.3 L1-RSRP measurement for beam reporting

#### A.5.6.3.1 SSB based L1-RSRP measurement when DRX is not used

##### A.5.6.3.1.1 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 9.5.4.1, with the testing configurations for NR cells in Table A.5.6.3.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.5.6.3.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.5.6.3.1.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.1.2-1 and Table A.5.6.3.1.2-2 below.

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

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.5.6.3.1.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~4 |  | freq1 |
| Duplex mode | 1~4 |  | TDD |
| TDD Configuration | 1~4 |  | TDDConf.3.1 |
| BWchannel | 1~4 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~4 |  | 66 |
| PDSCH Reference measurement channel | 1,2 |  | SR.3.2 TDD |
| 3,4 | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1,2 |  | CR.3.1 TDD |
| 3,4 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1~4 |  | CCR.3.1 TDD |
| 3,4 | CCR.3.7 TDD |
| SSB configuration | 1,2 |  | SSB.1 FR2 |
| 3,4 | SSB.2 FR2 |
| OCNG Patterns | 1~4 |  | OP.1 |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~4 |  | SMTC.1 |
| TRS Configuration | 1~4 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 |  | TCI.State.2 |
| DRX configuration | 1~4 |  | Off |
| reportConfigType | 1~4 |  | periodic |
| reportQuantity | 1~4 |  | ssb-Index-RSRP |
| Number of reported RS | 1~4 |  | 2 |
| L1-RSRP reporting period | 1~4 | slot | 320 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 2 |
| EPRE ratio of PSS to SSS | 1~4 | 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 | 1~4 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.5.6.3.1.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | | | |
| Assumption for UE beamsNote 4 | 1~4 |  | Rough | | | |
| Note2 | 1~4 | dBm/15kHz | -105 | | | |
| Note2 | 1,2 | dBm/SSB SCS | -96 | | | |
| 3,4 | -93 | | | |
|  | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| SSB\_RP Note3 | 1,2 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| 3,4 | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1,2 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| 3,4 | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| 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: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.5.6.3.1.3 Test Requirements

##### A.5.6.3.1.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

* 1680 for UE supporting power class 1
* 1200 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

#### A.5.6.3.2 SSB based L1-RSRP measurement when DRX is used

##### A.5.6.3.2.1 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 9.5.4.1, with the testing configurations for NR cells in Table A.5.6.3.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

Table A.5.6.3.2.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.5.6.3.2.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.2.2-1 and Table A.5.6.3.2.2-2 below.

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

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.5.6.3.2.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~4 |  | freq1 |
| Duplex mode | 1~4 |  | TDD |
| TDD Configuration | 1~4 |  | TDDConf.3.1 |
| BWchannel | 1~4 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~4 |  | 66 |
| PDSCH Reference measurement channel | 1,2 |  | SR.3.2 TDD |
| 3,4 | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1,2 |  | CR.3.1 TDD |
| 3,4 | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1,2 |  | CCR.3.1 TDD |
| 3,4 | CCR.3.7 TDD |
| SSB configuration | 1,2 |  | SSB.1 FR2 |
| 3,4 | SSB.2 FR2 |
| OCNG Patterns | 1~4 |  | OP.1 |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~4 |  | SMTC.1 |
| TRS Configuration | 1~4 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 |  | TCI.State.2 |
| DRX configuration | 1~4 |  | DRX.3 |
| reportConfigType | 1~4 |  | periodic |
| reportQuantity | 1~4 |  | ssb-Index-RSRP |
| Number of reported RS | 1~4 |  | 2 |
| L1-RSRP reporting period | 1~4 | slot | 320 |
| T1 | 1~4 | s | 5 |
| T2 | 1~4 | s | 3 |
| EPRE ratio of PSS to SSS | 1~4 | 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 | 1~4 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.5.6.3.2.2-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
| T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | | | |
| Assumption for UE beamsNote 4 | 1~4 |  | Rough | | | |
| Note2 | 1~4 | dBm/15kHz | -105 | | | |
| Note2 | 1,2 | dBm/SSB SCS | -96 | | | |
| 3,4 | -93 | | | |
|  | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| SSB\_RP Note3 | 1,2 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| 3,4 | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1,2 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
| 3,4 | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| 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: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.5.6.3.2.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than X ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in clause 10.1.20.1, where X is

* 2880 for UE supporting power class 1
* 1920 for UE supporting power class 2,3 or 4.

The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

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

#### A.5.6.3.3 CSI-RS based L1-RSRP measurement when DRX is not used

##### A.5.6.3.3.1 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 9.5.4.2, with the testing configurations for NR cells in Table A.5.6.3.3.1-1.

Table A.5.6.3.3.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

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

##### A.5.6.3.3.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.3.2-1 and Table A.5.6.3.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 480ms from the beginning of the test, the DCI trigger comes in slot 1 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.3.3.2-1.

