# 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 +/-3.29$\sigma$ 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.2.1.5 Requirements under CCA

A few requirements include CCA failures in DL and or UL. Considering that the CCA model is of statistical nature, requirements that include CCA failures are always considered of statistical nature.

# 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: 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.

### 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.

**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.

**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-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: 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 | CCR.1.5 FDD | | |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case | 10 | | |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 | | |
| Allocated resource blocks for CORESET Note 3 | | 24 | 18 | 24 | 18 | 24 | | |
| Number of transmitter antennas | | 1 | 1 | 1 | 1 | 1 | | |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 | 2 | | |
| monitoringSymbolsWithinSlot | | 1100000 0000000 | 1100000 0000000 | 1100000 0000000 | 1100000 0000000 | 0011000 0000000 | | |
| REG bundle size | | 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 | | |
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | | |
| Interleave n_shift | | 0 | 0 | 0 | 0 | 0 | | |
| Interleave size | | 2 | 2 | 2 | 2 | 2 | | |
| Beamforming Pre-Coder | | N/A | N/A | N/A | N/A | N/A | | |
| Aggregation level | CCE | 4 | 2 | 8 | 4 | 4 | | |
| DCI formats | | 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 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration<br>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 | CCR.1.5 TDD | | |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case | 10 | | |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 | | |
| Allocated resource blocks for CORESET Note 3 | | 24 | 18 | 24 | 18 | 18 | | |
| Number of transmitter antennas | | 1 | 1 | 1 | 1 | 1 | | |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 | 2 | | |
| monitoringSymbolsWithinSlot | | 1100000 0000000 | 1100000 0000000 | 1100000 0000000 | 1100000 0000000 | 0011000 0000000 | | |
| REG bundle size | | 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 | | |
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | | |
| Interleave n_shift | | 0 | 0 | 0 | 0 | 0 | | |
| Interleave size | | 2 | 2 | 2 | 2 | 2 | | |
| Beamforming Pre-Coder | | N/A | N/A | N/A | N/A | N/A | | |
| Aggregation level | CCE | 4 | 2 | 8 | 4 | 4 | | |
| DCI formats | | 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 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 | | | | |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | | | | |
| Subcarrier spacing | kHz | 30 | 30 | 30 | | | | |
| Allocated resource blocks for CORESET Note 3 | | 24 | 24 | 18 | | | | |
| Number of transmitter antennas | | 1 | 1 | 1 | | | | |
| Duration of CORESET | symbols | 2 | 2 | 2 | | | | |
| REG bundle size | | 6 | 6 | 6 | | | | |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | | | | |
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | | | | |
| Interleave n_shift | | 0 | 0 | 0 | | | | |
| Interleave size | | 2 | 2 | 2 | | | | |
| Beamforming Pre-Coder | | N/A | N/A | N/A | | | | |
| Aggregation level | CCE | 4 | 8 | 4 | | | | |
| DCI formats | | Note 1 | Note 1 | Note 1 | | | | |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | | | | |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration.<br>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 | | 11000000000000 | 00110000000000 | 11000000000000 | 11000000000000 | 00110000000000 | 11000000000000 | 11000000000000 |
| Duration of CORESET | slot | 1 | 1 | 1 | 1 | 1 | 1 | 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].<br>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 | TDDConf.2.2 | |
| *referenceSubcarrierSpacing* | kHz | 30 | 30 | |
| TDD UL/DL pattern 1 Note 2 | | '3D1S4U' S='6DL:4GP:4UL' | '1D1S2U' S='11DL: 1GP:2UL' | |
| *dl-UL-TransmissionPeriodicity* | ms | 4 | 2 | |
| *nrofDownlinkSlots* | | 3 | 1 | |
| *nrofDownlinkSymbols* | | 6 | 11 | |
| *nrofUplinkSlot* | | 4 | 2 | |
| *nrofUplinkSymbols* | | 4 | 2 | |
| TDD UL/DL pattern 2 Note 2 | | 'DD' | Not configured | |
| *dl-UL-TransmissionPeriodicity* | ms | 1 | Not configured | |
| *nrofDownlinkSlots* | | 2 | Not configured | |
| *nrofDownlinkSymbols* | | 0 | Not configured | |
| *nrofUplinkSlot* | | 0 | Not configured | |
| *nrofUplinkSymbols* | | 0 | Not configured | |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].<br>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].<br>Note 2: For information | | | | |

# A.3.1A Reference measurement channels under CCA

## A.3.1A.1 PDSCH

### A.3.1A.1.1 TDD

**Table A.3.1A.1.1-1: PDSCH Reference Measurement Channels for SCS=30kHz**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | SR.1.1 CCA | | | | | | |
| Channel bandwidth | MHz | 40 | | | | | | |
| 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 | Note 7 | | | | | | |
| 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 | 5184 | | | | | | |
| For slots without RMSI Note 6 | bits | 6048 | | | | | | |

Note 1: Allocated outside the discovery burst transmission window 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.3.10A.
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: PDSCH is transmitted during the RMC burst as specified in A.3.1A.5.

## A.3.1A.2 CORESET for RMSI scheduling

### A.3.1A.2.1 TDD

**Table A.3.1A.2.1-1: RMSI CORESET Reference Channel for SCS=30KHz**

| Parameter | Unit | Value | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | CR.1.1 CCA | | | | | | |
| Channel bandwidth | MHz | 40 | | | | | | |
| Subcarrier spacing | kHz | 30 | | | | | | |
| Allocated resource blocks for RMSI CORESET Note 7 | | 48 | | | | | | |
| | | | | | | | | |
| 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 0 | | | | | | |
| 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 4 in Table 13-4A 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.3.1A.3 CORESET for RMC scheduling

## A.3.1A.3.1 TDD

**Table A.3.1A.3.1-1: Control Channel RMC with SCS=30KHz**

| **Parameter** | **Unit** | **Value** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Reference channel | | CCR.1.1 CCA | CCR.1.2 CCA | CCR.1.3 CCA | | | | |
| Channel bandwidth | MHz | 40 | 40 | 40 | | | | |
| Subcarrier spacing | kHz | 30 | 30 | 30 | | | | |
| Allocated resource blocks for CORESET Note 3 | | 24 | 24 | 18 | | | | |
| Number of transmitter antennas | | 1 | 1 | 1 | | | | |
| Duration of CORESET | symbols | 2 | 2 | 2 | | | | |
| REG bundle size | | 6 | 6 | 6 | | | | |
| DMRS precoder granularity | | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | | | | |
| CCE to REG mapping | | Interleaved | Interleaved | Interleaved | | | | |
| Interleave n_shift | | 0 | 0 | 0 | | | | |
| Interleave size | | 2 | 2 | 2 | | | | |
| Beamforming Pre-Coder | | N/A | N/A | N/A | | | | |
| Aggregation level | CCE | 4 | 8 | 4 | | | | |
| DCI formats | | Note 1 | Note 1 | Note 1 | | | | |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | | | | |
| Note 1: DCI format shall depend upon the test configuration.<br>Note 2: Payload size shall depend upon the test configuration.<br>Note 3: Allocated in the same resource blocks where the associated RMC is scheduled. | | | | | | | | |

## A.3.1A.4 TDD UL/DL configuration

**Table A.3.1A.4-1: TDD UL/DL configuration for SCS=30kHz**

| Parameter | Unit | Value | | |
|---|---|---|---|---|
| Reference channel | | TDDConf.1.1 CCA | | |
| *referenceSubcarrierSpacing* | kHz | N/A | | |
| TDD UL/DL pattern 1 Note 2, Note 3 | | '3D1S4U' S='6DL:4GP:4UL' | | |
| *dl-UL-TransmissionPeriodicity* | ms | N/A | | |
| *nrofDownlinkSlots* | | N/A | | |
| *nrofDownlinkSymbols* | | N/A | | |
| *nrofUplinkSlot* | | N/A | | |
| *nrofUplinkSymbols* | | N/A | | |
| TDD UL/DL pattern 2 Note 2, Note 3 | | 'DD' | | |
| *dl-UL-TransmissionPeriodicity* | ms | N/A | | |
| *nrofDownlinkSlots* | | N/A | | |
| *nrofDownlinkSymbols* | | N/A | | |
| *nrofUplinkSlot* | | N/A | | |
| *nrofUplinkSymbols* | | N/A | | |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].<br>Note 2: Do not configure *tdd-UL-DL-ConfigurationCommon* using RRC configuration<br>Note 3: The UE will be scheduled via DCI according to the TDD pattern defined in the table. | | | | |

## A.3.1A.5 RMC burst transmission model

RMC not conveying RMSI is scheduled during the RMC burst. The length of the transmission burst in slots is defined as N. The burst transmission format is determined according to the steps below:

1. Select N randomly from a given set of the number of slots $S_1 = \{1,3,5\}$ with equal probability as the total length of RMC burst transmission format.

2. A uniform random variable from 0 to 1 is generated. If the random variable is less than $P_{CCA\_DL}$, a burst of N fully occupied slots is transmitted. Otherwise, the RMC burst transmission is muted and the muting duration is the same as the number N of slots for determined burst format.

RMC burst transmission is scheduled outside discovery burst transmission window. If transmission occurred in the previous slot, transmission is muted for a duration of one slot. Additionally, if the start time of the candidate RMC burst transmission is within 5 slots of the start of the discovery burst transmission window, RMC transmission is not performed.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.<br>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 $BW_{occupied}$ 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.<br>Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell.<br>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.<br>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.<br>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.<br>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.<br>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, the, 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 $q_0$ 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.4.5.5.5 | -15 |
| A.4.5.5.6 | -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.5.5.5.5 | -15 |
| A.5.5.5.6 | -15 |
| A.5.5.5.7 | -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.6.5.5.5 | -15 |
| A.6.5.5.6 | -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.7.5.5.5 | -15 |
| A.7.5.5.6 | -15 |
| A.7.5.5.7 | -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 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 bands E-UTRAN 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.3.6A Antenna configurations with unlicensed bands

### A.3.6A.1 Antenna configurations for FR1

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

#### A.3.6A.1.1 Antenna connection for 4 Rx capable UEs

##### A.3.6A.1.1.1 Introduction

All tests in clause A.13, A.10, A.11, and A.12 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.13, A.10, A.11 or A.12 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.3.6A.1.1.2 Principle of testing

###### A.3.6A.1.1.2.1 Single carrier tests

For 4RX capable UEs supporting at least one 2RX band, the, all single carrier tests specified in clause A.13. A.10, A.11 and A.12 except those in A.13.4, A.10.5, A.11.6 and A.12.5 shall be tested on any band where 2RX is supported with the antenna connection specified in A.3.6A.1.1.2.4. For single carrier tests specified in clause A.13.4, A.10.5, A.11.6 or A.12.5, all tests shall be tested with the antenna connection specified in A.3.6A.1.1.2.4 for bands where 2RX is supported, and the antenna connection specified in A.3.6A.1.1.2.5 for bands where 4RX is supported.

For 4RX capable UEs which do not support any 2RX band, all tests specified in clauses A.13, A.10, A.11 and A.12 shall be tested using the antenna connection specified in clause A.3.6A.1.1.2.5. For radio link monitoring tests, the SNR levels are modified according to table A.3.6A.1.1.2.1-1 and table A.3.6A.1.1.2.1-2

**Table A.3.6A.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.10.3.1.2 | -18 | N/A | N/A | N/A |
| A.10.3.1.4 | TBD | N/A | N/A | N/A |
| A.11.4.1.2 | -18 | N/A | N/A | N/A |
| A.11.4.1.4 | TBD | N/A | N/A | N/A |

**Table A.3.6A.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.10.3.1.3 | -18 | N/A | -8 | N/A |
| A.10.3.1.5 | TBD | N/A | TBD | N/A |
| A.11.4.1.3 | -18 | N/A | -8 | N/A |
| A.11.4.1.5 | TBD | N/A | TBD | N/A |

**Table A.3.6A.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 $q_0$ during T3, T4 and T5 (dB) | |
|---|---|---|
| | Test 1 | Test 2 |
| A.10.3.4.1 | -15 | N/A |
| A.10.3.4.2 | -15 | N/A |
| A.11.4.4.1 | -15 | N/A |
| A.11.4.4.2 | -15 | N/A |

### A.3.6A.1.1.2.2 Carrier aggregation tests

All carrier aggregation tests are performed using the antenna connection in clause A.3.6A.1.1.2.4 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in A.3.6A.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.3.6A.1.1.2.4 for the SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in A.3.6A.1.1.2.5 for the SCell antenna connection if an SCell is on a band where 4RX is supported.

### A.3.6A.1.1.2.3 EN-DC tests

All carrier aggregation tests are performed using the antenna connection in clause A.3.6A.1.1.2.6 for the PCell antenna connection if the PCell is on a band where 2RX is supported or the antenna connection in A.3.6A.1.1.2.7 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.3.6A.1.1.2.4 for the PSCell or SCell antenna connection if an SCell is on band where 2RX is supported or the testing procedure in A.3.6A.1.1.2.5 for the SCell antenna connection if an SCell or PSCell is on a band where 4RX is supported.

##### A.3.6A.1.1.2.4 Antenna connection for bands where 2RX is supported

For bands where 2RX is supported, it is left to the UE declaration and AP 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.3.6A.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.3.6A.1.1.2.1 and A.3.6A.1.1.2.2, no test parameters or requirements are modified.

##### A.3.6A.1.1.2.6 EN-DC LTE Antenna connection for bands where 2RX is supported

For bands where LTE 2RX is supported, it is left to the UE declaration and AP 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.3.6A.1.1.2.7 EN-DC LTE Antenna connection for bands where 4RX is supported

For bands where LTE 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.3.7 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 configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |

| | | |
|---|---|---|
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>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_RA[Note3] | dB | |
| OCNG_RB[Note3] | dB | |
| $N_{oc}$[Note4] | dBm/15 kHz | -104 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| RSRP [Note5] | dBm/15 kHz | -87 |
| SCH_RP [Note5] | dBm/15 kHz | -87 |
| Io [Note5] | dBm/Ch BW | -59.13+10log($N_{RB,c}$ /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.<br>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.<br>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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 5: $E_s/I_{ot}$, 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 configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | MHz | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |

| | | |
|---|---|---|
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>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_RA[Note3] | dB | |
| OCNG_RB[Note3] | dB | |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.<br>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.<br>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.<br>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 EN-DC test setup with unlicensed bands

## A.3.7B.1 Introduction

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

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

Table A.3.7A.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 under CCA in FR1. Unless otherwise stated within the test, all measurements in Annex A.4 and A.5 are performed only on the unlicensed 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.3.7B.2.1-1: E-UTRAN cell specific test parameters for tests with all NR cells user CCA in FR1**

| Parameter | Unit | E-UTRAN Cell |
|---|---|---|
| Duplex mode | | FDD or TDD |
| TDD special subframe configuration[Note1] | | 6 |
| TDD uplink-downlink configuration[Note1] | | 1 |
| $BW_{channel}$ | | 5 MHz: $N_{RB,c}$ = 25<br>10 MHz: $N_{RB,c}$ = 50<br>20 MHz: $N_{RB,c}$ = 100 |
| PDSCH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.7 FDD<br>10 MHz: R.3 FDD<br>20 MHz: R.6 FDD<br>5 MHz: R.4 TDD<br>10 MHz: R.0 TDD<br>20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:<br>DL Reference Measurement Channel[Note2] | | 5 MHz: R.11 FDD<br>10 MHz: R.6 FDD<br>20 MHz: R.10 FDD<br>5 MHz: R.11 TDD<br>10 MHz: R.6 TDD<br>20 MHz: R.10 TDD |
| OCNG Patterns[Note2] | | 5 MHz: OP.20 FDD<br>10 MHz: OP.10 FDD<br>20 MHz: OP.17 FDD<br>5 MHz: OP.9 TDD<br>10 MHz: OP.1 TDD<br>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_RA[Note3] | dB | |
| OCNG_RB[Note3] | dB | |
| $N_{oc}$[Note4] | dBm/15 kHz | -104 |

| | | |
|---|---|---|
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| RSRP Note5 | dBm/15 kHz | -87 |
| SCH_RP Note5 | dBm/15 kHz | -87 |
| Io Note5 | dBm/Ch BW | $-59.13+10\log(N_{RB,c}/50)$ |
| 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.<br>Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.<br>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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 5: $E_s/I_{ot}$, RSRP, SCH_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |

# 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.3.8 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<br>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, $N_{CS}$ = 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, $N_{CS}$ = 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, $N_{CS}$ = 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, $N_{CS}$ = 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, $N_{CS}$ = 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, $N_{CS}$ = 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 3Field | 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, $N_{CS}$ = 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, $N_{CS}$ = 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.3.8A PRACH configurations under CCA

## A.3.8A.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.3.8A.2 PRACH configurations in FR1

### A.3.8A.2.1 FR1 PRACH configuration 1 under CCA

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

**Table A.3.8A.2.1-1: Parameters for FR1 PRACH configuration 1 under CCA**

| 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-114 | Increased by 6 dB compared with FR1 PRACH configuration 1 for random access test with UL CCA failures. |
| preambleTransMax | n20 | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures |
| ra-ResponseWindow | Sl20 | 20 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 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.3.8A.2.2 FR1 PRACH configuration 2 under CCA

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

**Table A.3.8A.2.2-1: Parameters for FR1 PRACH configuration 2 under CCA**

| 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-114 | Increased by 6 dB compared with FR1 PRACH configuration 2 for random access test with UL CCA failures. |
| preambleTransMax | n20 | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures |
| ra-ResponseWindow | sl20 | 20 slots |
| zeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 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.3.9 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 | $RB_c$ Note 1 | |
| Bandwidth | RB | Same as RF channel defined in each test | same as RMSI CORESET (CORESET #0) defined in each test | |
| Note 1: $RB_c$ 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 |
| Starting PRB index | | 0 | $RB_b$ Note 1 | $RB_a$ Note 2 |
| Bandwidth | RB | Same as RF channel defined in each test | 25 for SSB SCS = 15KHz,<br>51 for SSB SCS = 30KHz,<br>32 for SSB SCS = 120KHz<br>48 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,<br>51 for SSB SCS = 30KHz,<br>32 for SSB SCS = 120KHz<br>48 for SSB SCS = 240KHz |
| Note 1: $RB_b$ is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) which is defined in Clause A.3.10.<br>Note 2: $RB_a$ is the lowest PRB index to guarantee the BWP including SSB PRB index ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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 | $RB_c$ Note 1 | |
| Bandwidth | RB | Same as RF channel defined in each test | same as RMSI CORESET (CORESET #0) defined in each test | |
| Note 1: $RB_c$ is same as $RB_c$ 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 |
| Starting PRB index | | 0 | $RB_b$ Note 1 | $RB_a$ Note 2 |
| Bandwidth | RB | Same as RF channel defined in each test | 25 for SSB SCS = 15KHz,<br>51 for SSB SCS = 30KHz,<br>32 for SSB SCS = 120KHz<br>48 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,<br>51 for SSB SCS = 30KHz,<br>32 for SSB SCS = 120KHz<br>48 for SSB SCS = 240KHz |
| Note 1: $RB_b$ is same as $RB_b$ for DLBWP.1.2 as defined in Table A.3.9.2.2-1.<br>Note 2: $RB_a$ is same as $RB_a$ 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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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].<br>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.<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)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].<br>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.<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 1 |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 1 |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)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].<br>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.<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+39}$) 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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+39}$) 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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+39}$) 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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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].<br>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 ($T_{SSB}$) | 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($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+39}$) 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].<br>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.3.10A SSB Configurations under CCA

## A.3.10A.1 SSB Configurations under CCA for FR1

### A.3.10A.1.1 SSB pattern 1 under CCA for semi-static channel access: SSB allocation for SSB SCS=30kHz in 40MHz

**Table A.3.10A.1.1-1: SSB.1 CCA: SSB Pattern 1 for SSB SCS=30 kHz in 40 MHz channel**

| SSB Parameters | Values |
|---|---|
| Channel bandwidth | 40 MHz |
| SSB SCS | 30 kHz |
| SSB periodicity ($T_{SSB}$) | 20 ms |
| Number of SSB indexes per SS-burst ($N_{SSB}^{QCL}$) | 1 |
| Number of SS/PBCH block candidates per SSB index | 1 |
| SS/PBCH block candidate position | 0 |
| 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($T_{SSB}$,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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].<br>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.3.10A.1.2 SSB pattern 2 under CCA for dynamic channel access: SSB allocation for SSB SCS=30kHz in 40MHz

**Table A.3.10A.1.2-1: SSB.2 CCA: 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 ($T_{SSB}$) | 20 ms | |
| Number of SSB indexes per SS-burst ($N_{SSB}^{QCL}$) | 1 | |
| Number of SS/PBCH block candidates per SSB index | 2 | |
| SS/PBCH block candidate position | 0 | 2 |
| SS/PBCH block index | 0 | 0 |
| Symbol numbers containing SSB [Note 2] | 2-5 | 2-5 |
| Slot numbers containing SSB [Note 2] | 0 | 1 |
| SFN containing SSB | SFN mod (max($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)[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].<br>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.3.10A.1.3 SSB pattern 3 under CCA for semi-static channel access: SSB allocation for SSB SCS=30 kHz in 40 MHz

**Table A.3.10.1.3-1: SSB.3 CCA: SSB Pattern 3 for SSB SCS=30 kHz in 40 MHz channel**

| SSB Parameters | Values | |
|---|---|---|
| Channel bandwidth | 40 MHz | |
| SSB SCS | 30 kHz | |
| SSB periodicity ($T_{SSB}$) | 20 ms | |
| Number of SSB indexes per SS-burst ($N_{SSB}^{QCL}$) | 2 | |
| Number of SS/PBCH block candidates per SSB index | 1 | |
| SS/PBCH block candidate position | 0 | 1 |
| 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($T_{SSB}$,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$)[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].<br>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.3.10A.1.4 SSB pattern 4 under CCA for dynamic channel access: SSB allocation for SSB SCS=30 kHz in 40 MHz

**Table A.3.10.1.4-1: SSB.4 CCA: 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 ($T_{SSB}$) | 20 ms | | | |
| Number of SSB indexes per SS-burst ($N_{SSB}^{QCL}$) | 2 | | | |
| Number of SS/PBCH block candidates per SSB index | 2 | | | |
| SS/PBCH block candidate position | 0 | 2 | 1 | 3 |
| SS/PBCH block index | 0 | 0 | 1 | 1 |
| Symbol numbers containing SSB Note 2 | 2-5 | 2-5 | 8-11 | 8-11 |
| Slot numbers containing SSB Note 2 | 0 | 1 | 0 | 1 |
| SFN containing SSB | SFN mod (max($T_{SSB}$,10ms)/10ms) = 0 | | | |
| RB numbers containing SSB within channel BW | ($RB_J$, $RB_{J+1}$,…., $RB_{J+19}$) 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].<br>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.3.12 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.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.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.3.14 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 | CSI-RS.1.5 FDD | CSI-RS.1.6 FDD |
|---|---|---|---|---|---|---|
| **Resource Type** | **periodic** | **periodic** | **aperiodic** | **aperiodic** | **aperiodic** | **periodic** |
| **Resource Set Config** | | | | | | |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | off | n.a. |
| aperiodicTriggeringOffset | n.a. | n.a. | 4 | 4 | 6 | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |

<table>
<tr><th>Resource Config</th><th></th><th></th><th></th><th></th><th></th><th></th></tr>
<tr><td rowspan="8">nzp-CSI-RS-ResourceId</td><td rowspan="8">0 for resource #0</td><td rowspan="4">0 for resource #0</td><td rowspan="4">0 for resource #0</td><td>0 for resource #0</td><td rowspan="4">0 for resource #0</td><td rowspan="8">0 for resource #0</td></tr>
<tr><td>1 for resource #1</td></tr>
<tr><td>2 for resource #2</td></tr>
<tr><td>3 for resource #3</td></tr>
<tr><td rowspan="4">1 for resource #1</td><td rowspan="4">1 for resource #1</td><td>4 for resource #4</td><td rowspan="4">1 for resource #1</td></tr>
<tr><td>5 for resource #5</td></tr>
<tr><td>6 for resource #6</td></tr>
<tr><td>7 for resource #7</td></tr>
<tr><td>powerControlOffset</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>powerControlOffsetSS</td><td>db0</td><td>db0</td><td>db0</td><td>db0</td><td>db0</td><td>db0</td></tr>
<tr><td>scramblingID</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Period (slots)</td><td>slot5</td><td>slot10</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>slot40</td></tr>
<tr><td>Offset</td><td>1</td><td>1</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>1</td></tr>
<tr><td rowspan="2">qcl-InfoPeriodicCSI-RS</td><td rowspan="2">TCI.State.0</td><td>TCI.State.0</td><td rowspan="2">n.a.</td><td rowspan="2">n.a.</td><td rowspan="2">n.a.</td><td rowspan="2">TCI.State.0</td></tr>
<tr><td>TCI.State.1</td></tr>
<tr><td>frequencyDomainAllocation</td><td>000001</td><td>0001</td><td>0001</td><td>0001</td><td>000001</td><td>000001</td></tr>
<tr><td>nrofPorts</td><td>2</td><td>1</td><td>1</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td rowspan="8">firstOFDMSymbolInTimeDomain</td><td rowspan="8">4 for resource #0</td><td rowspan="4">6 for resource #0</td><td rowspan="4">6 for resource #0</td><td>0 for resource #0</td><td rowspan="4">Specified in the test case for resource #0</td><td rowspan="8">5 for resource #0</td></tr>
<tr><td>1 for resource #1</td></tr>
<tr><td>2 for resource #2</td></tr>
<tr><td>3 for resource #3</td></tr>
<tr><td rowspan="4">10 for resource #1</td><td rowspan="4">10 for resource #1</td><td>4 for resource #4</td><td rowspan="4">n.a.</td></tr>
<tr><td>5 for resource #5</td></tr>
<tr><td>6 for resource #6</td></tr>
<tr><td>7 for resource #7</td></tr>
</table>

| | | | | | | |
|---|---|---|---|---|---|---|
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | noCDM | FD-CDM2 |
| density | 1 | 3 | 3 | 3 | 3 | 1 |
| startingRB | 0 | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 276 (Note 1) | 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.3.14.1-1A: CSI-RS Reference Measurement Channels for SCS=15kHz**

| | CSI-RS.1.1A FDD | CSI-RS.1.2A FDD | CSI-RS.1.3A FDD |
|---|---|---|---|
| Resource Type | periodic | aperiodic | periodic |
| **Resource Set Config** | | | |
| nzp-CSI-ResourceSetId | 1 | 1 | 1 |
| repetition | off | off | off |
| aperiodicTriggeringOffset | n.a. | 6 | n.a. |
| trs-Info | n.a. | n.a. | n.a. |
| **Resource Config** | | | |
| nzp-CSI-RS-ResourceId | 12 for resource #0<br>13 for resource #1 | 22 for resource #0<br>23 for resource #1 | 14 for resource #0<br>15 for resource #1 |
| powerControlOffset | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 |
| Period (slots) | slot20 | n.a. | slot10 |
| Offset | 1 | n.a. | 2 |
| qcl-InfoPeriodicCSI-RS | n.a. | n.a. | n.a. |
| frequencyDomainAllocation | 0001 | 0001 | 0001 |
| nrofPorts | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 6 for resource #0<br>10 for resource #1 | 7 for resource #0<br>11 for resource #1 | 6 for resource #0<br>10 for resource #1 |
| cdm-Type | noCDM | noCDM | noCDM |
| density | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 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**

<table>
<tr><th></th><th>CSI-RS.1.1 TDD</th><th>CSI-RS.1.2 TDD</th><th>CSI-RS.1.3 TDD</th><th>CSI-RS.1.4 TDD</th><th>CSI-RS.1.5 TDD</th></tr>
<tr><td>Resource Type</td><td>periodic</td><td>periodic</td><td>aperiodic</td><td>aperiodic</td><td>periodic</td></tr>
<tr><td>Resource Set Config</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>nzp-CSI-ResourceSetId</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>repetition</td><td>n.a.</td><td>off</td><td>off</td><td>on</td><td>n.a.</td></tr>
<tr><td>aperiodicTriggeringOffset</td><td>n.a.</td><td>n.a.</td><td>4</td><td>4</td><td>n.a.</td></tr>
<tr><td>trs-Info</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>n.a.</td></tr>
<tr><td>Resource Config</td><td></td><td></td><td></td><td></td><td rowspan="9"></td></tr>
<tr><td rowspan="8">nzp-CSI-RS-ResourceId</td><td rowspan="8">0 for resource #0</td><td rowspan="4">0 for resource #0</td><td rowspan="4">0 for resource #0</td><td>0 for resource #0</td></tr>
<tr><td>1 for resource #1</td></tr>
<tr><td>2 for resource #2</td></tr>
<tr><td>3 for resource #3</td></tr>
<tr><td rowspan="4">1 for resource #1</td><td rowspan="4">1 for resource #1</td><td>4 for resource #4</td></tr>
<tr><td>5 for resource #5</td></tr>
<tr><td>6 for resource #6</td></tr>
<tr><td>7 for resource #7</td></tr>
<tr><td>powerControlOffset</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>powerControlOffsetSS</td><td>db0</td><td>db0</td><td>db0</td><td>db0</td><td>db0</td></tr>
<tr><td>scramblingID</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Period (slots)</td><td>slot5</td><td>slot10</td><td>n.a.</td><td>n.a.</td><td>slot40</td></tr>
<tr><td>Offset</td><td>1</td><td>1</td><td>n.a.</td><td>n.a.</td><td>1</td></tr>
<tr><td rowspan="2">qcl-InfoPeriodicCSI-RS</td><td rowspan="2">TCI.State.0</td><td>TCI.State.0</td><td rowspan="2">n.a.</td><td rowspan="2">n.a.</td><td rowspan="2">TCI.State.0</td></tr>
<tr><td>TCI.State.1</td></tr>
<tr><td>frequencyDomainAllocation</td><td>000001</td><td>0001</td><td>0001</td><td>0001</td><td>000001</td></tr>
<tr><td>nrofPorts</td><td>2</td><td>1</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td rowspan="8">firstOFDMSymbolInTimeDomain</td><td rowspan="8">4 for resource #0</td><td rowspan="4">6 for resource #0</td><td rowspan="4">6 for resource #0</td><td>0 for resource #0</td><td rowspan="8">5 for resource #0</td></tr>
<tr><td>1 for resource #1</td></tr>
<tr><td>2 for resource #2</td></tr>
<tr><td>3 for resource #3</td></tr>
<tr><td rowspan="4">10 for resource #1</td><td rowspan="4">10 for resource #1</td><td>4 for resource #4</td></tr>
<tr><td>5 for resource #5</td></tr>
<tr><td>6 for resource #6</td></tr>
<tr><td>7 for resource #7</td></tr>
</table>

| | | | | | |
|---|---|---|---|---|---|
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | FD-CDM2 |
| density | 1 | 3 | 3 | 3 | 1 |
| startingRB | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 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.3.14.2-1A: CSI-RS Reference Measurement Channels for SCS=15kHz**

| | **CSI-RS.1.1A TDD** | **CSI-RS.1.2A TDD** | **CSI-RS.1.3A TDD** |
|---|---|---|---|
| Resource Type | periodic | aperiodic | periodic |
| **Resource Set Config** | | | |
| nzp-CSI-ResourceSetId | 1 | 1 | 1 |
| repetition | off | off | off |
| aperiodicTriggeringOffset | n.a. | 6 | n.a. |
| trs-Info | n.a. | n.a. | n.a. |
| **Resource Config** | | | |
| nzp-CSI-RS-ResourceId | 12 for resource #0 | 22 for resource #0 | 14 for resource #0 |
| | 13 for resource #1 | 23 for resource #1 | 15 for resource #1 |
| powerControlOffset | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 |
| Period (slots) | slot20 | n.a. | slot10 |
| Offset | 1 | n.a. | 2 |
| qcl-InfoPeriodicCSI-RS | n.a. | n.a. | n.a. |
| frequencyDomainAllocation | 0001 | 0001 | 0001 |
| nrofPorts | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| cdm-Type | noCDM | noCDM | noCDM |
| density | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 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**

<table>
<tr><th></th><th>CSI-RS.2.1 TDD</th><th>CSI-RS.2.2 TDD</th><th>CSI-RS.2.3 TDD</th><th>CSI-RS.2.4 TDD</th><th>CSI-RS.2.5 TDD</th><th>CSI-RS.2.6 TDD</th></tr>
<tr><th>Resource Type</th><th>periodic</th><th>periodic</th><th>aperiodic</th><th>aperiodic</th><th>aperiodic</th><th>periodic</th></tr>
<tr><th>Resource Set Config</th><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>nzp-CSI-ResourceSetId</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>repetition</td><td>n.a.</td><td>off</td><td>off</td><td>on</td><td>off</td><td>n.a.</td></tr>
<tr><td>aperiodicTriggeringOffset</td><td>n.a.</td><td>n.a.</td><td>4</td><td>4</td><td>6</td><td>n.a.</td></tr>
<tr><td>trs-Info</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>n.a.</td></tr>
<tr><th>Resource Config</th><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="8">nzp-CSI-RS-ResourceId</td><td rowspan="8">0 for resource #0</td><td rowspan="4">0 for resource #0</td><td rowspan="4">0 for resource #0</td><td>0 for resource #0</td><td rowspan="4">0 for resource #0</td><td rowspan="8">0 for resource #0</td></tr>
<tr><td>1 for resource #1</td></tr>
<tr><td>2 for resource #2</td></tr>
<tr><td>3 for resource #3</td></tr>
<tr><td rowspan="4">1 for resource #1</td><td rowspan="4">1 for resource #1</td><td>4 for resource #4</td><td rowspan="4">1 for resource #1</td></tr>
<tr><td>5 for resource #5</td></tr>
<tr><td>6 for resource #6</td></tr>
<tr><td>7 for resource #7</td></tr>
<tr><td>powerControlOffset</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>powerControlOffsetSS</td><td>db0</td><td>db0</td><td>db0</td><td>db0</td><td>db0</td><td>db0</td></tr>
<tr><td>scramblingID</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Period (slots)</td><td>slot10</td><td>slot20</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>slot80</td></tr>
<tr><td>Offset</td><td>2</td><td>2</td><td>n.a.</td><td>n.a.</td><td>n.a.</td><td>2</td></tr>
<tr><td rowspan="2">qcl-InfoPeriodicCSI-RS</td><td rowspan="2">TCI.State.0</td><td>TCI.State.0</td><td rowspan="2">n.a.</td><td rowspan="2">n.a.</td><td rowspan="2">n.a.</td><td rowspan="2">TCI.State.0</td></tr>
<tr><td>TCI.State.1</td></tr>
<tr><td>frequencyDomainAllocation</td><td>000001</td><td>0001</td><td>0001</td><td>0001</td><td>000001</td><td>000001</td></tr>
<tr><td>nrofPorts</td><td>2</td><td>1</td><td>1</td><td>1</td><td>1</td><td>2</td></tr>
<tr><td rowspan="8">firstOFDMSymbolInTimeDomain</td><td rowspan="8">5 for resource #0</td><td rowspan="4">6 for resource #0</td><td rowspan="4">6 for resource #0</td><td>0 for resource #0</td><td rowspan="4">Specified in the test case for resource #0</td><td rowspan="7">5 for resource #0</td></tr>
<tr><td>1 for resource #1</td></tr>
<tr><td>2 for resource #2</td></tr>
<tr><td>3 for resource #3</td></tr>
<tr><td rowspan="4">10 for resource #1</td><td rowspan="4">10 for resource #1</td><td>4 for resource #4</td><td rowspan="3">n.a.</td></tr>
<tr><td>5 for resource #5</td></tr>
<tr><td>6 for resource #6</td></tr>
<tr><td>7 for resource #7</td><td></td><td></td></tr>
<tr><td>cdm-Type</td><td>FD-CDM2</td><td>noCDM</td><td>noCDM</td><td>noCDM</td><td>noCDM</td><td>FD-CDM2</td></tr>
<tr><td>density</td><td>1</td><td>3</td><td>3</td><td>3</td><td>3</td><td>1</td></tr>
<tr><td>startingRB</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>nrofRBs</td><td>276 (Note 1)</td><td>276 (Note 1)</td><td>276 (Note 1)</td><td>276 (Note 1)</td><td>276 (Note 1)</td><td>276 (Note 1)</td></tr>
<tr><td colspan="7">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.</td></tr>
</table>