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

Table A.5.6.3.3.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Value** |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~2 |  | 66 |
| PDSCH Reference measurement channel | 1~2 |  | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1~2 |  | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1~2 |  | CCR.3.7 TDD |
| SSB configuration | 1~2 |  | SSB.1 FR2 |
| CSI-RS configuration | 1~2 |  | CSI-RS.3.3 TDD |
| 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 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | Off |
| reportConfigType | 1~2 |  | aperiodic |
| reportQuantity | 1~2 |  | cri-RSRP |
| Number of reported RS | 1~2 |  | 2 |
| qcl-Info | 1~2 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~2 |  | 8 |
| Propagation condition | 1~2 |  | AWGN |
| T1 | 1~2 | s | 5 |
| EPRE ratio of PSS to SSS | 1~2 | 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 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.5.6.3.3.2-1: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **CSI-RS#0** | **CSI-RS#1** |
| Angle of arrival configuration | 1~2 |  | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 | 1~2 |  | Rough | |
| Note1 | 1~2 | dBm/15kHz | -105 | |
| Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
|  | 1~2 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1~2 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.97 | -57.47 |
|  | 1~2 | dB | 0 | 9 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

##### A.5.6.3.3.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1. The reported L1-RSRP value shall include the Rx antenna gain in the range of -10 to +20 dB.

For absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1, the UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.6.3.3.3-1.

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

Table A.5.6.3.3.3-1: L1-RSRP absolute accuracy test requirement

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

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

#### A.5.6.3.4 CSI-RS based L1-RSRP measurement when DRX is used

##### A.5.6.3.4.1 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 9.5.4.2, with the testing configurations for NR cells in Table A.5.6.3.4.1-1.

Table A.5.6.3.4.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test

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

##### A.5.6.3.4.2 Test parameters

There are two cells in the test, E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.6.3.4.2-1 and Table A.5.6.3.4.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-RSRP measurement on the CSI-RS and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-RSRP on aperiodic CSI-RS resources. UE is also configured to measure L1-RSRP based on SSB. After 1440ms from the beginning of the test, the DCI trigger comes in slot 1 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.3.4.2-1.

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

Table A.5.6.3.4.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~2 |  | 66 |
| PDSCH Reference measurement channel | 1~2 |  | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1~2 |  | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1~2 |  | CCR.3.7 TDD |
| SSB configuration | 1~2 |  | SSB.1 FR2 |
| CSI-RS configuration | 1~2 |  | CSI-RS.3.3 TDD |
| 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 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | DRX.3 |
| reportConfigType | 1~2 |  | aperiodic |
| reportQuantity | 1~2 |  | cri-RSRP |
| Number of reported RS | 1~2 |  | 2 |
| qcl-Info | 1~2 |  | SSB#0 for resource#0 |
| SSB#1 for resource#1 |
| reportSlotOffsetList | 1~2 |  | 8 |
| Propagation condition | 1~2 |  | AWGN |
| T1 | 1~2 | s | 5 |
| EPRE ratio of PSS to SSS | 1~2 | 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 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.5.6.3.4.2-1: CSI-RS specific test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | 1~2 |  | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 | 1~2 |  | Rough | |
| Note1 | 1~2 | dBm/15kHz | -105 | |
| Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
|  | 1~2 | dB | 0 | 9 |
| CSI-RS RSRP Note2 | 1~2 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.97 | -57.47 |
|  | 1~2 | dB | 0 | 9 |
| Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

##### A.5.6.3.4.3 Test Requirements

After1440ms from the beginning of the test, the UE shall send L1-RSRP report at slot 8 from the reception of DCI triggering the L1-RSRP measurement. The L1-RSRP report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.20.1.

For absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1, the UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.6.3.4.3-1.

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

Table A.5.6.3.4.3-1: L1-RSRP absolute accuracy test requirement

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

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

## A.5.7 Measurement Performance requirements

Unless explicitly stated otherwise:

- Reported measurements shall be within defined range of accuracy limits defined in Clause 10 for at least 90 % of the reported cases. If multiple measurement performance requirements are verified in the same test, the reported measurements for each requirement shall be within defined range of accuracy limits of the corresponding requirement defined in Clause 10 for at least 90% of the reported cases.

- Measurements are performed in RRC\_CONNECTED state.

- The reference channels assume transmission of PDSCH with a maximum number of 5 HARQ transmissions unless otherwise specified.

### A.5.7.1 SS-RSRP

#### A.5.7.1.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

##### A.5.7.1.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.3.1.1 and 10.1.3.1.2 for intra-frequency measurements.

##### A.5.7.1.1.2 Test parameters

In this set of test cases, all NR cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.1.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.5.7.1.1.2-2 and A.5.7.1.1.2-3. The E-UTRA PCell is configured as specified in clause A.3.7.2.2. In all test cases, Cell 1 is the PCell, cell 2 is the PSCell and Cell 3 is the target cell. The test consists of two time phases T1 and T2.