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

| | **CSI-RS.2.1A TDD** | **CSI-RS.2.2A TDD** | **CSI-RS.2.3A TDD** |
|---|---|---|---|
| Resource Type | periodic | aperiodic | periodic |
| **Resource Set Config** | | | |
| nzp-CSI-ResourceSetId | 1 | 1 | 1 |
| repetition | off | off | off |
| aperiodicTriggeringOffset | n.a. | 6 | n.a. |
| trs-Info | n.a. | n.a. | n.a. |
| **Resource Config** | | | |
| nzp-CSI-RS-ResourceId | 12 for resource #0 | 22 for resource #0 | 14 for resource #0 |
| | 13 for resource #1 | 23 for resource #1 | 15 for resource #1 |
| powerControlOffset | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 |
| Period (slots) | slot40 | n.a. | slot20 |
| Offset | 2 | n.a. | 4 |
| qcl-InfoPeriodicCSI-RS | n.a. | n.a. | n.a. |
| frequencyDomainAllocation | 0001 | 0001 | 0001 |
| nrofPorts | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| cdm-Type | noCDM | noCDM | noCDM |
| density | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 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 | CSI-RS.3.5 TDD |
|---|---|---|---|---|---|
| Resource Type | periodic | periodic | aperiodic | aperiodic | **periodic** |
| **Resource Set Config** | | | | | |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | n.a. |
| aperiodicTriggeringOffset | n.a. | n.a. | 4 | 4 | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** | | | | | |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 0 for resource #0<br>1 for resource #1 | 0 for resource #0<br>1 for resource #1 | 0 for resource #0<br>1 for resource #1<br>2 for resource #2<br>3 for resource #3<br>4 for resource #4<br>5 for resource #5<br>6 for resource #6<br>7 for resource #7 | 0 for resource #0 |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot40 | slot80 | n.a. | n.a. | slot320 |
| Offset | 8 | 8 | n.a. | n.a. | 8 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0<br>TCI.State.1 | n.a. | n.a. | TCI.State.0 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 |
| nrofPorts | 1 | 1 | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 6 for resource #0<br>10 for resource #1 | 6 for resource #0<br>10 for resource #1 | 0 for resource #0<br>1 for resource #1<br>2 for resource #2<br>3 for resource #3<br>4 for resource #4<br>5 for resource #5<br>6 for resource #6<br>7 for resource #7 | 5 for resource #0 |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | FD-CDM2 |
| density | 1 | 3 | 3 | 3 | 1 |
| startingRB | 0 | 0 | 0 | 0 | 0 |
| nrofRBs | 276 (Note 1) | 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.3.14.2-3A: CSI-RS Reference Measurement Channels for SCS=120kHz**

| | CSI-RS.3.1A TDD | CSI-RS.3.2A TDD | CSI-RS.3.3A TDD |
|---|---|---|---|
| Resource Type | periodic | aperiodic | periodic |
| **Resource Set Config** | | | |
| nzp-CSI-ResourceSetId | 1 | 1 | 1 |
| repetition | off | off | off |
| aperiodicTriggeringOffset | n.a. | 6 | n.a. |
| trs-Info | n.a. | n.a. | n.a. |
| **Resource Config** | | | |
| nzp-CSI-RS-ResourceId | 12 for resource #0<br>13 for resource #1 | 22 for resource #0<br>23 for resource #1 | 14 for resource #0<br>15 for resource #1 |
| powerControlOffset | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 |
| Period (slots) | slot160 | n.a. | slot80 |
| Offset | 8 | n.a. | 16 |
| qcl-InfoPeriodicCSI-RS | n.a. | n.a. | n.a. |
| frequencyDomainAllocation | 0001 | 0001 | 0001 |
| nrofPorts | 1 | 1 | 1 |
| firstOFDMSymbolInTimeDomain | 6 for resource #0<br>10 for resource #1 | 7 for resource #0<br>11 for resource #1 | 6 for resource #0<br>10 for resource #1 |
| cdm-Type | noCDM | noCDM | noCDM |
| density | 3 | 3 | 3 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 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 A.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 |
| 5 | 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-Type2 Note1 | 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<br>Note 2: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner.<br>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 BWP Note 1 |
| SCS | kHz | 15 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 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<br>11 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0 Note 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<br>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 BWP Note 1 |
| SCS | kHz | 30 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 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<br>21 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0 Note 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<br>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 BWP Note 1 |
| SCS | kHz | 15 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 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<br>11 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0 Note 2 |
| TCI state | | TCI.State.0 |
| Note: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases | | |

**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 BWP[Note 1] |
| SCS | kHz | 30 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 5 for CSI-RS resource 1 and 3<br>$l_0$ = 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<br>21 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0[Note 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<br>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 BWP[Note 1,3] |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 1 for CSI-RS resource 1 and 3<br>$l_0$ = 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<br>41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0[Note 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<br>Note 2: Unless otherwise specified in the test case<br>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 BWP[Note 1,3] |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS | | $k_0$=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS | | $l_0$ = 2 for CSI-RS resource 1 and 3<br>$l_0$ = 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<br>41 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0[Note 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<br>Note 2: Unless otherwise specified in the test case<br>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.3.19 Test applicability for DAPS handover

## A.3.19.1 Introduction

In Annex A test cases for DAPS handover may be defined with cells in on same or different carrier frequency to verify intra-frequency, intra-band inter-frequency and inter-band inter-frequency DAPS handover RRM requirements, respectively.

## A.3.19.2 Principle of testing

To verify intra-frequency DAPS handover requirements

- The UE capable of intra-frequency asynchronous DAPS handover on any band needs to be tested only in asynchronous scenario.
- The UE not capable of intra-frequency asynchronous DAPS handover on any band but capable of synchronous DAPS handover on some band needs to be tested only in synchronous scenario.

To verify intra-band inter-frequency DAPS handover requirements

- The UE capable of intra-band inter-frequency asynchronous DAPS handover on any band needs to be tested only in asynchronous scenario.

- The UE not capable of intra-band inter-frequency asynchronous DAPS handover on any band but capable of intra-band inter-frequency synchronous DAPS handover on some band needs to be tested only in synchronous scenario.

To verify inter-band inter-frequency DAPS handover requirements

- The UE capable of inter-band inter-frequency asynchronous DAPS handover on any band combination needs to be tested only in asynchronous scenario.

- The UE not capable of inter-band inter-frequency asynchronous DAPS handover on any band combination but capable of inter-band inter-frequency synchronous DAPS handover on some band combination needs to be tested only in synchronous scenario.

# A.3.20 MsgA configurations

## A.3.20.1 Introduction

This clause provides the typical PRACH and PUSCH configurations for MsgA 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.3.20.2 MsgA configurations in FR1

### A.3.20.2.1 FR1 MsgA configuration 1

FR1 MsgA configuration 1 in this clause provides the typical MsgA configuration for SSB-based contention based random access for 2-step RA type in FR1.

**Table A.3.20.2.1-1: Parameters for FR1 MsgA configuration 1**

| Field | Value | Comment |
|---|---|---|
| msgA-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]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | OneFourth: 1 SSB associated with 4 RACH occasions n48: 48 contention based preambles per SSB |
| msgA-RO-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| ra-ContentionResolutionTimer | sf48 | 48 sub-frames |
| msgA-PreamblePowerRampingStep | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-120 | |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| msgB-ResponseWindow | sl10 | 10 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| msgA-MCS | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | Number of time domain PUSCH occasions in each slot |
| msgA-PUSCH-TimeDomainOffset | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | |
| PUSCH allocation length | 14 | |
| mappingTypeMsgA-PUSCH | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 1 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 3 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Whether to apply delta MCS |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

## A.3.20.2.2 FR1 MsgA configuration 2

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

**Table A.3.20.2.2-1: Parameters for FR1 MsgA configuration 2**

| Field | Value | Comment |
|---|---|---|
| msgA-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]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msgA-RO-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| msgA-PreamblePowerRampingStep | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-120 | |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| msgB-ResponseWindow | sl10 | 10 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 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 |
| msgA-MCS | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | Number of time domain PUSCH occasions in each slot |
| msgA-PUSCH-TimeDomainOffset | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | |
| PUSCH allocation length | 14 | |
| mappingTypeMsgA-PUSCH | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 1 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 3 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Whether to apply delta MCS |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

## A.3.20.3 MsgA configurations in FR2

### A.3.20.3.1 FR2 MsgA configuration 1

FR2 MsgA configuration 1 in this clause provides the typical MsgA configuration for SSB-based contention based random access for 2-step RA type in FR2.

**Table A.3.20.3.1-1: Parameters for FR2 MsgA configuration 1**

| Field | Value | Comment |
|---|---|---|
| msgA-prach-ConfigurationIndex | 190 | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configurations defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention-based preambles per SSB |
| msgA-RO-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| ra-ContentionResolutionTimer | sf48 | 48 sub-frames |
| msgA-PreamblePowerRampingStep | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-120 | |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| msgB-ResponseWindow | sl10 | 10 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 20 ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| msgA-MCS | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | Number of time domain PUSCH occasions in each slot |
| msgA-PUSCH-TimeDomainOffset | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | |
| PUSCH allocation length | 10 | |
| mappingTypeMsgA-PUSCH | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 1 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 3 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Whether to apply delta MCS |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.20.3.2 FR2 MsgA configuration 2

FR2 MsgA configuration 2 in this clause provides the typical MsgA configuration for SSB based non-contention based random access for 2-step RA type in FR2.

**Table A.3.20.3.2-1: Parameters for FR2 MsgA configuration 2**

| Field | Value | Comment |
|---|---|---|
| msgA-prach-ConfigurationIndex | 190 | Preamble Format C2, with 10ms PRACH periodicity, and other detailed configurations defined in table 6.3.3.2-4 in TS 38.211 [6]. |
| msgA-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. |
| msgA-PRACH-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msgA-RO-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| msgA-PreamblePowerRampingStep | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-120 | |
| preambleTransMax | n6 | Max number of RA preamble transmission performed before declaring a failure is 6 |
| msgB-ResponseWindow | sl10 | 10 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 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 |
| msgA-MCS | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | Number of time domain PUSCH occasions in each slot |
| msgA-PUSCH-TimeDomainOffset | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | |
| PUSCH allocation length | 10 | |
| mappingTypeMsgA-PUSCH | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 1 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 3 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Whether to apply delta MCS |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

# A.3.20A MsgA configurations under CCA

## A.3.20A.1 Introduction

This clause provides the typical PRACH and PUSCH configurations for MsgA 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.3.20A.2 MsgA configurations in FR1

### A.3.20A.2.1 FR1 MsgA configuration 1 under CCA

FR1 MsgA configuration 1 under CCA in this clause provides the typical MsgA configuration for SSB-based contention based random access for 2-step RA type in FR1.

**Table A.3.20A.2.1-1: Parameters for FR1 MsgA configuration 1 under CCA**

| Field | Value | Comment |
|---|---|---|
| msgA-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]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| msgA-SSB-perRACH-OccasionAndCB-PreamblesPerSSB | oneFourth, n48 | OneFourth: 1 SSB associated with 4 RACH occasions<br>n48: 48 contention based preambles per SSB |
| msgA-RO-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| ra-ContentionResolutionTimer | sf48 | 48 sub-frames |
| msgA-PreamblePowerRampingStep | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-114 | Increased by 6 dB compared with FR1 MsgA configuration 1 for random access test with UL CCA failures. |
| preambleTransMax | n20 | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures |
| msgB-ResponseWindow | sl20 | 20 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| msgA-MCS | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | Number of time domain PUSCH occasions in each slot |
| msgA-PUSCH-TimeDomainOffset | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | |
| PUSCH allocation length | 14 | |
| mappingTypeMsgA-PUSCH | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 1 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 3 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Whether to apply delta MCS |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

## A.3.20A.2.2 FR1 MsgA configuration 2 under CCA

FR1 PRACH configuration 2 under CCA in this clause provides the typical MsgA configuration for SSB based non-contention based random access for 2-step RA type in FR1.

**Table A.3.20A.2.2-1: Parameters for FR1 MsgA configuration 2 under CCA**

| Field | Value | Comment |
|---|---|---|
| msgA-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]. |
| msgA-SubcarrierSpacing | Same as UL carrier SCS | |
| msgA-totalNumberOfRA-Preambles | 48 | Total number of preambles used for contention based and contention free random access |
| numberOfRA-PreamblesGroupA | 48 | No group B. |
| msgA-PRACH-RootSequenceIndex | 0 | Logic sequence index = 0, resulting in root sequence = 1. |
| ssb-perRACH-Occasion | oneFourth | OneFourth: 1 SSB associated with 4 RACH occasions |
| msgA-RO-FDM | One | One PRACH transmission occasions FDMed in one time instance. |
| msgA-PreamblePowerRampingStep | dB2 | |
| msgA-PreambleReceivedTargetPower | dBm-114 | Increased by 6 dB compared with FR1 MsgA configuration 2 for random access test with UL CCA failures. |
| preambleTransMax | n20 | Max number of RA preamble transmission performed before declaring a failure is 20 to account for CCA failures |
| msgB-ResponseWindow | sl20 | 20 slots |
| msgA-ZeroCorrelationZoneConfig | 11 | N-CS configuration, $N_{CS}$ = 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 |
| msgA-MCS | 1 | MCS index for MsgA PUSCH |
| nrofSlotsMsgA-PUSCH | 1 | Number of slots containing one or multiple PUSCH occasions |
| nrofMsgA-PO-PerSlot | 1 | Number of time domain PUSCH occasions in each slot |
| msgA-PUSCH-TimeDomainOffset | 1 | A single time offset with respect to the start of each PRACH slot, counted as the number of slots |
| PUSCH start symbol | 0 | |
| PUSCH allocation length | 14 | |
| mappingTypeMsgA-PUSCH | typeA | |
| nrofPRBs-PerMsgA-PO | 2 | Number of RBs per PUSCH occasion |
| nrofMsgA-PO-FDM | One | The number of MsgA PUSCH occasions FDMed in one time instance |
| msgA-DMRS-AdditionalPosition | pos1 | Position for additional DM-RS |
| msgA-PUSCH-NrofPorts | 1 | Configure 1 port per CDM group |
| msgA-DeltaPreamble | 3 | Power offset of msgA PUSCH relative to the preamble received target power |
| msgA-Alpha | alpha1 | Alpha value for MsgA PUSCH. Set 1 |
| deltaMCS | Disabled | Whether to apply delta MCS |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

# A.3.21 V2X sidelink communication

## A.3.21.1 Introduction

This clause also defines the principle and the reference configurations that are applicable to test cases verifying RRM core requirements for V2X sidelink communication.

## A.3.21.2 Reference resource pool configurations for V2X Sidelink Communication

**Table A.3.21.2-1: V2X sidelink SL-BWP configuration for NR**

| Derivation Path: 38.331 clause 6.3.5 | | | | | |
|---|---|---|---|---|---|
| Information Element | | | | Value | Comment |
| SL-BWP-ConfigCommon-r16::= SEQUENCE { | | | | | |
| sl-BWP-Generic-r16 | SL-BWP-Generic-r16 ::= SEQUENCE{ | | | | |
| | sl-LengthSymbols-r16 | | | sym14 | |
| | sl-StartSymbol-r16 | | | sym0 | |
| | } | | | | |
| sl-BWP-PoolConfigCommon-r16 | SL-BWP-PoolConfigCommon-r16 ::= SEQUENCE{ | | | | |
| | sl-RxPool-r16 | SEQUENCE (SIZE (1..maxNrofRXPool-r16)) OF SL-ResourcePool-r16 | | | Indicates the receiving resource pool on the configured BWP.<br>maxNrofRXPool-r16 = 1<br>See Table A.3.21.2-2 |
| | sl-TxPoolSelectedNormal-r16 | SEQUENCE (SIZE (1..maxNrofTXPool-r16)) OF SL-ResourcePoolConfig-r16 | SL-ResourcePoolConfig-r16 ::= SEQUENCE{ | | Indicates the resources by which the UE is allowed to transmit NR sidelink communication by UE autonomous resource selection on the configured BWP.<br>maxNrofTXPool-r16 = 1 |
| | | | sl-ResourcePool-r16 | | See Table A.3.21.2-2 |
| | | | } | | |
| | sl-TxPoolExceptional-r16 | SL-ResourcePoolConfig-r16 | | | Not present |
| | } | | | | |
| } | | | | | |

**Table A.3.21.2-2: V2X sidelink resource pool configuration for NR**

| Derivation Path: 38.331 clause 6.3.5 | | | | |
|---|---|---|---|---|
| Information Element | | | Value | Comment |
| SL-ResourcePool-r16 ::= SEQUENCE{ | | | | |
| | sl-SyncAllowed-r16 | | *Set according to the specific test configuration* | ENUMERATED {gnss, gnbEnb, ue } |
| | sl-TimeResource | | 11111111 11111111 1111 | Indicates the time resource of resource pool within sl-Period. |
| | sl-SubchannelSize | | 10 | ENUMERATED {n10} Minimum bandwidth of subchannel for adjacent transmission |
| | sl-NumSubchannel | | 1 | ENUMERATED {n1} Number of subchannel for adjacent transmission |
| | sl-StartRB-Subchannel | | 0 | Indicates the lowest RB index of the subchannel with the lowest index. |
| | sl-MCS-Table | | qam64 | Indicates the MCS table used in the resource pool. |
| | sl-RxParametersNcell-r16 | SEQUENCE{ | | |
| | | sl-TDD-Config | | Not presented |
| | | sl-SyncConfigIndex-r16 | | Not presented |
| | | } | | |
| | sl-UE-SelectedConfigRP-r16 | SL-UE-SelectedConfigRP-r16::= SEQUENCE { | | |
| | | sl-MaxNumPerReserve | 2 | ENUMERATED{n2}. Indicates the maximum number of reserved PSCCH/PSSCH resources that can be indicated by an SCI. |
| | | sl-RS-ForSensing | {pssch} | Indicates whether DMRS of PSCCH or PSSCH is used for L1 RSRP measurement in the sensing operation. |
| | | sl-SensingWindow | 100ms | ENUMERATED {ms100} Parameter that indicates the start of the sensing window. |
| | | sl-SelectionWindow | {n20} | Parameter that determines the end of the selection window in the resource selection for a TB with respect to priority indicated in SCI. |
| | | sl-ResourceReservePeriodList-r16 SEQUENCE (SIZE (1..16)) OF SL-ResourceReservePeriod-r16{ | | |

| | | | | |
|---|---|---|---|---|
| | | SL-ResourceReservePeriod-r16 | {s100} | Set of possible resource reservation period allowed in the resource pool. Up to 16 values can be configured per resource pool. |
| | | } | | |
| | | SL-ThresPSSCH-RSRP-List-r16 | *Set according to the specific test configuration* | Indicates a list of 64 thresholds, and the threshold should be selected based on the priority in the decoded SCI and the priority in the SCI to be transmitted. A resource is excluded if it is indicated or reserved by a decoded SCI and PSSCH RSRP in the associated data resource is above a threshold. |
| | | } | | |
| | sl-ZoneConfigMCR-List-r16 | | | Not present |
| } | | | | |