Table A.5.7.1.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

Table A.5.7.1.1.2-2: SS-RSRP Intra frequency general test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ParameterNote 5 | | Unit | T1 | | T2 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID | |  | 489 | 0 | 489 | 0 |
| SSB ARFCN | |  | freq1 | | freq1 | |
| Duplex mode | |  | TDD | | TDD | |
| TDD configuration | |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | 24 | | 24 | |
|  | Initial DL BWP |  | DLBWP.0.1 | | | |
| BWP configuration | Dedicated DL BWP |  | DLBWP.1.1 | | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | | |
|  | Dedicated UL BWP |  | ULBWP.1.1 | | | |
| TRS configuration | |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state | |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel | |  | SR.3.2 TDD | - | SR.3.2 TDD | - |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated CORESET Reference Channel | |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | |  | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration | |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration | |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 2 | | μs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 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 conditions | |  | AWGN | | AWGN | |
| Antenna configuration | |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: All parameters apply for configuration 1 and 2  Note 6: Void | | | | | | |

Table A.5.7.1.1.2-3: SS-RSRP Intra frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **T1** | | **T2** | |
| **Cell 2** | **Cell 3** | **Cell 2** | **Cell 3** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 8 |  | Rough | | | |
| Note1 | dBm/15kHzNote4 | -91.6 | | N/A | |
| Note1 | dBm/SCSNote4 | -82.6 | | N/A | |
|  | dB | 6.0 | 1.0 | N/A | N/A |
| Es | dBm/SCSNote4 | -76.6 | -81.6 | (Table B.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| SSB\_RPNote2 | dBm/SCS | -76.6 | -81.6 | (Table B.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| BB Note6 | dB | 2.44 | -5.98 | -5.98 | -5.98 |
| IoNote2 | dBm/95.04 MHz Note4 | -50.05 | | (Table B.2.2-2 Rx Beam Peak +29.70dB) | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot, Es in test 1 and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 7: All parameters apply for configurations 1 and 2  Note 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.5.7.1.1.3 Test Requirements

The SS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.3.1.1 and relative accuracy requirements in clause 10.1.3.1.2. The following requirements are to be verified:

During T1:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.5.7.1.1.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T2:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in table A.5.7.1.1.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

During T1 and T2:

Relative accuracy of Cell 2 during T2 compared with Cell 2 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1

Relative accuracy of Cell 3 during T2 compared with Cell 3 during T1. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in Table 10.1.3.1.2-1.

Table A.5.7.1.1.3-1: SS-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | **Test requirement** Notes1,2,3 |
| Cell 2 | SSB\_RP2 -δ +Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP2 +δ +Gmax |
| Cell 3 | SSB\_RP3 -δ +Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP3 +δ +Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.3.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

#### A.5.7.1.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

##### A.5.7.1.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.5.1.1 and 10.1.5.1.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.5.7.1.2.1-1.

Table A.5.7.1.2.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | FDD LTE PCell, cells 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, cells 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | FDD LTE PCell, cells 2&3 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | TDD LTE PCell, cells 2&3 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

##### A.5.7.1.2.2 Test parameters

In this set of test cases, there are three cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.1.2.2-1 and Table A.5.7.1.2.2-2 below. Both absolute and relative accuracy of RSRP intrer-frequency measurements are tested by using the parameters in Table A.5.7.1.2.2-1 and Table A.5.7.1.2.2-2. The inter-frequency measurements are supported by a measurement gap.

Table A.5.7.1.2.2-1: SS-RSRP inter-frequency test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | | **Test 2** | |
| **Cell 2** | **Cell 3** | **Cell 2** | **Cell 3** |
| SSB ARFCN | 1~4 |  | freq1 | freq2 | freq1 | freq2 |
| BWchannel | 1~4 |  | 100:  NRB,c = 66 | | 100:  NRB,c = 66 | |
| Data RBs allocated | 1,2 |  | 24 | | 24 | |
| 3,4 | 48 | | 48 | |
| Duplex mode | 1~4 |  | TDD | | TDD | |
| TDD configuration | 1~4 |  | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH Reference measurement channel | 1,2 |  | SR.3.2 TDD | - | SR.3.2 TDD | - |
| 3,4 | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1,2 |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| 3,4 | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1,2 |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| 3,4 | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1,2 |  | SSB.3 FR2 | | SSB.3 FR2 | |
| 3,4 | SSB.4 FR2 | | SSB.4 FR2 | |
| PDSCH/PDCCH subcarrier spacing | 1~4 | kHz | 120 | | 120 | |
| OCNG Patterns | 1~4 |  | OP.3 | | OP.3 | |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~4 |  | DLBWP.1.3  ULBWP.1.3 | | DLBWP.1.3  ULBWP.1.3 | |
| TRS Configuration | 1~4 |  | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~4 |  | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~4 |  | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 3 | 1~4 | μs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | 0 | 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 | 1~4 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1~4 | - | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void | | | | | | |