**Table A.3.21.2-3: V2X sidelink UE autonomous resource selection configuration for NR**

| Derivation Path: 38.331 clause 6.3.5 | | | | | |
|---|---|---|---|---|---|
| Information Element | | | | Value | Comment |
| SL-UE-SelectedConfig-r16::= SEQUENCE { | | | | | |
| | sl-ProbResourceKeep-r16 | | | 0.8 | ENUMERATED{v0dot8}. Indicates the probability with which the UE keeps the current resource when the resource reselection counter reaches zero for sensing based UE autonomous resource selection (see TS 38.321 [7]). |
| | sl-ReselectAfter-r16 | | | 1 | ENUMERATED{n1}.Indicates the number of consecutive skipped transmissions before triggering resource reselection for sidelink communication (see TS 38.321 [7]). |
| | sl-PreemptionEnable-r16 | | | {enabled} | |
| | sl-PSSCH-TxConfigList | SL-PSSCH-TxConfig-r16 ::= SEQUENCE{ | | | |
| | | sl-TypeTxSync-r16 | | *Set according to the specific test configuration* | This filed indicates the synchronization reference type. For configurations by the eNB/gNB, only gnbEnb can be configured; and for pre-configuration or when this filed is absent, the configuration is applicable for all synchronization reference types. |
| | | sl-ThresUE-Speed | | kmph200 | This filed indicates a UE absolute speed threshold. |
| | | sl-ParametersAboveThres-r16 | SL-PSSCH-TxParameters-r16 ::= SEQUENCE{ | | |
| | | | sl-MinMCS-PSSCH-r16 | 0 | This field indicates the minimum and maximum MCS values used for transmissions on PSSCH. |
| | | | sl-MaxMCS-PSSCH-r16 | 15 | |
| | | | sl-MinSubChannelNumPSSCH-r16 | 1 | |

| | | | | | |
|---|---|---|---|---|---|
| | | | sl-MaxSubchannelNumPSSCH-r16 | 1 | This field indicates the minimum and maximum number of sub-channels which may be used for transmissions on PSSCH. |
| | | | sl-MaxTxTransNumPSSCH-r16 | Both | Indicates the maximum transmission number (including new transmission and retransmission) for PSSCH. |
| | | | sl-MaxTxPower-r16 | Not present | This filed indicates the maximum transmission power for transmission on PSSCH and PSCCH. |
| | | | } | | |
| | | sl-ParametersBelowThres-r16 | | | |
| | | | sl-ParametersBelowThres-r16 SEQUENCE { | | |
| | | | sl-MinMCS-PSSCH-r16 | 4 | |
| | | | sl-MaxMCS-PSSCH-r16 | 25 | |
| | | | sl-MinSubChannelNumPSSCH-r16 | 1 | |
| | | | sl-MaxSubchannelNumPSSCH-r16 | 1 | |
| | | | sl-MaxTxTransNumPSSCH-r16 | n1 | |
| | | | sl-MaxTxPower-r16 | Not present | |
| | | | } | | |
| | | } | | | |
| } | | | | | |

### A.3.21.3 Reference measurement channels for V2X Sidelink Communication

**Table A.3.21.3-1: PSCCH Reference Measurement Channels**

| Parameter | | Unit | Value |
|---|---|---|---|
| Reference channel | | | CC.1A HD |
| Channel bandwidth | | MHz | Note2 |
| Number of PSCCH symbols per slot | | | 2 |
| Number of PSCCH RB | | | 10 |
| Modulation | | | QPSK |
| Information Bit Payload (without CRC) | | Bits | 26 |
| Information Bit | Number of DMRS ports | | 0 (1 port) |
| | Priority | | As set by higher layers |
| | Resource reservation period | | N/A |
| | Modulation and coding scheme | | Set as the PSSCH MCS specified in the test |
| | DMRS pattern | | 0 (2 DMRS) |
| | 2nd stage SCI format | | 0 (Multi-cast) |
| | Beta offset indicator | | Set as specified in the test |
| | Frequency resource assignment | | Set as per PSSCH RB allocation specific in the test |
| | Time resource assignment | | Set as per PSSCH slot allocation specific in the test |
| | Reserved bits | | Set all these bits to 0 |
| Transport block CRC | | Bits | 24 |
| Binary Channel Bits (see Note 1) | | Bits | 360 |
| Note 1: Binary channel bits calculated under assumption of 2 CP-OFDM symbols per subframe.<br>Note 2: Channel bandwidth depends on test configuration. | | | |

**Table A.3.21.3-2: PSSCH Reference Measurement Channels**

| Parameter | Unit | Value |
|---|---|---|
| Reference channel | | CD.1A HD |
| Sidelink transmission mode | | 2 |
| Channel bandwidth | MHz | Note1 |
| Allocated PSSCH resource blocks | | 10 |
| Number of PSSCH symbols per slot | | 10 |
| Modulation | | QPSK |
| Target Code Rate | | 1/3 |
| Information Bit Payload (Transport block size) | Bits | 672 |
| Transport block CRC | Bits | 24 |
| Number of PSSCH HARQ retransmissions | | 0 |
| Binary Channel Bits | Bits | 2160 |
| Note 1: Channel bandwidth depends on test configuration.<br>Note 2: 2nd state SCI and PSFCH are not allocated per slot. | | |

## A.3.22 CSI-IM configurations

### A.3.22.1 FDD

**Table A.3.22.1-1: CSI-IM Reference Measurement Channels for SCS=15kHz**

| | CSI-IM.1.1 FDD | CSI-IM.1.2 FDD | CSI-IM.1.3 FDD |
|---|---|---|---|
| Resource Type | periodic | aperiodic | periodic |

| | | | |
|---|---|---|---|
| **Resource Set Config** | | | |
| csi-IM-ResourceSetId | 0 | 0 | 0 |
| **Resource Config** | | | |
| csi-IM-ResourceId | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |
| | 1 for resource #1 | 11 for resource #1 | 3 for resource #1 |
| csi-IM-ResourceElementPattern | pattern1 | pattern1 | pattern1 |
| subcarrierLocation-p1 | s0 | s0 | s0 |
| symbolLocation-p1 | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots) | slot20 | n.a. | slot10 |
| Offset | 1 | n.a. | 2 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 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.3.22.2 TDD

**Table A.3.22.2-1: CSI-IM Reference Measurement Channels for SCS=15kHz**

| | CSI-IM.1.1 TDD | CSI-IM.1.2 TDD | CSI-IM.1.3 TDD |
|---|---|---|---|
| Resource Type | periodic | aperiodic | periodic |
| **Resource Set Config** | | | |
| csi-IM-ResourceSetId | 0 | 0 | 0 |
| **Resource Config** | | | |
| csi-IM-ResourceId | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |
| | 1 for resource #1 | 11 for resource #1 | 3 for resource #1 |
| csi-IM-ResourceElementPattern | pattern1 | pattern1 | pattern1 |
| subcarrierLocation-p1 | s0 | s0 | s0 |
| symbolLocation-p1 | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots) | slot20 | n.a. | slot10 |
| Offset | 1 | n.a. | 2 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 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.3.22.2-2: CSI-IM Reference Measurement Channels for SCS=30kHz**

| | CSI-IM.2.1 TDD | CSI-IM.2.2 TDD | CSI-IM.2.3 TDD |
|---|---|---|---|
| Resource Type | periodic | aperiodic | periodic |

| | | | |
|---|---|---|---|
| **Resource Set Config** | | | |
| csi-IM-ResourceSetId | 0 | 0 | 0 |
| **Resource Config** | | | |
| csi-IM-ResourceId | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |
| | 1 for resource #1 | 11 for resource #1 | 3 for resource #1 |
| csi-IM-ResourceElementPattern | pattern1 | pattern1 | pattern1 |
| subcarrierLocation-p1 | s0 | s0 | s0 |
| symbolLocation-p1 | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots) | slot40 | n.a. | slot40 |
| Offset | 2 | n.a. | 4 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 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.3.22.2-3: CSI-RS Reference Measurement Channels for SCS=120kHz**

| | CSI-IM.3.1 TDD | CSI-IM.3.2 TDD | CSI-IM.3.3 TDD |
|---|---|---|---|
| Resource Type | periodic | aperiodic | periodic |
| **Resource Set Config** | | | |
| csi-IM-ResourceSetId | 0 | 0 | 0 |
| **Resource Config** | | | |
| csi-IM-ResourceId | 0 for resource #0 | 10 for resource #0 | 2 for resource #0 |
| | 1 for resource #1 | 11 for resource #1 | 3 for resource #1 |
| csi-IM-ResourceElementPattern | pattern1 | pattern1 | pattern1 |
| subcarrierLocation-p1 | s0 | s0 | s0 |
| symbolLocation-p1 | 6 for resource #0 | 7 for resource #0 | 6 for resource #0 |
| | 10 for resource #1 | 11 for resource #1 | 10 for resource #1 |
| Period (slots) | slot160 | n.a. | slot80 |
| Offset | 8 | n.a. | 16 |
| startingRB | 0 | 0 | 0 |
| nrofRBs | 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.3.23 Spatial Relation Configuration

## A.3.23.1 Introduction

This clause provides the configurations for spatial relation towards either SSB or CSI-RS. The spatial relation defined in this clause are configured in each test when applicable to indicate spatial setting for certain UL signals with the referenceSignal configured in the spatial relation.

## A.3.23.2 Spatial Relation

**Table A.3.23.2-1: PUCCH Spatial Relation**

| Parameter | PUCCH.SRI.0 | PUCCH.SRI.1 |
|---|---|---|
| pucch-SpatialRelationInfoId | Id0 | Id1 |
| referenceSignal | SSB0 | SSB1 |
| Note 1: referenceSignal configurations towards which the spatial relation are configured in a test-specific manner. | | |

**Table A.3.23.2-2: SRS Spatial Relation**

| Parameter | SRS.SRI0 | SRS.SRI1 |
|---|---|---|
| srs-SpatialRelationInfoId | Id0 | Id1 |
| referenceSignal | SSB0 | SSB1 |
| Note 1: referenceSignal configurations towards which the spatial relation are configured in a test-specific manner. | | |

# A.3.24 SRS configuration

**Table A.3.24-1: Sounding Reference Symbol Configuration for SCS=15kHz**

| | SRS.1 TDD | POS-SRS.1 | |
|---|---|---|---|
| **Field** | **Value** | | **Comment** |
| c-SRS | 12 | Same as $N_{RB,c}$ in the test case | |
| b-SRS | 0 | n.a. | |
| b-hop | 0 | n.a. | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | |
| pathlossReferenceRS ssb-Index | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | n.a. | |
| startPosition | 0 | 0 | resourceMapping setting |
| nrofSymbols | 4 | 4 | |
| repetitionFactor | n1 | n.a. | without repetition. |
| transmissionComb | n2 | n4 | |
| combOffset-n2 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | |
| nrofSRS-Ports | port1 | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | Periodic | |
| periodicityAndOffset-p | sl40, 2 | sl160, 20 | SRS transmission periodicity |

**Table A.3.24-2: Sounding Reference Symbol Configuration for SCS=30kHz**

| | SRS.2 TDD | |
|---|---|---|
| **Field** | **Value** | **Comment** |
| c-SRS | 24 | |
| b-SRS | 0 | |
| b-hop | 0 | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | |
| pathlossReferenceRS ssb-Index | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | |
| startPosition | 0 | resourceMapping setting |
| nrofSymbols | 4 | |
| repetitionFactor | n1 | without repetition. |
| transmissionComb | n2 | |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | |
| periodicityAndOffset-p | sl80, 4 | SRS transmission periodicity is 40ms |

**Table A.3.24-3: Sounding Reference Symbol Configuration for SCS=120kHz**

| | SRS.3 TDD | |
|---|---|---|
| **Field** | **Value** | **Comment** |
| c-SRS | 17 | |
| b-SRS | 0 | |
| b-hop | 0 | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | |
| pathlossReferenceRS ssb-Index | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | |
| startPosition | 0 | resourceMapping setting |
| nrofSymbols | 4 | |
| repetitionFactor | n1 | without repetition. |
| transmissionComb | n2 | |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | |
| periodicityAndOffset-p | sl320, 16 | SRS transmission periodicity is 40ms |

# A.3.25 Channel bandwidth (CBW) configurations

## A.3.25.1 DL UE specific CBW

**Table A.3.25.1-1: DL CBW patterns for UE specific CBW configuration**

| BWP Parameters | Unit | Values | |
|---|---|---|---|
| Reference CBW | | DLCBW.1.1 | DLCBW.1.2 |
| OffsetToCarrier | RB | 0 | $RB_x$ Note 1 |
| carrierBandwidth | RB | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: $RB_x$ is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that $RB_x$ has to be within the CBW of BS. | | | |

## A.3.25.2 UL UE specific CBW

**Table A.3.25.2-1: UL CBW patterns for UE specific CBW configuration**

| BWP Parameters | Unit | Values | |
|---|---|---|---|
| Reference CBW | | ULCBW.1.1 | ULCBW.1.2 |
| OffsetToCarrier | RB | 0 | $RB_x$ Note 1 |
| carrierBandwidth | RB | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: $RB_x$ is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that $RB_x$ has to be within the CBW of BS. | | | |

# A.3.26 CCA model

## A.3.26.1 Introduction

The CCA model is used in some RRM test cases with at least one cell on a carrier frequency with CCA. The intention with the CCA model is to emulate in the test equipment the behaviour of a gNB or UE which performs channel measurement to check that the channel is clear prior to performing one or more downlink or uplink transmissions.

## A.3.26.2 CCA model for operation on a carrier frequency with CCA in FR1

### A.3.26.2.1 DL CCA model

The same DL CCA model is applicable regardless of whether DRX is used or not.

Prior to each DBT window, the test equipment shall determine whether the CCA attempt is successful (i.e., the corresponding signals have to be transmitted), based on probability $P_{CCA\_DL}$ of successful CCA configured in the corresponding test case.

If the CCA attempt is successful for a transmission, then the test equipment shall transmit also other remaining transmissions, according to the configuration, within the same DBT window.

If the CCA attempt is not successful for a transmission within the DBT window, the test equipment shall determine whether the CCA attempt is successful for the next configured transmission, based on probability $P_{CCA\_DL}$.

The probability can be different in different time intervals $T_i$ during a test case. One probability value (per cell) applies at any time point during a test; one or more probability values can be configured in the entire test, one value

$P_{CCA\_DL}$ per time interval $T_i$ where $i \geq 1$, and the multiple time intervals (when $i>1$) do not overlap (e.g., $P_{CCA\_DL}=1.0$ in $T_1$ and $P_{CCA\_DL}=0.75$ in $T_2$)..

For semi-static channel access configuration, a single value $P_{CCA\_DL}$ is used to configure the probability of CCA success in different time intervals $T_i$ during a test realization. An additional limit $L_{CCA\_DL}$ is used to determine the maximum number of unavailable DBT samples within an evaluation window $W_{CCA\_DL}$. If the number of unavailable DBT samples on the last $W_{CCA\_DL}$ DBT samples is larger or equal to $L_{CCA\_DL}$, the CCA attempt is considered successful for transmission.

For dynamic channel access configuration, the parameters $P_{CCA\_DL\_1}$ and $P_{CCA\_DL\_2}$ are used to configure the probability of CCA success on the first and second SSB candidate positions, respectively, in different time intervals $T_i$ during a test realization. An additional limit $L_{CCA\_DL}$ is used to determine the maximum number of unavailable DBT samples within an evaluation window $W_{CCA\_DL}$. If the number of unavailable DBT samples on the last $W_{CCA\_DL}$ DBT samples is larger or equal to $L_{CCA\_DL}$, the CCA attempt is considered successful for transmission

For semi-static channel access configuration or for dynamic channel access configuration where one candidate SSB position is modeled, prior to each discovery burst transmission window within a time interval Ti of the test, the test equipment shall:

1 - Generate a uniform random variable *p1* from the range [0, 1] for the first candidate position.

2 - Transmit the discovery burst based on *p1* in the first candidate position. If $p1 \leq P_{CCA\_DL}$, the discovery burst is transmitted at the first candidate SSB location; else if the number of CCA failures within a window $W_{CCA\_DL}$ is larger or equal to $L_{CCA\_DL}$, the discovery burst is transmitted at the first candidate SSB location, otherwise the discovery burst is muted.

For dynamic channel access configuration where two candidate SSB positions are modelled, prior to each discovery burst transmission window within a time interval $T_i$ of the test, the test equipment shall:

1 - Generate a uniform random variable *p1* from the range [0, 1] for the first candidate position.

2 - Transmit the discovery burst based on *p1* in the first candidate position: if $p1 \leq P_{CCA\_DL1}$, the discovery burst is transmitted at first candidate SSB location, else the test equipment shall:

a - Generate a uniform random variable *p2* from the range [0, 1] for the second candidate SSB position.

b - Transmit the discovery burst based on *p2* in the second candidate position. If $p2 \leq P_{CCA\_DL2}$, the discovery burst is transmitted at the second candidate SSB location; else if the number of CCA failures within a window $W_{CCA\_DL}$ is larger or equal to $L_{CCA\_DL}$, the discovery burst is transmitted at the second candidate SSB location, otherwise the discovery burst is muted.

The above steps are repeated for each discovery burst transmission window in each time interval $T_i$ of the test. The limit $L_{CCA\_DL}$ and window $W_{CCA\_DL}$ is a configuration parameter for each test case.