Table A.5.7.1.2.2-2: SS-RSRP inter-frequency OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | | **Test 2** | |
| **Cell 2** | **Cell 3** | **Cell 2** | **Cell 3** |
| Angle of arrival configuration | 1~4 |  | Setup 4b according to clause A.3.15.4.2 | | Setup 4b according to clause A.3.15.4.2 | |
| AoA1  Spherical coverage | AoA2  Rx Beam Peak | AoA1  Spherical coverage | AoA2  Rx Beam Peak |
| Assumption for UE beamsNote 7 | 1~4 |  | Rough | | Rough | |
| Note1 | 1, 2 | dBm/15kHzNote4 | -90.6 | -90.6 | (Table B.2.3-2 Rx Beam PeakNote 8 +1.97dB) | (Table B.2.3-2 Rx Beam PeakNote 8 -3.03dB) |
| 3, 4 | -93.7 | -93.7 |
| Note1 | 1, 2 | dBm/SCSNote4 | -81.6 | -81.6 | (Table B.2.3-2 Rx Beam PeakNote 8 +11.0dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +6.0dB) |
| 3, 4 | -81.7 | -81.7 | (Table B.2.3-2 Rx Beam PeakNote 8 +14.0dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +9.0dB) |
|  | 1~4 | dB | 6.0 | 6.0 | 17.0 | -1.0 |
| SSB\_RPNote2 | 1, 2 | dBm/SCS | -75.6 | -75.6 | (Table B.2.3-2 Rx Beam PeakNote 8 +28.0dB) | (Table B.2. 3-2 Rx Beam PeakNote 8 +5.0dB) |
| 3, 4 | -75.7 | -75.7 | (Table B.2.3-2 Rx Beam PeakNote 8 +31.0dB) | (Table B.2. 3-2 Rx Beam PeakNote 8 +8.0dB) |
| (SSB\_RPCell 2 – SSB\_RPCell 3) | 1~4 | dB | 0 | | 23.00 | |
| BBNote6 | 1, 2 | dB | 5.26 | 5.96 | 9.53 | -3.46 |
| 3, 4 | 4.61 | 5.91 |
| IoNote2 | 1, 2 | dBm/95.04 MHz Note4 | -50.00 | -50.00 | (Table B.2.3-2 Rx Beam PeakNote 8 +52.68dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +33.13dB) |
| 3, 4 | -50.09 | -50.09 | (Table B.2.3-2 Rx Beam PeakNote 8 +55.69dB) | (Table B.2.3-2 Rx Beam PeakNote 8 +36.14dB) |
| (Iofreq 1 – Io freq 2) | 1~4 | dB | 0 | | 19.55 | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SSB\_RP, Es/Iot, Io, (SSB\_RPCell 3 – SSB\_RPCell 2) and (Iofreq 2 – Io freq 1) levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP or ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: The value in Table B.2.3-2 is the Minimum SSB\_RP for SCSSSB = 120 kHz, selected according to the operating band of cell 3 and UE power class, without ∆MBP,n adjustment. | | | | | | |

##### A.5.7.1.2.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the absolute requirements in clause 10.1.5.1.1 and the relative requirements in clause 10.1.5.1.2.

Test 1:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.2.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.5.7.1.2.3-2.

Test 2:

Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.2.3-1.

Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported SS-RSRP meets the requirements in A.5.7.1.2.3-2.

Table A.5.7.1.2.3-1: SS-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3,4 |
| Cell 2 | SSB\_RP2 -δ +Gmin +X ≤ Reported RSRP(dBm) ≤ SSB\_RP2 +δ +Gmax |
| Cell 3 | SSB\_RP3 -δ +Gmin ≤ Reported RSRP(dBm) ≤ SSB\_RP3 +δ+Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  Note 4: X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. | |

**Table A.5.7.1.2.3-2: SS-RSRP relative accuracy test requirement**

|  |  |
| --- | --- |
|  | **Test requirement Notes1,2,3,4, 5, 6** |
| Cell 3 – Cell 2 | SSB\_RP3 - SSB\_RP2 -δ - D - Ginter ≤ Reported RSRP(dB) ≤ SSB\_RP3 - SSB\_RP2 +δ + Ginter–(X) |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  Note 2: δ is the RSRP relative accuracy requirement from Table 10.1.5.1.2-1  Note 3: Void  Note 4: X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value.  Note 5: D is the margin due to mis-alignment between fine beam and rough beam. D is the Rough Beam gain reduction in Rx beam peak direction from Table B.2.1.5.3-1, selected according to the UE power class. D is always a positive value.  Note 6: Ginter is the margin due to different antenna gain caused by frequency separation. Ginter is from Table B.2.1.5.2-1, selected according to the UE power class, and is always a positive value. | |

#### A.5.7.1.3 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell

##### A.5.7.1.3.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.5.1.1 for inter-frequency measurements with the testing configurations in Table A.5.7.1.3.1-1.

Table A.5.7.1.3.1-1: Applicable NR configurations for FR2 inter-frequency SS-RSRP accuracy test

|  |  |  |
| --- | --- | --- |
| **Config** | **Description of serving cell** | **Description of target cell** |
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | | |

##### A.5.7.1.3.2 Test parameters

In this set of test cases there are three cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2) and a FR2 neighbour cell (Cell 3) on a different frequency than the PSCell. The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 and Cell 3 are given in Table A.5.7.1.3.2-1 and Table A.5.7.1.3.2-2 below. Absolute accuracy of RSRP inter-frequency measurements are tested by using the parameters in Table A.5.7.1.3.2-1 and Table A.5.7.1.3.2-2. The inter-frequency measurements are supported by a measurement gap.

Table A.5.7.1.3.2-1: SS-RSRP inter-frequency test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | 1~6 |  | freq1 | freq2 | freq1 | freq2 |
| BWchannel | 1,4 | MHz | 10:  NRB,c = 52 | 100:  NRB,c = 66 | 10:  NRB,c = 52 | 100:  NRB,c = 66 |
| 2,5 | 10:  NRB,c = 52 | 10:  NRB,c = 52 |
| 3,6 | 40:  NRB,c = 106 | 40:  NRB,c = 106 |
| Data RBs allocated | 1,2,4,5 |  | 52 | 24 | 52 | 66 |
| 3,6 | 106 | 106 |
| Gap pattern ID |  |  | 0 | | 0 | |
| Duplex mode | 1,4 |  | FDD | TDD | FDD | TDD |
| 2,5 | TDD | TDD |
| 3,6 | TDD | TDD |
| TDD configuration | 1,4 |  | N/A | TDDConf.3.1 | N/A | TDDConf.3.1 |
| 2,5 | TDDConf.1.1 | TDDConf.1.1 |
| 3,6 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH Reference measurement channel | 1,4 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
| 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| 3,6 | SR.2.1 FDD | SR.2.1 FDD |
| RMSI CORESET Reference Channel | 1,4 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
| 2,5 | CR.1.1 TDD | - | CR.1.1 TDD | - |
| 3,6 | CR.2.1 FDD | - | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1,4 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| 2,5 |  | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| 3,6 |  | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | 1,4 |  | SSB.1 FR1 | SSB.3 FR2 | SSB.1 FR1 | SSB.3 FR2 |
| 2,5 | SSB.1 FR1 | SSB.1 FR1 |
| 3,6 | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | 1~6 |  | OP.1 | OP.3 | OP.1 | OP.1 |
| Initial BWP Configuration | 1~6 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~6 |  | DLBWP.1.3  ULBWP.1.3 | | DLBWP.1.3  ULBWP.1.3 | |
| TRS Configuration | 1~6 |  | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1~6 |  | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1~6 |  | SMTC.1 | | SMTC.1 | |
| Time offset between Cell 2 and Cell 3 | 1~6 | μs | 3 | | 3 | |
| EPRE ratio of PSS to SSS | 1~6 | dB | 0 | 0 | 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 | 1~6 | - | NA  Link only, see clause A.3.7A | AWGN | NA  Link only, see clause A.3.7A | AWGN |
| Antenna configuration | 1~6 | - | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void | | | | | | |

Table A.5.7.1.3.2-2: SS-RSRP inter-frequency OTA related test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration according to clause A.3.15 |  |  | NA | Setup 2b | NA | Setup 2b |
| Assumption for UE beamsNote 4 |  |  | N/A | Rough | N/A | Rough |
|  | 1~6 | dBm/15kHz | NA  Link only, see clause A.3.7A | -90 | NA  Link only, see clause A.3.7A | NA |
|  | 1~6 | dBm/SSB SCS | -80.97 | NA |
|  |  |  |
|  | 1~6 | dB | 5 | NA |
| Es | 1~6 | dBm/SCS |  | (Table B.2.3-2 Spherical coverage +1dB) |
| SSB\_RPNote1 | 1~6 | dBm/SCS | -76.0 | (Table B.2.3-2 Spherical coverage +1dB) |
|  |  |  |
| BBNote6 | 1~6 | dB | 4.35 | -3.81 |
| IoNote1 | 1~6 | dBm/  95.04MHz | -50.18 | SSB\_RP+28.98 |
| Note 1: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Void  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation.  Note 5: Where used, 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 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBS from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

##### A.5.7.1.3.3 Test Requirements

The SS-RSRP measurement accuracy for Cell 3 shall fulfil the Absolute requirement in clause 10.1.5.1.1.

Test 1:

Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.3.3.

Test 2:

Absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported SS-RSRP is in the range shown in Table A.5.7.1.3.3.

Table A.5.7.1.3.3: SS-RSRP absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2,3,4 |
| Cell 3 | SSB\_RP2 -δ +Gmin +X ≤ Reported RSRP(dBm) ≤ SSB\_RP2 +δ +Gmax |
| Note 1: SSB\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.5.1.1-1, selected according to the Io used in the test  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class  Note 4: X is the Spherical coverage gain difference in dB, derived as (UE Refsens - UE Spherical coverage) from TS 38.101-2 [19] clauses 7.3.2 and 7.3.4, selected according to the UE power class and operating band. X is always a negative value. | |

### A.5.7.2 SS-RSRQ

#### A.5.7.2.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

###### A.5.7.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.8.1.1.

###### A.5.7.2.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.2.1.2-1. The absolute accuracy of SS-RSRQ intra-frequency measurement is test by using the parameters in Table A.5.7.2.1.2-2 and Table A.5.7.2.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.5.7.2.1.2-1: SS-RSRQ Intra frequency SS-RSRQ supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

Table A.5.7.2.1.2-2: SS-RSRQ Intra frequency test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | Test 2 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | |  | Freq1 | | Freq1 | |
| Duplex mode | |  | TDD | | TDD | |
| TDD configuration | |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | 66 | | 66 | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | | | |
| Dedicated DL BWP | DLBWP.1.1 | | | |
| Initial UL BWP | ULBWP.0.1 | | | |
| Dedicated UL BWP | ULBWP.1.1 | | | |
| TRS configuration | |  | TRS.2.1 TDD |  | TRS.2.1 TDD |  |
| TCI state | |  | TCI.State.0 |  | TCI.State.0 |  |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD |  | SR.3.1 TDD |  |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC | |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns | |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | |  | SMTC.1 | | | |
| SSB configuration | |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | |  | Not Applicable | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 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 | |  | AWGN | | AWGN | |
| Antenna Configuration | |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void  Note 5: Void | | | | | | |