In many test cases, the requirement under a test depends on the number of configured SSB transmissions which are not available during the test due to CCA failure, so the test equipment shall track how many such signal occasions are not transmitted in DL during the test period.

### A.3.26.2.2 UL CCA model

For UL CCA, the modelling approach is based on probability $P_{CCA\_UL}$ of successful CCA. Probability $P_{CCA\_UL}$ is configured in the corresponding test case, based on a set $S_{CCA\_UL}$ of possible values including 75 % and 87% as typical values for dynamic and semi-static channel access configurations, 0% to model consistent UL CCA failures, and 100% to model no UL CCA failures.

Consistent UL CCA failures are modelled by configuring a low value for $P_{CCA\_UL}$, e.g., $P_{CCA\_UL}$ = 0%.

In the same time interval $T_i$ during the same test case, $P_{CCA\_UL}$ can be different from $P_{CCA\_DL}$.

The probability can be different in different time intervals $T_i$ during a test case. One probability value applies at any time point during a test; one or more probability values can be configured in the entire test, one value $P_{CCA\_UL}$ per time interval $T_i$ where $I \geq 1$, and the multiple time intervals (when $I > 1$) do not overlap (e.g., $P_{CCA\_UL} = 1.0$ in $T_1$ and $P_{CCA\_UL} = 0.75$ in $T_2$).

$T_{CCA}$ µs prior to each UL transmission burst in the test, the test equipment (TE) shall generate a uniform random variable p from the range [0, 1]. If $p<P_{CCA\_UL}$, the TE transmits an OCNG noise pattern with an energy level X within the UE BW scheduled/configured for the UL transmission for at-least $T_{CCA}$ µs. Where $T_{CCA}$ µs is energy detection time for accessing the uplink channel as defined in section 5.1.1 of TS 37.106 [36]. Where:

- X is 3 dB above the energy detection threshold defined in section 5.1.1 of TS 37.106 [36].
- $T_{CCA}$ is the channel sensing period depending on CCA category for the next UL transmission.

The TE shall count the number of UL CCA failures, and no further UL CCA failures are modeled if the number of failures exceeds the limit $L_{CCA\_UL}$ within a window $W_{CCA\_UL}$. For each UL CCA failure generated by the model, the TE shall monitor the corresponding UL resource for the desired UL signal, and based on when and/or whether the TE received the desired UL signal, it deems the test case to pass or fail.

In many cases, the requirement under a test depends on the number of configured signal occasions which are not available during the test, so the test equipment shall track how many such signal occasions are not transmitted in UL during the test period.

## A.3.27 Test Cases with at Least One Cell on a Carrier Frequency with CCA

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

### A.3.27.1 Introduction

### A.3.27.2 NR Standalone Tests with NR SCell under CCA and All Other NR Cells in FR1

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

### A.3.27.3 EN-DC Tests with NR PSCell under CCA and Other NR Cells in FR1

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

### A.3.27.4 NR Standalone Tests with NR PCell under CCA and Other NR Cells in FR1

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

### A.3.27.5 E-UTRA Standalone Tests with at Least One NR Cell under CCA

*Editor's note: This clause will include applicability rules for the corresponding test cases.*

## A.3.28 Discovery Burst Transmission Window configuration under CCA

### A.3.28.1 DBT Window pattern 1: DBT Window period = 20 ms with DBT Window duration = 1 ms

**Table A.3.28.1-1: DBT.1: DBT Window Pattern 1 for DBT Window period = 20 ms and duration = 1 ms**

| SMTC Parameters | Values |
|---|---|
| Discovery burst transmission window periodicity | 20 ms |
| Discovery burst transmission window offset | 0 ms |
| Discovery burst transmission window duration | 1 ms |

## A.3.29 Testing principles for UE capable of only NR bands with shared spectrum access

### A.3.29.1 Introduction

In annex A test cases are defined involving one or more NR cells operating on NR band(s) with shared spectrum channel access. The NR bands with shared spectrum channel access are defined in clause 5.2 of TS 38-101-1 [18].

### A.3.29.2 Principle of testing for UE capable of EN-DC with only NR bands with shared spectrum access

In Annex A, test cases in table A.3.29.2-1 are defined for UE capable of EN-DC with only NR band(s) with shared spectrum access and are not required for UE supporting also other NR band(s) (i.e. band with no shared spectrum access). The EN-DC configurations are defined in clause of 5.5B of TS 38.101-3 [20].

**Table A.3.29.2-1: Test cases applicable to UE supporting EN-DC with only NR bands with shared spectrum access**

| Test category | Section | Test case |
|---|---|---|
| Active BWP switching | A.10.3.5.2.1 | E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC |
| | A.10.3.5.2.2 | E-UTRAN – NR PSCell FR1 DL active BWP switch with FR1 SCell in non-DRX in synchronous EN-DC |
| | A.10.3.5.3.1 | E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC |

### A.3.29.3 Principle of testing for UE capable of SA operation with only NR bands with shared spectrum access

In Annex A, test cases in table A.3.29.3-1 are defined for UE capable of NR SA operation with only NR band(s) with shared spectrum access and are not required for UE supporting also other NR band(s) (i.e. band with no shared spectrum access).

**Table A.3.29.3-1: Test cases applicable to UE supporting SA operation with only NR bands with shared spectrum access**

| Test category | Section | Test case |
|---|---|---|
| Active BWP switching | A.11.4.5.2.1 | NR FR1- NR FR1 DL active BWP switch of PCell with non-DRX in SA |
| | A.11.4.5.2.2 | NR FR1 DL active BWP switch with non-DRX in SA |
| | A.11.4.5.3.1 | NR FR1 DL active BWP switch of Cell with non-DRX in SA |
| | | |

# A.3.30 CSI-RS configurations for RRM

## A.3.30.1 FDD

**Table A.3.30.1-1: CSI-RS RRM Reference Measurement Channels for SCS=15kHz**

| | **CSI-RS.RRM.FR1.1 FDD** |
|---|---|
| **CSI-RS-ResourceConfigMobility** | |
| subcarrierSpacing, kHz | 15 |
| **CSI-RS-CellMobility** | |
| cellId note1 | 0 |
| nrofPRBs | 48 |
| startPRB | 0 |
| density | 3 |
| **CSI-RS-Resource-Mobility** | |
| csi-RS-Index | 0 |
| slotConfig: ms20 note2 | slot1 |
| associatedSSB | True |
| ssb-Index note3 | 0 |
| isQuasiColocated | True |
| firstOFDMSymbolInTimeDomain note4 | 10 |
| sequenceGenerationConfig | 0 |
| **Others** | |
| nrofPorts | 1 |
| CDM Type | NoCDM |
| EPRE ratio to SSS, dB | 0 |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise | |

## A.3.30.2 TDD

**Table A.3.30.2-1: CSI-RS RRM Reference Measurement Channels for SCS=15kHz**

| | **CSI-RS.RRM.FR1.1 TDD** |
|---|---|
| **CSI-RS-ResourceConfigMobility** | |
| subcarrierSpacing, kHz | 15 |
| **CSI-RS-CellMobility** | |
| cellId note1 | 0 |
| nrofPRBs | 48 |
| startPRB | 0 |
| density | 3 |
| **CSI-RS-Resource-Mobility** | |
| csi-RS-Index | 0 |
| slotConfig: ms20 note2 | slot1 |
| associatedSSB | True |
| ssb-Index note3 | 0 |
| isQuasiColocated | True |
| firstOFDMSymbolInTimeDomain note4 | 10 |
| sequenceGenerationConfig | 0 |
| **Others** | |
| nrofPorts | 1 |
| CDM Type | NoCDM |
| EPRE ratio to SSS, dB | 0 |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise | |

**Table A.3.30.2-2: CSI-RS RRM Reference Measurement Channels for SCS=30kHz**

| | **CSI-RS.RRM.FR1.2 TDD** |
|---|---|
| **CSI-RS-ResourceConfigMobility** | |
| subcarrierSpacing, kHz | 30 |
| **CSI-RS-CellMobility** | |
| cellId note1 | 0 |
| nrofPRBs | 48 |
| startPRB | 0 |
| density | 3 |
| **CSI-RS-Resource-Mobility** | |
| csi-RS-Index | 0 |
| slotConfig: ms20 note2 | slot1 |
| associatedSSB | True |
| ssb-Index note3 | 0 |
| isQuasiColocated | True |
| firstOFDMSymbolInTimeDomain note4 | 10 |
| sequenceGenerationConfig | 0 |
| **Others** | |
| nrofPorts | 1 |
| CDM Type | NoCDM |
| EPRE ratio to SSS, dB | 0 |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise | |

**Table A.3.30.2-3: CSI-RS RRM Reference Measurement Channels for SCS=120kHz**

| | CSI-RS.RRM.FR2.1 TDD |
|---|---|
| **CSI-RS-ResourceConfigMobility** | |
| subcarrierSpacing, kHz | 120 |
| **CSI-RS-CellMobility** | |
| cellId note1 | 0 |
| nrofPRBs | 48 |
| startPRB | 0 |
| density | 3 |
| **CSI-RS-Resource-Mobility** | |
| csi-RS-Index | 0 |
| slotConfig: ms20 note2 | slot1 |
| associatedSSB | True |
| ssb-Index note3 | 0 |
| isQuasiColocated | True |
| firstOFDMSymbolInTimeDomain note4 | 10 |
| sequenceGenerationConfig | 0 |
| **Others** | |
| nrofPorts | 1 |
| CDM Type | NoCDM |
| EPRE ratio to SSS, dB | 0 |
| Note1: unless specified otherwise<br>Note2: unless specified otherwise<br>Note3: assume the same SS/PBCH block index of the corresponding cell in the test case<br>Note4: unless specified otherwise | |

# A.3.31 PRS Configurations

## A.3.31.1. PRS Configurations for FR1

### A.3.31.1.1. PRS pattern 1 in FR1: SCS=15 KHz

**Table A.3.31.1.1-1: PRS.1 FR1: PRS Pattern 1 for SSB SCS=15 KHz**

| **PRS Parameters** | **Values** | | | | | |
|---|---|---|---|---|---|---|
| Reference channel | PRS.1.1 FR1 | PRS.1.2 FR1 | PRS.1.3 FR1 | | PRS.1.4 FR1 | |
| Resource index in resource set | 0 | 0 | 0 | 1 | 0 | 1 |
| PRS periodicity | 160ms | | | | | |
| PRS Resource set slot offset Note 1 | 10 ms | | | | | |
| PRS Resource slot offset (slot) Note 1 | 0 | 4 | 0 | | 4 | |
| PRS RE offset Note 1 | 0 | | 0 | 1 | 0 | 1 |
| SCS | 15kHz | | | | | |
| PRS comb size | 2 | 4 | 2 | | 4 | |
| Number of PRS symbol | 4 | 4 | 4 | | 4 | |
| Repetion factor | 2 | 1 | 2 | | 1 | |
| PRS resource time gap (slot) | 1 | 1 | 1 | | 1 | |
| RB numbers containing PRS within channel BW | 0-23 | 0-103 | 0-23 | | 0-103 | |
| PRS Start PRB | 0 | | | | | |
| Note 1: Unless otherwise specified in the test case | | | | | | |

### A.3.31.1.2. PRS pattern 2 in FR1: SCS=30 KHz

**Table A.3.31.1.2-1: PRS.2 FR1: PRS Pattern 2 for SCS=30 KHz**

| PRS Parameters | Values | | | | | |
|---|---|---|---|---|---|---|
| Reference channel | PRS.2.1 FR1 | PRS.2.2 FR1 | PRS.2.3 FR1 | | PRS.2.4 FR1 | |
| Resource index in resource set | 0 | 0 | 0 | 1 | 0 | 1 |
| PRS periodicity | 160ms | | | | | |
| PRS Resource set slot offset Note 1 | 10 ms | | | | | |
| PRS Resource slot offset (slot) Note 1 | 0 | 4 | 0 | | 4 | |
| PRS RE offset Note 1 | 0 | | 0 | 1 | 0 | 1 |
| SCS | 30kHz | | | | | |
| PRS comb size | 2 | 4 | 2 | | 4 | |
| Number of PRS symbol | 4 | 4 | 4 | | 4 | |
| Repetion factor | 2 | 1 | 2 | | 1 | |
| PRS resource time gap (slot) | 1 | 1 | 1 | | 1 | |
| RB numbers containing PRS within channel BW | 0-23 | 0-131 | 0-23 | | 0-131 | |
| PRS Start PRB | 0 | | | | | |
| Note 1: Unless otherwise specified in the test case | | | | | | |

## A.3.31.2. PRS Configurations for FR2

### A.3.31.2.1. PRS pattern 1 in FR2: SCS=120 KHz

**Table A.3.31.2.1-1: PRS.1 FR2: PRS Pattern 1 for SCS=120 KHz**

| PRS Parameters | Values | | | | | |
|---|---|---|---|---|---|---|
| Reference channel | PRS.1.1 FR2 | PRS.1.2 FR2 | PRS.1.3 FR2 | | PRS.1.4 FR2 | |
| Resource index in resource set | 0 | 0 | 0 | 1 | 0 | 1 |
| PRS periodicity | 160ms | | | | | |
| PRS Resource set slot offset Note 1 | 10 ms | | | | | |
| PRS Resource slot offset (slot) Note 1 | 0 | 4 | 0 | | 4 | |
| PRS RE offset Note 1 | 0 | | 0 | 1 | 0 | 1 |
| SCS | 120kHz | | | | | |
| PRS comb size | 2 | 4 | 2 | | 4 | |
| Number of PRS symbol | 4 | 4 | 4 | | 4 | |
| Repetion factor | 2 | 1 | 2 | | 1 | |
| PRS resource time gap (slot) | 1 | 1 | 1 | | 1 | |
| RB numbers containing PRS within channel BW | 0-23 | 0-127 | 0-23 | | 0-127 | |
| PRS Start PRB | 0 | | | | | |
| Note 1: Unless otherwise specified in the test case | | | | | | |

# 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 4-step RA type 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 | $\hat{E}_s/I_{ot}$ | | dB | 3 | Power of SSB with index 0 is setto be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| | SS-RSRP Note 3 | | dBm/ SCS | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | 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 ($P_{\text{CMAX, f, c}}$) | | | 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

###### ClauseA.4.3.2.2.1.2.6 Void

###### ClauseA.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 4-step RA type n on-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 | $\hat{E}_s/I_{ot}$ | | dB | 3 | 3 | Power of SSB with index 0 is set to be above configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | -98 | |
| | | Config 3,4 | | -101 | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | 3 | |
| | SS-RSRP Note 3 | | dBm/ SCS | -95 | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | -17 | Power of SSB with index 1 is set to be below configured *rsrp-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | -98 | |
| | | Config 3,4 | | -101 | -101 | |
| | $\hat{E}_s/N_{oc}$ | | 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 ($P_{\mathrm{CMAX,\,f,\,c}}$) | | | 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.4.3.2.2.3 2-step RA type contention based random access test in FR1 for PSCell in EN-DC

###### A.4.3.2.2.3.1 Test Purpose and Environment

The purpose of this test is to verify that the behaviour of the random access procedure is according to the requirements and that the MsgA PRACH, MsgA PUSCH power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.3 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.4.3.2.2.3.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.3.1-2.

**Table A.4.3.2.2.3.1-1: Supported test configurations for 2-step RA type 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.4.3.2.2.3.1-2: General test parameters for 2-step RA type 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 3 | | 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 | $\hat{E}_s/I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| | SS-RSRP Note 2 | | dBm/ SCS | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | SS-RSRP Note 2 | | dBm/ SCS | -115 | |
| Io | | 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 ($P_{\text{CMAX, f, c}}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| MsgA Configuration | | | | FR1 MsgA configuration 1 | As defined in A.3.20.2.1. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [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.<br>Note 2: SS-RSRP, Es/Iot and Io levels have been derived from other parameters for information purpose. They are not settable parameters.<br>Note 3: 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.4.3.2.2.3.2 Test Requirements

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

##### A.4.3.2.2.3.2.1 MsgA Transmission

To test the UE behaviour specified in Clause 6.2.2.3.1.1 the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0, which has SS-RSRP above the configured *msgA-RSRP-ThresholdSSB*.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first MsgA preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where $\mu$ indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

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

##### A.4.3.2.2.3.2.2 MsgB Reception

To test the UE behaviour specified in Clause 6.2.2.3.1.2 the System Simulator shall transmit a MsgB with fallbackRAR 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 MsgB *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for MsgB(s) and shall transmit the msg3 if the MsgB with a fallbackRAR 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 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if all received MsgB's contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first MsgA preamble shall be -22 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where $\mu$ indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

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

##### A.4.3.2.2.3.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.1.3 the System Simulator shall transmit a MsgB with fallbackRAR containing a successRAR message and 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 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all MsgA transmission shall be in accordance with what is specified in Clause 6.2.2.2. The power of the first MsgA preamble shall be -30 dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18]. The power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18], where $\mu$ indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

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

#### A.4.3.2.2.4 2-step RA type n on-contention based random access test in FR1 for PSCell in EN-DC

##### A.4.3.2.2.4.1 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 6.2.2.3 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.4.3.2.2.4.1-1. UE capable of EN-DC with PSCell in FR1 needs to be tested by using the parameters in Table A.4.3.2.2.4.1-2.

**Table A.4.3.2.2.4.1-1: Supported test configurations for non-contention based random access test for 2-step RA type 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.4.3.2.2.4.1-2: General test parameters for non-contention based random access test for 2-step RA type 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 3 | 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 TDD | |
| | Config 3,4 | | | CR.2.1 TDD | |
| Dedicated CORESET Reference Channel | Config 1,2 | | | CCR.1.1 TDD | |
| | 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 | $\hat{E}_s/I_{ot}$ | | dB | 3 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | 3 | |
| | SS-RSRP | | dBm/ SCS | -95 | |
| SSB with index 1 | $\hat{E}_s/I_{ot}$ | | dB | -17 | Power of SSB with index 1 is set to be below configured *msgA-RSRP-ThresholdSSB* |
| | $N_{oc}$ | Config 1,2 | dBm/15kHz | -98 | |
| | | Config 3,4 | | -101 | |
| | $\hat{E}_s/N_{oc}$ | | dB | -17 | |
| | SS-RSRP | | 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 ($P_{CMAX,f,c}$) | | | dBm | 23 | As defined in clause 6.2.4 in TS 38.101-1. |
| MsgA Configuration | | | | FR1 MsgA configuration 2 | As defined in A.3.20.2. |
| *msgA-RSRP-ThresholdSSB* | | | dBm | RSRP_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [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: | 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.4.3.2.2.4.2 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.4.3.2.2.4.2.1 MsgA Transmission

In Test-1, to test the UE behavior specified in Clause 6.2.2.3.2.1 for MsgA transmission, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA which has the Preamble Index associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA 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 occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

In addition, the power applied to all MsgA transmission 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18] , where $\mu$ indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

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

###### A.4.3.2.2.4.2.2 MsgB Reception

To test the UE behavior specified in Clause 6.2.2.3.2.2 the System Simulator shall transmit a MsgB containing a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble after 5 MsgA transmissions have been received by the System Simulator. In response to the first 4 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for MsgB if the MsgB contains a successRAR MAC subPDU corresponding to the transmitted Random Access Preamble.