Table A.5.7.2.1.2-3: SS-RSRQ Intra frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 9 |  | Rough | | | |
| Note1 | dBm/15kHzNote4 | -95 | | -95 | |
| Note1 | dBm/SCSNote3 | -86 | | -86 | |
|  | dB | 3 | 3 | -3 | -3 |
| SSB\_RPNote2 | dBm/SCS Note4 | -83 | -83 | -89 | -89 |
| SS-RSRQ Note2 | dB | -14.77 | -14.77 | -16.81 | -16.81 |
|  | dB | -1.76 | -1.76 | -4.76 | -4.76 |
| IoNote2 | dBm/95.04 MHz Note4 | -50 | | --54 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRQ, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Void  Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

###### A.5.7.2.1.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SS-RSRQ -2.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ +3.5dB to Nominal SS-RSRQ -3.5dB according to the requirements in clause 10.1.8.1.1. Nominal SS-RSRQ is the value shown in table A.5.7.2.1.2-3.

#### A.5.7.2.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

##### A.5.7.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.9.1.1 and 10.1.9.1.2 for inter-frequency measurement.

##### A.5.7.2.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.2.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-RSRQ inter-frequency measurement are tested by using test setup in Table A.5.7.2.2.2-2 and Table A.5.7.2.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1.

Table A.5.7.2.2.2-1: SS-RSRQ Inter frequency SS-RSRQ supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

Table A.5.7.2.2.2-2: SS-RSRQ Inter frequency general test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | Test 2 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN | |  | Freq1 | freq2 | freq1 | Freq2 |
| Duplex mode | |  | TDD | | TDD | |
| TDD configuration | |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | 66 | | 66 | |
|  | Initial DL BWP |  | DLBWP.0.1 | | | |
| BWP configuration | Dedicated DL BWP |  | DLBWP.1.1 | | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | | |
|  | Dedicated UL BWP |  | ULBWP.1.1 | | | |
| TRS configuration | |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state | |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel | |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel | |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns | |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SSB configuration | |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration | |  | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 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 conditions | |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void | | | | | | |

Table A.5.7.2.2.2-3: SS-RSRQ Inter frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| AoA setup |  | Setup 1 in clause in clause A.3.15 | | Setup 1 in clause in clause A.3.15 | |
| Assumption for UE beamsNote 8 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote4 | -94.03 | -94.03 | -94.03 | -94.03 |
| Note1 | dBm/SCSNote3 | -85.0 | -85.0 | -85.0 | -85.0 |
|  | dB | -1.75 | -1.75 | -3 | -3 |
| SSB\_RPNote2 | dBm/SCS Note4 | -86.75 | -86.75 | -88 | -88 |
| SS-RSRQNote2 | dB | -14.75 | -14.75 | -15.56 | -15.56 |
|  | dB | -1.75 | -1.75 | -3 | -3 |
| IoNote2 | dBm/95.04 MHz Note4 | -53.8 | -53.8 | -54.25 | -54.25 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRQ, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRQ and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.5.7.2.2.3 Test Requirements

The SS-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal SS-RSRQ+2.5dB to Nominal SSRQ-2.5dB and the SS-RSRQ measurement accuracy in test 2 shall be within the range Nominal SS-RSRQ+3.5dB to Nominal SS-RSRQ-3.5dB according to the requirements in clause 10.1.10.1.1.

The SS-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.1.2.

### A.5.7.3 SS-SINR

#### A.5.7.3.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

##### A.5.7.3.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.13.1.1.

##### A.5.7.3.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.3.1.2-1. The absolute accuracy of SS-SINR intra-frequency measurement is test by using the parameters in Table A.5.7.3.1.2-2 and Table A.5.7.3.1.2-3. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell.

Table A.5.7.3.1.2-1: SS-SINR Intra frequency SS-SINR supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

Table A.5.7.3.1.2-2: SS-SINR Intra frequency test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN |  | Freq2 | | Freq2 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 66 | | 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | | | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | | | |
| DRX cycle configuration | ms | Not applicable | | | |
| TRS configuration |  | TRS.2.1 TDD | | | |
| TCI state |  | TCI.State.0 | | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD |  | SR.3.1 TDD |  |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Dedicated RMSI CORESET Reference Channel |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 | | | |
| SSB configuration |  | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement |  | Not Applicable | | | |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 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 conditions |  | AWGN | | AWGN | |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void | | | | | |

Table A.5.7.3.1.2-3: SS-SINR Intra frequency OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 9 |  | Rough | | Rough | |
| Note1 | dBm/15kHz Note4 | -105 | | -105 | |
| Note1 | dBm/SCS Note3 | -96 | | -96 | |
|  | dB | 4.54 | 2.66 | -3 | -3 |
| SS-RSRPNote2 | dBm/SCS Note4 | -91.46 | -93.34 | -99 | -99 |
| SS-SINR Note2 | dB | 0 | -3.2 | -4.76 | -4.76 |
|  | dB | 0 | -3.2 | -4.76 | -4.76 |
| IoNote2 | dBm/95.04 MHz Note4 | 59.43 | | -64 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-SINR, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Void  Note 9: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

##### A.5.7.3.1.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3B to Nominal SS-SINR -3dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR +3.5dB to Nominal SS-SINR -3.5dB according to the requirements in clause 10.1.10.13.1. Nominal SS-SINR is the value shown in table A.5.7.3.1.2-3.