The UE shall again perform the Random Access Resource selection procedure specified in clause 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power if Random Access Responses Reception has not been considered as successful.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18] , where $\mu$ indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

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

###### A.4.3.2.2.4.2.3 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.2.3 the System Simulator shall transmit a MsgB 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 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window configured in *RACH-ConfigGenericTwoStepRA*.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-1 [18] , where $\mu$ indicates the MsgA PUSCH numerology. The relative power applied to additional MsgA transmissions shall have an accuracy specified in clause 6.3.4.3 of TS 38.101-1 [18].

The transmit timing of all MsgA 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 | | |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{RB,c}$ = 52 | | |
| | | 2,5 | 10: $N_{RB,c}$ = 52 | | |
| | | 3,6 | 40: $N_{RB,c}$ = 106 | | |
| Initial BWP Configuration | | 1,2,3,4,5,6 | DLBWP.0.1<br>ULBWP.0.1 | | |
| Dedicated BWP Configuration | | 1,2,3,4,5,6 | DLBWP.1.1<br>ULBWP.1.1 | | |
| DRx Cycle | ms | 1,2,3,4,5,6 | N/A | DRX.8[Note5] | |
| 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 | | 1,4 | 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) | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,3,4,5,6 | -98 | -98 | |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | -98 | -98 | |
| | | 3,6 | -95 | -95 | |

| | | | | | |
|---|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | 1,2,3,4,5,6 | 3 | 3 | |
| $\hat{E}_s/N_{oc}$ | | 1,2,3,4,5,6 | 3 | 3 | |
| SS-RSRP[Note3] | dBm/SCS | 1,2,4,5 | -95 | -95 | |
| | | 3,6 | -92 | -92 | |
| Io[Note3] | 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.1[Note6] | SRSConf.3[Note6] | |
| | | 3, 6 | SRSConf.1[Note6] | SRSConf.2[Note6] | |

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 $N_{oc}$ 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<br>25 for test configuration 3,6 | 25 | 14 | Matches $N_{RB,c}$ |
| | 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 $(N_{TA} + N_{TA\_offset})\times T_c \pm T_e$ of the first detected path of DL SSB.

    a. The $N_{TA}$ offset value (in $T_c$ units) is 25600

    b. The $T_e$ 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 | $+64*64T_c$ | $+32*64T_c$ |
| 30 | $+32*64T_c$ | $+16*64T_c$ |

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 $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$ 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 $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$ 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<br>Cell 2: 2 | 1 for E-UTRAN PCell<br>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 ($T_A$) value during T1 | | 31 | $N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | *For 15 kHz SCS* $N_{TA\_new} = N_{TA\_old} + 8192*T_c$<br>*For 30 kHz SCS* $N_{TA\_new} = N_{TA\_old} + 4096*T_c$<br>(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 |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 |
| BWP BW | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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 | | 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 |
| 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) | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -98 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -98 |
| | Config 3,6 | | -95 |
| $\hat{E}_s/I_{ot}$ | | dB | 3 |
| $\hat{E}_s/N_{oc}$ | | dB | 3 |
| Io Note3 | 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 $N_{oc}$ 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<br>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 SSB#1, 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 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 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 |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.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 |
| 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 | Config 1, 4 | | CSI-RS.1.1 FDD |

| | | | |
|---|---|---|---|
| reporting | 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | |
| | Config 2, 5 | | -98 | | |
| | Config 3, 6 | | -98 | | |
| $N_{oc}$ | 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.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>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). | |

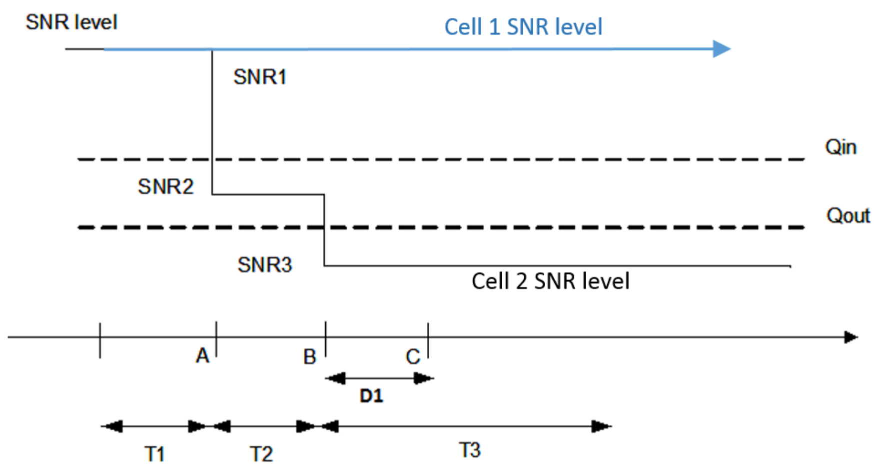


**Figure A.4.5.1.1.1-1: SNR variation for out-of-sync testing**

#### 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 SSB#1, 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 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 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 |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| $N_{oc}$ | 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**

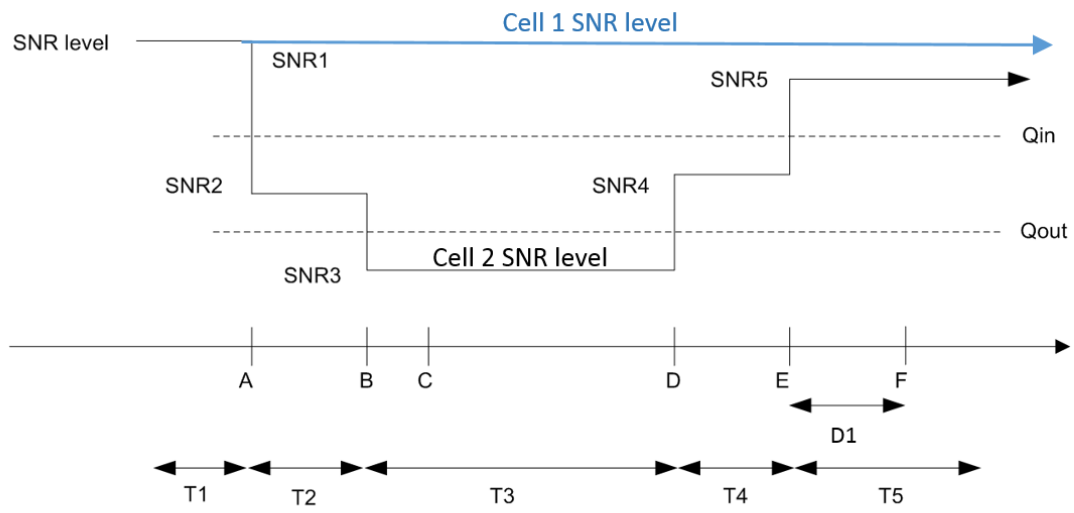


**Figure A.4.5.1.2.1-1: SNR variation for in-sync testing**

### 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 SSB#1, 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 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 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 |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.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 |
| 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 |
| $N_{oc}$ | Config 1, 4 | dBm/15kHz | -98 | | |
| | Config 2, 5 | | -98 | | |
| | Config 3, 6 | | -98 | | |
| $N_{oc}$ | 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.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>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.<br>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**

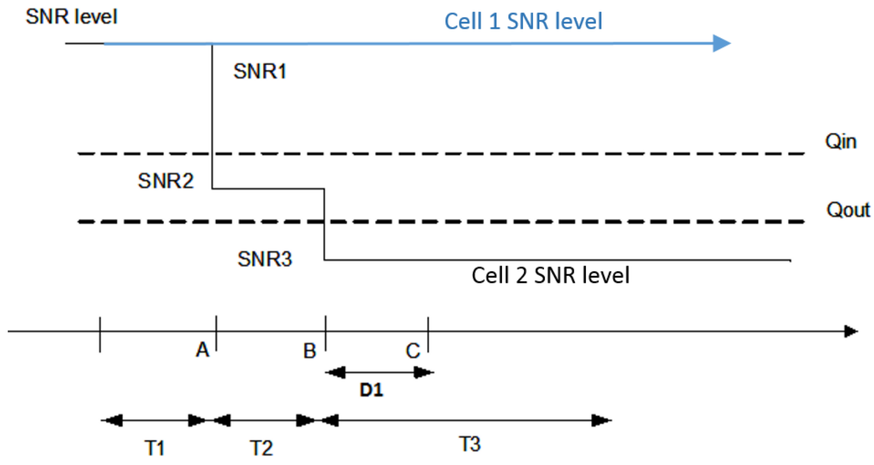


**Figure A.4.5.1.3.1-1: SNR variation for out-of-sync testing**

#### 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 SSB#1, 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 |
| $BW_{channel}$ | Config 1, 4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2, 5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3, 6 | | 40: $N_{RB,c}$ = 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 |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD |
| | Config 2, 5 | | CR.1.1 TDD |
| | Config 3, 6 | | CR.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 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | | | | |
| | Config 2, 5 | | -98 | | | | |
| | Config 3, 6 | | -98 | | | | |
| $N_{oc}$ | 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**

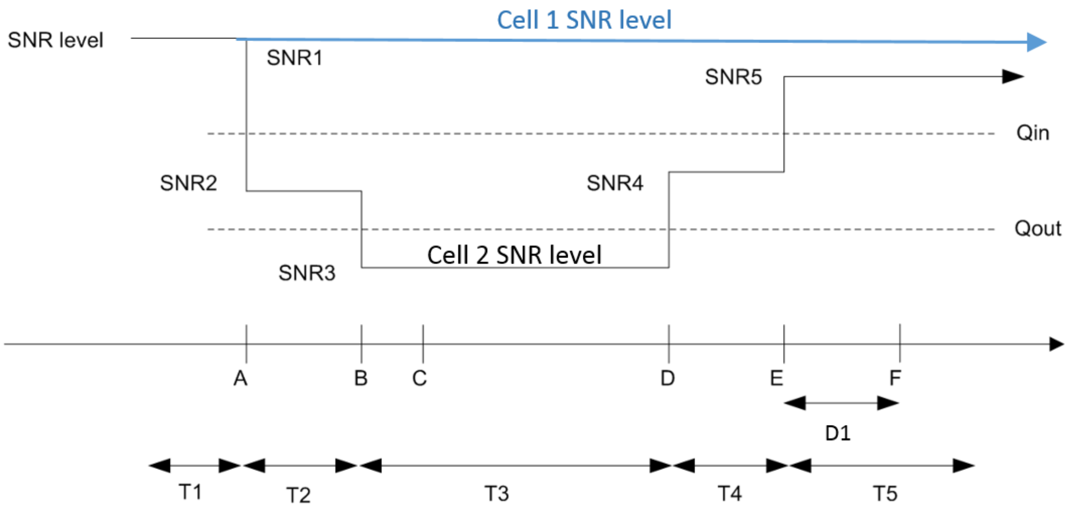


**Figure A.4.5.1.4.1-1: SNR variation for in-sync testing**

#### 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 |
| 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 |
| 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.<br>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 |
| $N_{oc}$ | 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.<br>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.<br>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.<br>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.<br>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.<br>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>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.<br>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.. | | | | | |

**Table A.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**

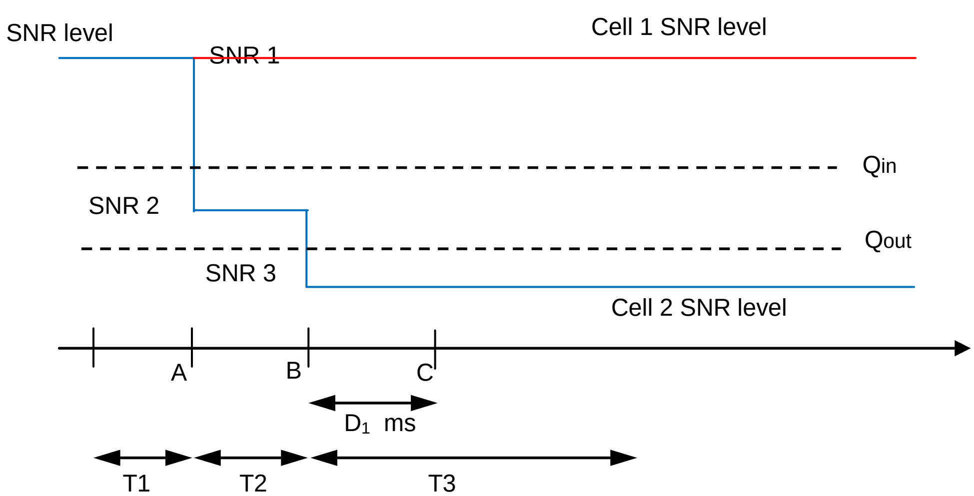


**Figure A.4.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing**

#### 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 ($D_1$ 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 |
| 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 |
| 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.<br>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 SSSPDCCH_beta | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | | | |
| EPRE ratio of PSS to SSSPSS_beta | | dB | | | | | |
| EPRE ratio of PBCH to PBCH DMRSSSS_beta | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRSPDSCH_beta | | 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 |
| $N_{oc}$ | 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 clause A.3.6.1.1.. | | | | | | | |

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

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

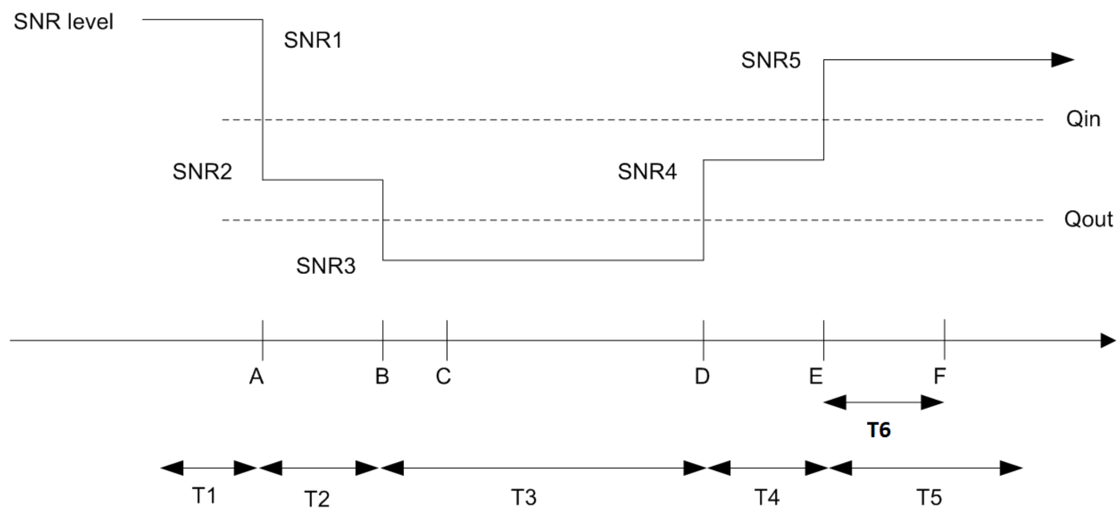


**Figure A.4.5.1.6.1-1: SNR variation for CSI-RS in-sync testing**

#### 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 |
| 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 |
| 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.<br>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 SSSPDCCH_beta | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | |
| EPRE ratio of PBCH to PBCH DMRSSSS_beta | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMR | | dB | | | |
| SNR on RLM-RS | Config 1, 4 | dB | 1 | -7 | -15 |
| | Config 2, 5 | | 1 | -7 | -15 |
| | Config 3, 6 | | 1 | -7 | -15 |
| $N_{oc}$ | 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.<br>Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.<br>Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.<br>Note 4: Measurement gap configuration is assigned to the UE prior to the start of time period T1.<br>Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.<br>Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>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.<br>Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is specified in clause A.3.6.1.1.. | | |

**Table A.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**

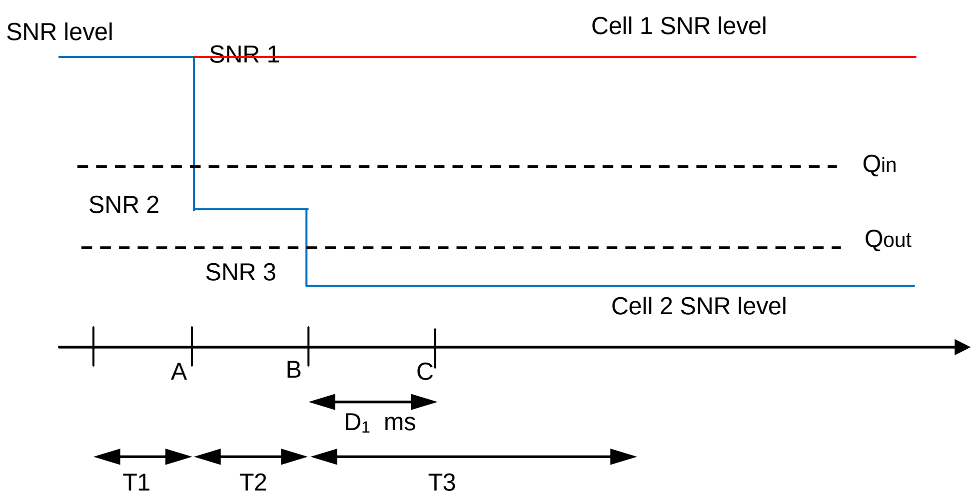


**Figure A.4.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing**

### 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 ($D_1$ 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 |
| 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 |
| 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.<br>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 SSSPDCCH_beta | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS | Config 1, 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 |
| $N_{oc}$ | 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 clause 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**