#### A.5.7.3.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

##### A.5.7.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that the SS-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.15.1.1 and 10.1.15.1.2 for inter-frequency measurement.

##### A.5.7.3.2.2 Test Parameters

In this test case the two NR cells (i.e., Cell 2 and Cell 3) are on different carrier frequencies and measurement gaps are provided. Supported test configurations are shown in Table A.5.7.3.2.2-1. Both absolute accuracy and relative accuracy requirements of SS-SINR inter-frequency measurement are tested by using test setup in Table A.5.7.3.2.2-2 and Table A.5.7.3.2.2-3. In all test cases, Cell 2 is the PSCell and Cell 3 is target cell. Cell 1 is the E-UTRA cell which specific test parameters for this test case are specified in Table A.3.7.2.1-1. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.5.7.3.2.2-2: SS-SINR Inter frequency SS-SINR supported test configurations**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A. 5.7.3.2.2-2: SS-SINR Inter frequency general test parameters**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| SSB ARFCN |  | Freq1 | freq2 | freq1 | Freq2 | freq1 | Freq2 |
| Duplex mode |  | TDD | | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated |  | 66 | | 66 | | 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration |  | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | | | | | |
| DRX cycle configuration | ms | Not applicable | | | | | |
| TRS configuration |  | TRS.2.1 TDD | | | | | |
| TCI state |  | TCI.State.0 | | | | | |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - | CR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration |  | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 | 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 conditions |  | AWGN | AWGN | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void  Note 4: Void | | | | | | | |

**Table A.5.7.3.2.2-3: SS-SINR Inter frequency OTA related test parameters**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | | Test 3 | |
| Cell 2 | Cell 3 | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | degrees | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 10 |  | Rough | | Rough | | Rough | |
| Note1 | dBm/15kHz Note4 | -105 | -105 | -105 | -105 | -105 | -105 |
| Note1 | dBm/SCS Note3 | -96 | -96 | -96 | -96 | -96 | -96 |
|  | dB | -0.5 | -0.5 | 11 | 11. | -3.0 | -3.0 |
| SS-RSRPNote2 | dBm/SCS Note4 | -96.5 | -96.5 | -85 | -85 | -99 | -99 |
| SS-SINRNote2 | dB | -0.5 | -0.5 | 11 | 11 | -3.0 | -3.0 |
|  | dB | -0.5 | -0.5 | 11 | 11 | -3.0 | -3.0 |
| IoNote2 | dBm/95.04 MHz Note4 | -69.3 | -69.3 | -55.4 | -55.4 | -65.24 | -65.24 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-SINR, SSB\_RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-SINR and SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Void  Note 7: Void  Note 8: Void  Note 9: Void  Note 10: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | | | | |

##### A.5.7.3.2.3 Test Requirements

The SS-SINR absolute measurement accuracy in test 1 shall be within the range Nominal SS-SINR+3dB to Nominal SS-SINR -3dB and the SS-SINR measurement accuracy in test 2 shall be within the range Nominal SS-SINR+3.5dB to Nominal SS-SINR -3.5dB according to the requirements in clause 10.1.15.1.1. Nominal SS-SINR is the value shown in table A.5.7.2.2.2-3

The SS-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.1.2.

### A.5.7.4 L1-RSRP measurement for beam reporting

#### A.5.7.4.1 SSB based L1-RSRP measurement

##### A.5.7.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.2 and clause 10.1.20.1 for L1-RSRP measurements based on SSB with the testing configurations for NR cells in Table A.5.7.4.1.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.4.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

##### A.5.7.4.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.4.1.2-1 and Table A.5.7.4.1.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.5.7.4.1.2-1 and Table A.5.7.4.1.2-2.

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

**Table A.5.7.4.1.2-1: FR2 SSB based L1-RSRP general test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | 1~4 |  | freq1 | freq1 |
| Duplex mode | 1~4 |  | TDD | TDD |
| TDD Configuration | 1~4 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1~4 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Data RBs allocated | 1~4 |  | 66 | 66 |
| PDSCH Reference measurement channel | 1,2 |  | SR.3.2 TDD | SR.3.2 TDD |
| 3,4 | SR.3.3 TDD | SR.3.3 TDD |
| RMSI CORESET Reference Channel | 1,2 |  | CR.3.1 TDD | CR.3.1 TDD |
| 3,4 | CR.3.2 TDD | CR.3.2 TDD |
| Dedicated CORESET Reference Channel | 1,2 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| 3,4 | CCR.3.7 TDD | CCR.3.7 TDD |
| SSB configuration | 1,2 |  | SSB.1 FR2 | SSB.1 FR2 |
| 3,4 | SSB.2 FR2 | SSB.2 FR2 |
| OCNG Patterns | 1~4 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 |  | DLBWP.1.3  ULBWP.1.3 | DLBWP.1.3  ULBWP.1.3 |
| TRS Configuration | 1~4 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 |  | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1~4 |  | SMTC.1 | SMTC.1 |
| reportConfigType | 1~4 |  | periodic | periodic |
| reportQuantity | 1~4 |  | ssb-Index-RSRP | ssb-Index-RSRP |
| Number of reported RS | 1~4 |  | 2 | 2 |
| L1-RSRP reporting period | 1~4 |  | slot320 | slot320 |
| Propagation condition | 1~4 |  | AWGN | AWGN |
| Antenna configuration |  |  | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | |

**Table A.5.7.4.1.2-2: FR2 SSB based L1-RSRP OTA related test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
| SSB0 | SSB1 | SSB0 | SSB1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | | Rough | |
|  | 1~4 | dBm/15kHz | -100 | | n.a. | |
|  | 1,2 | dBm/SSB SCS | -91 | | n.a. | |
| 3,4 | -88 | | n.a. | |
|  | 1~4 | dB | 10 | -2 | n.a. | |
| SSB\_RPNote1 | 1,2 | dBm/SCS | -81 | -93 | As in Table B.2.4-2 | |
| 3,4 | -78 | -90 | As in Table B.2.4-2 | |
| IoNote1 | 1~4 | dBm/  95.04MHz | -51.57 | | SSB\_RP+28.98 | |
|  | 1~4 | dB | 10 | -2 | n.a. | |
| Note 1: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: Void  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | | | |

##### A.5.7.4.1.3 Test Requirements

After 320ms from the beginning of the test, the L1-RSRP measurement accuracy for SSB#0 and SSB#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB0. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.7.4.1.3-1.

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

For Test 2:

Absolute accuracy of SSB resource reported by UE in L1-RSRP report (SSB0 or SSB1). The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.7.4.1.3-1.

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

Table A.5.7.4.1.3-1: L1-RSRP absolute accuracy test requirement

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

#### A.5.7.4.2 CSI-RS based L1-RSRP measurement on resource set with repetition off

##### A.5.7.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.5.3 and clause 10.1.20.2 for L1-RSRP measurements based on CSI-RS with the testing configurations for NR cells in Table A.5.7.4.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.4.2.1-1: Applicable NR configurations for FR2 CSI-RS based L1-RSRP test**

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

##### A.5.7.4.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.4.2.2-1 and Table A.5.7.4.2.2-2 below. The absolute and relative accuracy of L1-RSRP measurements are tested by using the parameters in Table A.5.7.4.2.2-1 and Table A.5.7.4.2.2-2.

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

**Table A.5.7.4.2.2-1: FR2 CSI-RS based L1-RSRP general test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | **Test 2** |
| SSB GSCN | 1~2 |  | freq1 | freq1 |
| Duplex mode | 1~2 |  | TDD | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1~2 |  | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 |  | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 |  | CCR.3.1 TDD | CCR.3.1 TDD |
| SSB configuration | 1~2 |  | SSB.1 FR2 | SSB.1 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.1  ULBWP.1.1 | DLBWP.1.1  ULBWP.1.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 | TCI.State.2 |
| SMTC configuration | 1~2 |  | SMTC.1 | SMTC.1 |
| CSI-RS | 1~2 |  | CSI-RS.3.2 TDD | CSI-RS.3.2 TDD |
| reportConfigType | 1~2 |  | periodic | periodic |
| reportQuantity | 1~2 |  | cri-RSRP | cri-RSRP |
| Number of reported RS | 1~2 |  | 2 | 2 |
| L1-RSRP reporting period | 1~2 |  | slot320 | slot320 |
| Propagation condition | 1~2 |  | AWGN | AWGN |
| Antenna configuration | 1~2 |  | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | |

**Table A.5.7.4.2.2-2: FR2 CSI-RS based L1-RSRP OTA related test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | Test 2 NOTE 3 | |
| CSI-RS0 | CSI-RS1 | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | | Rough | |
|  | 1~2 | dBm/15kHz | -100 | | n.a. | |
|  | 1~2 | dBm/SSB SCS | -91 | | n.a.  n.a. | |
|  | 1~2 | dB | 10 | -2 | n.a. | |
| CSI-RS-RSRPNote1 | 1~2 | dBm/SCS | -81 | -93 | As in Table B.2.4-2 | |
| IoNote1 | 1~2 | dBm/  95.04MHz | -59.86 | | SS-RSRP+28.98 | |
|  | 1~2 | dB | -51.57 | -2 | n.a. | |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

##### A.5.7.4.2.3 Test Requirements

After 320ms from the beginning of the test, the L1-RSRP measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.20.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0. The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.7.4.2.3-1.

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

For Test 2:

Absolute accuracy of CSI-RS resource reported by UE in L1-RSRP report (CSI-RS0 or CSI-RS1). The UE is deemed to meet the requirement if the reported L1-RSRP is in the range shown in Table A.5.7.4.2.3-1.

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

Table A.5.7.4.2.3-1: L1-RSRP absolute accuracy test requirement

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

## A.5.8 Void