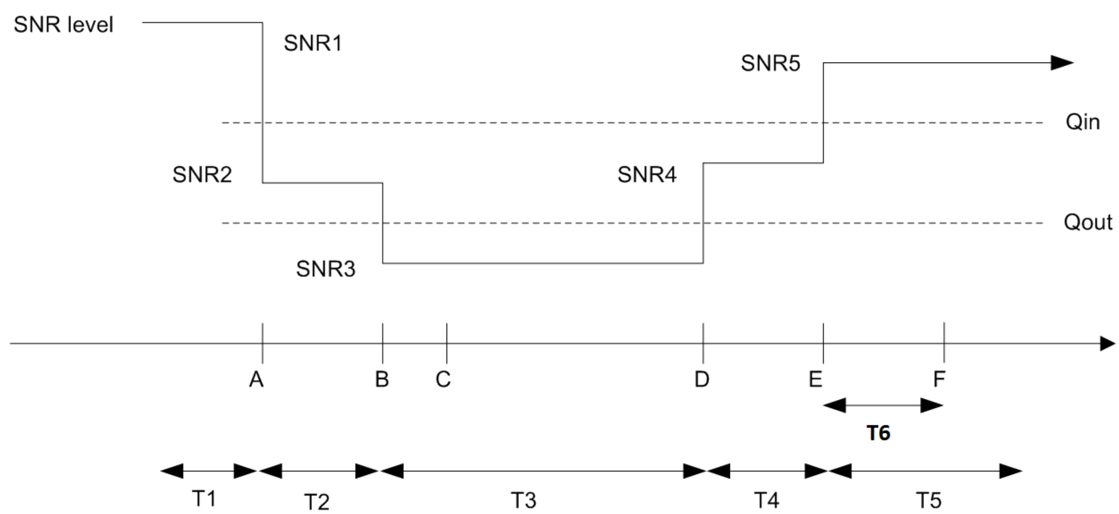


**Figure A.4.5.1.8.1-1: SNR variation for CSI-RS in-sync testing**

#### 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 |
| $BW_{channel}$ | Config 1,4 | | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | 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 | 33 |

| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.<br>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**

| $\mu$ | 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 |
| $BW_{channel}$ | Config 1,4 | | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | 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 | 500 |

| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.<br>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**

| $\mu$ | 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

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 are shown in table A.4.5.2.3.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.3.1-2 and A.4.5.2.3.1-3 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 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**

| 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<br>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 ($BW_{channel}$) 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 E-UTRAN – NR interruptions during measurements on deactivated NR SCC in synchronous EN-DC**

| Parameter | | Unit | Cell2 | Cell3 |
|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 |
| Duplex mode | Config 1,4 | | FDD | FDD |
| | Config 2,3,5,6 | | TDD | TDD |
| TDD configuration | Config 1,4 | | Not Applicable | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | | Note 8 | Note 8 |
| | Config 2,5 | | Note 8 | Note 8 |
| | Config 3,6 | | Note 8 | Note 8 |
| $BW_{occupied}$ | Config 1,4 | RB | 52 Note 6 | 52 Note 6 |
| | Config 2,5 | | 52 Note 6 | 52 Note 6 |
| | Config 3,6 | | 106 Note 7 | 106 Note 7 |
| Initial DL BWP Configuration | Config 1,4 | | DLBWP.0.1 | DLBWP.0.1 |
| | Config 2,5 | | DLBWP.0.1 | DLBWP.0.1 |
| | Config 3,6 | | DLBWP.0.1 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | | DLBWP.1.1 | DLBWP.1.1 |
| | Config 2,5 | | DLBWP.1.1 | DLBWP.1.1 |
| | Config 3,6 | | DLBWP.1.1 | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.1 | ULBWP.0.1 |
| | Config 2,5 | | ULBWP.0.1 | ULBWP.0.1 |
| | Config 3,6 | | ULBWP.0.1 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | | ULBWP.1.1 | ULBWP.1.1 |
| | Config 2,5 | | ULBWP.1.1 | ULBWP.1.1 |
| | Config 3,6 | | ULBWP.1.1 | 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 | 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 |
| PDCCH CORESET parameters | 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 |
| 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 |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 6 | OP.1 Note 6 |
| | Config 3,6 | | OP.1 Note 7 | OP.1 Note 7 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 |
| TCI state | | | TCI.State.0 | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | 1x2 Low |
| 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) | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 | -58.96 |
| | Config 3,6 | dBm/38.16MHz | -52.86 | -52.86 |

| | | | |
|---|---|---|---|
| Time offset to Cell1 Note 4 | μs | 33 | 33 + Time offset to Cell2 |
| Time offset to Cell2 Note 5 | μs | - | 3 |
| Propagation Condition | | 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.<br>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 $N_{oc}$ to be fulfilled within $BW_{occupied}$.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.<br>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<br>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.<br>Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.<br>Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.<br>Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$. | | | |

### 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**

| $\mu$ | 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**

| $\mu$ | 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 are shown in table A.4.5.2.4.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.4.1-2 and A.4.5.2.4.1-3 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 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.4.5.2.4.1-1: Interruptions during measurements on deactivated NR SCC 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<br>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 ($BW_{channel}$) 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 E-UTRAN – NR interruptions during measurements on deactivated NR SCC in asynchronous EN-DC**

| Parameter | | Unit | Cell2 | Cell3 |
|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 |
| Duplex mode | Config 1,4 | | FDD | FDD |
| | Config 2,3,5,6 | | TDD | TDD |
| TDD configuration | Config 1,4 | | Not Applicable | Not Applicable |
| | Config 2,5 | | TDDConf.1.1 | TDDConf.1.1 |
| | Config 3,6 | | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | Config 1,4 | | Note 8 | Note 8 |
| | Config 2,5 | | Note 8 | Note 8 |
| | Config 3,6 | | Note 8 | Note 8 |
| $BW_{occupied}$ | Config 1,4 | RB | 52 Note 6 | 52 Note 6 |
| | Config 2,5 | | 52 Note 6 | 52 Note 6 |
| | Config 3,6 | | 106 Note 7 | 106 Note 7 |
| Initial BWP Configuration | Config 1,4 | | DLBWP.0.1 | DLBWP.0.1 |
| | Config 2,5 | | DLBWP.0.1 | DLBWP.0.1 |
| | Config 3,6 | | DLBWP.0.1 | DLBWP.0.1 |
| Dedicated DL BWP Configuration | Config 1,4 | | DLBWP.1.1 | DLBWP.1.1 |
| | Config 2,5 | | DLBWP.1.1 | DLBWP.1.1 |
| | Config 3,6 | | DLBWP.1.1 | DLBWP.1.1 |
| Initial UL BWP Configuration | Config 1,4 | | ULBWP.0.1 | ULBWP.0.1 |
| | Config 2,5 | | ULBWP.0.1 | ULBWP.0.1 |
| | Config 3,6 | | ULBWP.0.1 | ULBWP.0.1 |
| Dedicated UL BWP Configuration | Config 1,4 | | ULBWP.1.1 | ULBWP.1.1 |
| | Config 2,5 | | ULBWP.1.1 | ULBWP.1.1 |
| | Config 3,6 | | ULBWP.1.1 | 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 | 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 |
| PDCCH CORESET parameters | 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 |
| 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 |
| OCNG Patterns | Config 1,2,4,5 | | OP.1 Note 6 | OP.1 Note 6 |
| | Config 3,6 | | OP.1 Note 7 | OP.1 Note 7 |
| SSB Configuration | Config 1,2,4,5 | | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 | SSB.2 FR1 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 |
| TCI state | | | TCI.State.0 | TCI.State.0 |
| Correlation Matrix and Antenna Configuration | | | 1x2 Low | 1x2 Low |
| 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) | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 | -58.96 |

| | | | | |
|---|---|---|---|---|
| | Config 3,6 | dBm/38.16MHz | -52.86 | -52.86 |
| Time offset to Cell1 Note 4 | | ms | 3 | 3 + Time offset to Cell2 |
| Time offset to Cell2 Note 5 | | μs | - | 3 |
| Propagation Condition | | | 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 modeled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within $BW_{occupied}$.
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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 8: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

#### 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**

| $\mu$ | 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**

| $\mu$ | 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 |
|---|---|
| 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.4.5.2.5.1-2: 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, 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. |
| Active 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.4.5.2.5.1-3: 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 |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | 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 | 33 |
| 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 $N_{oc}$ 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 interruptions immediately before and immediately after an SMTC. 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**

| $\mu$ | NR Slot length (ms) | Interruption length X slot | Interruption length Y slot |
|---|---|---|---|
| | | Sync | |
| 0 | 1 | 1 | 1 |
| 1 | 0.5 | 1 | 1 |

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 |
|---|---|
| 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.4.5.2.6.1-2: 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 |
| $BW_{channel}$ | Config 1,4 | | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | 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 | 500 |
| 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 $N_{oc}$ 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 interruptions 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 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**

| $\mu$ | 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**

| $\mu$ | 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.4.5.2.8 E-UTRAN - NR FR1 interruptions at NR SRS carrier based switching in asynchronous EN-DC

#### A.4.5.2.8.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS, the UE can perform carrier based switching to one carrier not configured for PUCCH/PUSCH transmission from a CC with PUCCH/PUSCH transmission. The test will verify the interruption requirements on E-UTRAN PCell and NR PSCell in clause 8.2.1.2.12. Supported test configurations are shown in table A.4.5.2.8.1-1.

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.8.1-2 and A 4.5.2.8.1-3 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 is E-UTRAN PCell, Cell2 is NR PSCell in FR1 with PUCCH/PUSCH transmission, Cell3 is an activated NR SCell in FR1 which operates in downlink without PUCCH/PUSCH transmission. The UE is configured with the SRS carrier based switching between PSCell and SCell.

The test consists of two successive time periods, with duration of T1 and T2, respectively. Throughout the test the UE shall be continuously scheduled on PCell and PSCell. Immediately at the beginning of T2, a PDCCH with TPC-SRS-RNTI is sent to the UE to initiate NR SRS switching.

**Table A.4.5.2.8.1-1: Interruptions at SRS carrier switching supported test configurations in FR1**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell FDD duplex mode, SCell TDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell TDD duplex mode, SCell 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, PSCell FDD duplex mode, SCell TDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, 10 MHz bandwidth, PSCell TDD duplex mode, SCell 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.4.5.2.8.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at SRS carrier based switching 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 | Configured PSCell on NR RF channel number 2. |
| Configured SCell | | Cell3 | Configured activated secondary cell on NR RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell2 and Cell3. |
| DRX | | OFF | Continuous monitoring of primary cell |
| Filter coefficient | | 0 | L3 filtering is not used |
| T1 | s | 5 | |
| T2 | ms | 40 | UE shall perform SRS switching during T2 |

**Table A.4.5.2.8.1-3: NR Cell specific test parameters for E-UTRAN – NR FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

| Parameter | | Unit | Cell2 | Cell3 |
|---|---|---|---|---|
| Frequency Range | | | FR1 | FR1 |
| Duplex mode | Config 1,4 | | FDD | TDD |
| | Config 2,3,5,6 | | TDD | TDD |
| TDD configuration | Config 1,4 | | Not Applicable | TDDConfig.1.1 |
| | Config 2,5 | | TDDConf.1.1 | TDDConfig.1.1 |
| | Config 3,6 | | TDDConf.2.1 | TDDConfig.2.1 |
| $BW_{channel}$ | Config 1,2,4,5 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |

| | | | | |
|---|---|---|---|---|
| DL Initial BWP configuration | Config 1-6 | | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1-6 | | DLBWP.1.1 | DLBWP.1.1 |
| UL Initial BWP configuration | Config 1-6 | | ULBWP.0.1 | - |
| UL dedicated BWP configuration | Config 1-6 | | ULBWP.1.1 | - |
| PDSCH Reference measurement channel | Config 1,4 | | SR.1.1 FDD | SR.1.1 TDD |
| | Config 2,5 | | SR.1.1 TDD | SR.1.1 TDD |
| | Config 3,6 | | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 | | CR.1.1 FDD | CR.1.1 TDD |
| | Config 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 | | CCR.1.1 FDD | CCR.1.1 TDD |
| | 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 | OP.1 |
| TRS configuration | Config 1,4 | | TRS.1.1 FDD | TRS.1.1 TDD |
| | Config 2,5 | | TRS.1.1 TDD | TRS.1.1 TDD |
| | Config 3,6 | | TRS.1.2 TDD | TRS.1.2 TDD |
| SMTC configuration | | | SMTC.1 | SMTC.1 |
| SSB configuration | Config 1,2,4,5 | | SSB.1 FR1 | SSB.1 FR1 |
| | Config 3,6 | | SSB.2 FR1 | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | 15 kHz |
| | Config 3,6 | | 30 kHz | 30 kHz |
| SRS Configuration | Config 1,2,4,5 | kHz | - | SRS.1 TDD |
| | Config 3,6 | | - | SRS.2 TDD |
| 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 | 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) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 | -104 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | -104 |
| | Config 3,6 | | -101 | -101 |
| SS-RSRP Note3 | Config 1,2,4,5 | dBm/SCS | -87 | -87 |
| | Config 3,6 | | -84 | -84 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| Io[Note3] | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.86 | -52.86 |
| Time offset to Cell1 [Note 5] | | µs | - | 3 |
| Propagation condition | | - | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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. | | | | |

**Table A.4.5.2.8.1-4: Void**

### A.4.5.2.8.2 Test Requirements

During the time duration T2, the interruption on NR PSCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table A.4.5.2.8.2-1 dependent on the applied SRS carrier switching time.

**Table A4.5.2.8.2-1: Interruption length on NR active serving cells at NR SRS carrier switching (slot)**

| $\mu$ | NR Slot length (ms) of victim cell | SRS carrier switching time (us)[Note 1] | Interruption length X1 (slots) | |
|---|---|---|---|---|
| | | | Sub carrier spacing for agressor cell (kHz) | |
| | | | 15 | 30 |
| 0 | 1 | ≤ 200 | 2 | 2 |
| | | 300, 500 | 2 | 2 |
| | | 900 | 3 | 3 |
| 1 | 0.5 | ≤ 200 | 3 | 2 |
| | | 300, 500 | 3 | 3 |
| | | 900 | 4 | 4 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | | | | |

During the time duration T2, the interruption on E-UTRAN PCell during the switching from NR PSCell to NR SCell shall not exceed the value as defined in Table A.4.5.2.8.2-2 dependent on the applied SRS carrier switching time.

**Table 4.5.2.8.2-2: Interruption length on E-UTRAN active serving cells at NR SRS carrier switching**

| NR SRS carrier switching time (us)[note1] | Interruption length X1 (subframes) |
|---|---|
| ≤500 | 2 |
| 900 | 3 |
| Note1: NR SRS carrier switching time is UE capability indicated by higher layer parameter *SRS-SwitchingTimeNR*. | |

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

### A.4.5.2.9 E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching

#### A.4.5.2.9.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS on a PUSCH-less carrier of SCell, the UE can perform carrier based switching to one PUSCH-less SCCs from a CC with PUSCH. The test will verify the interruption requirements on active serving cell in SCG in clause 8.2.1.2.13. Supported test configurations are shown in table A.4.5.2. x2.1-1.

In the test there are three cells: cell1, cell2 and cell3. Cell1 is E-UTRAN PCell on the primary component carrier. Cell3 is E-UTRAN SCell on the TDD secondary component carrier which operates in downlink without PUCCH/PUSCH. Cell2 is NR FR1 PSCell. The UE is configured with the SRS switching between E-UTRAN PCell and E-UTRAN SCell. The general test parameters, NR cell specific test parameters and E-UTRA SRS configurations are given in Table A.4.5.2.9.1-2, A.4.5.2.9.1-3 and Table A.4.5.2.9.1-4 below. And the E-UTRAN cell specific test parameters (for cell1 and cell3) can refer to Table A.3.7.2.1-1. The test consists of two successive time periods, with duration of T1 and T2, respectively. During T1 LTE PCell and NR PSCell are continuously scheduled in DL. Immediately at the beginning of T2, a PDCCH with SRS-TPC-RNTI is sent to the UE to initiate SRS switching.

**Table A.4.5.2.9.1-1: E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD(cell1), LTE TDD (cell3), NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD(cell1), LTE TDD (cell3), 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.4.5.2.9.1-2: General test parameters for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

| 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. |
| Active PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Activated SCell | | Cell3 | SCell on E-UTRAN RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | UE shall perform SRS switching during T2 |

**Table A.4.5.2.9.1-3: NR cell specific test parameters for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

| 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 |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | 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 | 33 |
| 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 $N_{oc}$ 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.4.5.2.9.1-4: Sounding Reference Symbol Configuration for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

| Field | Value | Comment |
|---|---|---|
| srsBandwidthConfiguration | bw5 | |
| srsSubframeConfiguration | Sc8 | Once every 5 subframes |
| ackNackSrsSimultaneousTransmission | FALSE | |
| srsMaxUpPTS | N/A | Not applicable for E-UTRAN FDD |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 | |
| frequencyDomainPosition | 0 | |
| Duration | TRUE | Indefinite duration |
| Srs-ConfigurationIndex | 47 | SRS periodicity of 40ms. |
| transmissionComb | 0 | |
| cyclicShift | cs0 | No cyclic shift |
| SRS-AntennaPort | an1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 36.331. | | |

### A.4.5.2.9.2 Test Requirements

The UE shall be continuously scheduled in NR PSCell throughout the test and during the time duration T2, Each interruption on NR PSCell shall not exceed X defined in Table A.4.5.2.9.2-1.

**Table A.4.5.2.9.2-1: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching**

| $\mu$ | NR Slot length (ms) | Interruption length X3 (slots) |
|---|---|---|
| 0 | 1 | 2 |
| 1 | 0.5 | 3 |

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

# 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 are shown in table A.4.5.3.1.1-1 below. 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 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 $\mathrm{m} + \frac{T_{\mathrm{HARQ}} + T_{\mathrm{activation\_time}} + T_{\mathrm{CSI\_Reporting}}}{\mathrm{NR\ slot\ length}}$, as defined in clause 8.3. The UE shall start reporting CSI in PSCell in 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 $m + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to slot $m + 1 + \frac{T_{\mathrm{HARQ}} + 3\mathrm{ms} + T_{\mathrm{X}}}{\mathrm{NR\ slot\ length}} + N_{\mathrm{interruption}}$, as defined in clause 8.3, where $N_{\mathrm{interruption}}$ is the interruption length given in clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{EUTRA\ slot\ length}}$ to subframe $m_2 + 1 + \frac{T_{\mathrm{HARQ}} + 3\mathrm{ms} + T_{\mathrm{X}}}{\mathrm{EUTRA\ slot\ length}} + N_{\mathrm{interruption}}$, where $\mathrm{m}_1$ and $\mathrm{m}_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\mathrm{interruption}}$ is the interruption length given in TS 36.133 [14] clause 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 $\mathrm{n} + \frac{\mathrm{T_{HARQ}} + 3ms}{NR\ slot\ length}$, as defined in clause 8.3. The starting point of any PSCell interruption due to the deactivation shall occur in the slot $\mathrm{n} + 1 + \frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $\mathrm{n} + 1 + \frac{\mathrm{T_{HARQ}} + 3\mathrm{ms}}{NR\ slot\ length}$, as defined in clause 8.3. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe $n_1 + 1 + \frac{T_{\mathrm{HARQ}}}{EUTRA\ subframe\ length}$ to subframe $\mathrm{n}_2 + 1 + \frac{T_{\mathrm{HARQ}} + 3\mathrm{ms}}{EUTRA\ subframe\ length}$, where $\mathrm{n}_1$ and $\mathrm{n}_2$ 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**

| 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 1: The UE is only required to be tested in one of the supported test configurations<br>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 ($BW_{channel}$) 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.<br>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. |
| $T_{HARQ}$ | ms | $k_1$NR slot length | $k_1$ 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] |
| $T_{CSI\_Reporting}$ | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for 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 | $k_1+3\cdot N_{\text{slot}}^{\text{subframe},\mu}+1$ | As specified in clause 4.3 of TS 38.213 [3] |

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

| Parameter | | Unit | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| SSB ARFCN | | | 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 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | Note 7 | | | | | |
| | Config 2,5 | | Note 7 | | | | | |
| | Config 3,6 | | Note 7 | | | | | |
| $BW_{occupied}$ | 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 | | | SR.1.1 FDD | | |
| | Config 2,5 | | SR.1.1 TDD | | | SR.1.1 TDD | | |
| | Config 3,6 | | SR.2.1 TDD | | | SR.2.1 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 | | |
| RMC 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 | | |
| 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 | | |
| 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 | | | N/A | | |
| CSI reporting offset | Config 3,6 | | 10 | | | N/A | | |
| | Config 1,2,4,5 | slot | 2 | | | N/A | | |
| | Config 3,6 | | 4 | | | N/A | | |
| 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) | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 |
| | Config 3,6 | | -101 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | 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 |
| Propagation condition | | - | AWGN |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | -58.96 |
| | Config 3,6 | dBm/ 38.16MHz | -52.87 |
| 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.<br>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 $N_{oc}$ to be fulfilled within $BW_{occupied}$.<br>Note 3: SS-RSRP, Io and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]<br>Note 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.<br>Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.<br>Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$. | | | |

### A.4.5.3.1.2 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 uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $\mathrm{m} + \frac{\mathrm{T_{HARQ}} + T_{\mathrm{activtion\_time}} + T_{\mathrm{CSI\_Reporting}}}{NR\ slot\ length}$, $\mathrm{T_{activation\_time}} = \mathrm{T_{FirstSSB}} + 5\mathrm{ms}$, as defined in clause 8.3.

During T3 the UE shall stop sending CSI reports for SCell at latest in a slot $\mathrm{n} + \frac{\mathrm{T_{HARQ}} + 3\mathrm{ms}}{NR\ slot\ length}$, as defined in clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to $m + 1 + \frac{T_{\mathrm{HARQ}} + 3\mathrm{ms} + T_{\mathrm{X}}}{\mathrm{NR\ slot\ length}} + N_{\mathrm{interruption}}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1 + \frac{T_{\mathrm{HARQ}}}{\mathrm{EUTRA\ slot\ length}}$ to subframe $m_2 + 1 + \frac{T_{\mathrm{HARQ}} + 3\mathrm{ms} + T_{\mathrm{X}}}{\mathrm{EUTRA\ slot\ length}} + N_{\mathrm{interruption}}$, as defined in clause 8.3.

During T3 the starting point of interruption of PSCell during SCell deactivation shall not happen outside the slot $n + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$, 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 $n_1 + 1 + \frac{T_{HARQ}}{EUTRA\ subframe\ length}$ to subframe $n_2 + 1 + \frac{T_{HARQ}+3ms}{EUTRA\ subframe\ length}$.

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 $m + \frac{T_{HARQ}+T_{activtion\_time}+T_{CSI\_Reporting}}{NR\ slot\ length}$ 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 320 ms 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, 320 ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| SCell measurement cycle (measCycleSCell) | ms | 320 | |

#### 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 $T_{activation\_time}$ will be replaced with the value $T_{FirstSSB\_MAX} + T_{rs}$ + 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 $m + \frac{T_{HARQ}+T_{activtion\_time}+T_{CSI\_Reporting}}{NR\ slot\ length}$ as defined in clause 8.3 provided the SCell can be successfully detected on the first attempt. The UE shall start reporting CSI in 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 $m + 1 + \frac{T_{HARQ}}{\text{NR slot length}}$ to slot $m + 1 + \frac{T_{HARQ}+3\text{ms}+T_X}{\text{NR slot length}} + N_{\text{interruption}}$, as defined in clause 8.3, where $N_{\text{interruption}}$ is the interruption length given in clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1 + 1 + \frac{T_{HARQ}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{HARQ}+3\text{ms}+T_X}{\text{EUTRA slot length}} + N_{\text{interruption}}$, where $m_1$ and $m_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\text{interruption}}$ is the interruption length given in TS 36.133 [14] clause 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 $n + \frac{T_{HARQ}+3ms}{NR\ slot\ length}$ as defined in clause 8.3. The starting point of any PSCell interruption due to the deactivation shall occur in the slot $n + 1 + \frac{T_{HARQ}}{NR\ slot\ length}$ to $n + 1 + \frac{T_{HARQ}+3\text{ms}}{NR\ slot\ length}$, as defined in clause 8.3. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe $n_1 + 1 + \frac{T_{HARQ}}{EUTRA\ subframe\ length}$ to subframe $n_2 + 1 + \frac{T_{HARQ}+3\text{ms}}{EUTRA\ subframe\ length}$, where $n_1$ and $n_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

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 $T_{activation\_time}$ will be replaced with the value $T_{FirstSSB\_MAX} + T_{SMTC\_MAX} + 2*T_{rs}$ + 5ms as defined in clause 8.3.

## A.4.5.3.4 SCell Activation and deactivation of multiple unknown SCells in FR1 with single activation/deactivation command

### A.4.5.3.4.1 Test Purpose and Environment

The purpose of this test is to verify that the multiple SCell activation and deactivation times are within the requirements stated in clause 8.3.7 and 8.3.8, when the two configured deactivated SCells in FR1 are unknown by the UE at the time of activation.

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 Table A.4.5.3.4.1-1 will replace the values of corresponding parameters in Table A.4.5.3.1.1-2. The cell specific test parameter values in Table A.4.5.3.4.1-2 will replace the values of corresponding parameters in Table A.4.5.3.1.1-3.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are four carriers, E-UTRA has one cell, NR has three 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) and Cell 4(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 SCells (Cell 3 and Cell 4) become configured on NR. During T1 the SCells (Cell 3 and Cell 4) are powered off and UE is not aware of SCells.

A MAC message for activation of SCells(Cell 3 and Cell 4) 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 SCells is received at the UE antenna connector defines the start of time period T2. Immediately at beginning of T2 the transmission power of cell 3 and cell 4 are increased to same level as for cell 2. The UE shall be able to report valid CSI for the activated SCells (Cell3 and Cell 4) at latest in slot $\mathrm{m}+\frac{T_{HARQ}+T_{activation\_time\_multiple\_scells}+T_{CSI\_Reporting}}{NR\ slot\ length}$ respectively as defined in clause 8.3.7 provided the SCells can be successfully detected on the first attempt. The UE shall start reporting CSI for cell 3 and cell 4 in slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation for cell 3 and cell 4 has been completed, respectively. Any PSCell interruption due to activation of SCells shall occur in the slot $m+1+\frac{T_{\mathrm{HARQ}}}{\mathrm{NR\ slot\ length}}$ to slot $m+1+\frac{T_{\mathrm{HARQ}}+3\mathrm{ms}+T_{\mathrm{X}}}{\mathrm{NR\ slot\ length}}+N_{\mathrm{interruption}}$, as defined in clause 8.3, where $N_{\mathrm{interruption}}$ is the interruption length given in section 8.2. Any E-UTRA PCell interruption due to activation of SCells shall occur in the subframe $m_1+1+\frac{T_{\mathrm{HARQ}}}{\mathrm{EUTRA\ slot\ length}}$ to subframe $m_2+1+\frac{T_{\mathrm{HARQ}}+3\mathrm{ms}+T_{\mathrm{X}}}{\mathrm{EUTRA\ slot\ length}}+N_{\mathrm{interruption}}$, where $\mathrm{m}_1$ and $\mathrm{m}_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\mathrm{interruption}}$ is the interruption length given in TS 36.133 [14] clause 7.32.

Time period T3 starts when a MAC message for deactivation of the SCells (Cell 3 and Cell 4), 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 SCells at latest in slot $\mathrm{n}+\frac{\mathrm{T_{HARQ}}+3ms}{NR\ slot\ length}$ as defined in clause 8.3. The starting point of any PSCell interruption due to the deactivation shall occur in the slot $\mathrm{n}+1+\frac{\mathrm{T_{HARQ}}}{NR\ slot\ length}$ to $\mathrm{n}+1+\frac{\mathrm{T_{HARQ}}+3\mathrm{ms}}{NR\ slot\ length}$, as defined in clause 8.3. The starting point of any E-UTRA PCell interruption due to the deactivation shall occur in the subframe $n_1+1+\frac{T_{\mathrm{HARQ}}}{EUTRA\ subframe\ length}$ to subframe $\mathrm{n}_2+1+\frac{T_{\mathrm{HARQ}}+3\mathrm{ms}}{EUTRA\ subframe\ length}$, where $\mathrm{n}_1$ and $\mathrm{n}_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot n.

The test equipment verifies the activation time for Cell 3 by counting the slots from the time when the SCell activation command is sent until CSI report of acticated Cell 3 with other than CQI index 0 is received.

The test equipment verifies the activation time for Cell 4 by counting the slots from the time when the SCell activation command is sent until CSI report of acticated Cell 4 with other than CQI index 0 is received.

The test equipment verifies the deactivation time for Cell 3 by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for Cell 3 is discontinued.

The test equipment verifies the deactivation time for Cell 4by counting the slots from the time when the SCell deactivation command is sent until CSI reporting for Cell 4 is discontinued.

**Table A.4.5.3.4.1-1: General test parameters for unknown FR1 SCell activation case with 2 deactivated SCells, 160ms SCell measurement cycle**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| Configured deactivated SCell 1 | | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 which is an intra-band contiguous CC to PSCC of Cell 2;<br>*ssb-PositionInBurst* of Cell 3 is same as the one for Cell 2 |
| Configured deactivated SCell 2 | | Cell 4 | Configured deactivated secondary cell on NR RF channel number 4 which is an inter-band CC to PSCC of Cell 2 |
| Cell3 timing offset to cell2 | μs | 0 | |
| Cell4 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. |
| Time alignment error between cell4 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 | ms | 100 | During this time the PSCell shall be known and the SCell configured, but not detected. |

**Table A. 4.5.3.4.1-2: Cell specific test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle**

| Parameter | | Unit | Cell 3 | | Cell 4 | |
|---|---|---|---|---|---|---|
| | | | T2 | T3 | T2 | T3 |
| SSB ARFCN | | | Freq2 | | Freq3 | |
| 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 | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| 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 | | SR.2.1 TDD | |
| | Config 1,4 | | CR.1.1 FDD | | CR.1.1 FDD | |

| | | | | |
|---|---|---|---|---|
| RMSI CORESET Reference Channel | Config 2,5 | | CR.1.1 TDD | CR.1.1 TDD |
| | Config 3,6 | | CR.2.1 TDD | CR.2.1 TDD |
| RMC 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 |
| 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 |
| OCNG Patterns | | | OP.1 | |
| SMTC configuration | | | 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 | |
| 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) | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | |
| | Config 3,6 | | -101 | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | |
| $\hat{E}_s/N_{oc}$ | | 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 | |
| Propagation condition | | - | AWGN | |

#### 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 for both Cell 3 and Cell 4, except the followings:

- For Cell 3 activation delay, $T_{activation\_time}$ will be replaced with the value $T_{activation\_time\_multiple\_scells} = T_{FirstSSB\_MAX\_multiple\_scells} + T_{SMTC\_MAX\_multiple\_scells} + T_{rs}$ +5ms as defined in clause 8.3.7.
- For Cell 4 activation delay, $T_{activation\_time}$ will be replaced with the value $T_{activation\_time\_multiple\_scells} = T_{FirstSSB\_MAX\_multiple\_scells} + T_{SMTC\_MAX\_multiple\_scells} + 2*T_{rs}$ +5ms as defined in clause 8.3.7.

### A.4.5.3.5 Direct SCell activation at SCell addition of known SCell in FR1

#### A.4.5.3.5.1 Test Purpose and Environment

The purpose of this test is to verify that the direct SCell activation time is within the requirements stated in clause 8.3.4, when the SCell in FR1 is known by the UE at the time of activation.

The supported test configurations are shown in table A.4.5.3.5.1-1 below. The test parameters are given in Tables A.4.5.3.5.1-2 and cell-specific parameters in A.4.5.3.5.1-3 below. The test consists of two successive time periods, with duration of T1 and T2, 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 measurement on Cell 3 is configured. The UE now starts measuring the Cell 3. During T1, Cell 3 should be detected and measured by the UE such that it meets the condition for known cell defined in clause 8.3.4 for direct SCell activation. At the end of T1, the test equipment sends an RRC message for direct SCell activation of the Cell 3.

The point in time at which the RRC message for direct SCell actvation 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 $\mathrm{m}+\frac{N_{\mathrm{direct}}}{\mathrm{NR\ slot\ length}}$, as defined in clause 8.3.4. The UE shall start reporting CSI in PSCell in slot (m+k+$T_{RRC\_process}$) 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 $m+1$ to slot $m+1+\frac{T_{RRC\_Process}+T_1+T_X}{NR\ slot\ length}+N_{\mathrm{interruption}}$, as defined in clause 8.3.4, where $N_{\mathrm{interruption}}$ is the interruption length given in clause 8.2. Any E-UTRA PCell interruption due to activation of SCell shall occur in the subframe $m_1+1$ to subframe $m_2+1+\frac{T_{RRC\_Process}+T_1+T_X}{NR\ slot\ length}+N_{\mathrm{interruption}}$, where $\mathrm{m}_1$ and $\mathrm{m}_2$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m, and $N_{\mathrm{interruption}}$ is the interruption length given in TS 36.133 [14] clause 7.32.

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.

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

**Table A.4.5.3.5.1-1: known FR1 direct SCell activation supported test configurations**

| 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 be tested in one of the supported test configurations | |

**Table A.4.5.3.5.1-2: General test parameters for known FR1 direct SCell activation**

| 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. |
| SCell | | Cell 3 | Secondary cell on NR RF channel number 3 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| CQI/PMI periodicity and offset configuration index | | 0 | CQI reporting for SCell every four slots. |
| 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 Cell 3 shall be known. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ 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] |
| $T_{CSI\_Reporting}$ | ms | 2 | the delay uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2] |
| k | ms | $k_1 + 3 \cdot N_{slot}^{subframe,\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [3] |

**Table A.4.5.3.5.1-3: Cell specific test parameters for known FR1 direct SCell activation**

| Parameter | | Unit | Cell 2 | | | Cell 3 | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 |
| **SSB ARFCN** | | | 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 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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 | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| 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 | | | SR.2.1 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 | | |
| RMC 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 | | |
| 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 | | |
| OCNG Patterns | | | OP.1 | | | | | |
| SMTC configuration | | | 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 | | | | | |
| 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) | | | | | | | | |
| $N_{oc}$ Note2 | | dBm/15kHz | -104 | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | dBm/SCS | -104 | | | | | |
| | Config 3,6 | | -101 | | | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | | | | | |
| $\hat{E}_s/N_{oc}$ | | 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 |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. | | | |

#### A.4.5.3.5.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k+$T_{RRC\_process}$). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k+$T_{RRC\_process}$) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k+$T_{RRC\_process}$).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $m + \frac{N_{direct}}{NR\ slot\ length}$. $N_{direct} = T_{RRC\_Process} + T_1 + T_{activation\_time} + T_{CSI\_Reporting}$ - 3ms, where $T_{RRC\_Process}$ = 16ms and other components are defined in clause 8.3.4.

During T2 interruption of PSCell during direct SCell activation shall not happen outside the slot $m + 1$ to $m + 1 + \frac{T_{RRC\_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1$ to subframe $m_2 + 1 + \frac{T_{RRC\_Process}+T_1+T_X}{NR\ slot\ length} + N_{\text{interruption}}$, as defined in clause 8.3.4.

The interruption of PSCell shall not be more than the values specified for EN-DC in Clause 8.2.1.2.8.

All of the above test requirements shall be fulfilled in order for the observed direct SCell activation delay to be counted as correct. The rate of correct observed direct SCell activation 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 $m + \frac{T_{RRC\_Process}+T_1+T_X}{NR\ slot\ length}$ as defined in clause 8.3.4 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

## 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;<br>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;<br>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;<br>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;<br>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;<br>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;<br>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;<br>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;<br>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;<br>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<br>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 ($BW_{channel}$) 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<br>Cell 2: FR1 PSCell<br>Cell 3: FR1 SCell | E-UTRAN PCell on RF channel number 1<br>FR1 PSCell on RF channel number 2<br>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 |
| $BW_{channel}$ | 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 |
| $BW_{occupied}$ | 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 | | | | | | | | |
| $N_{oc}$ 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 | | |
| $\hat{E}_s/N_{oc}$ | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 | 16 | 16 | 16 |
| $\hat{E}_s/I_{ot}$ 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/ 38.16 MHz | 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.<br>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 $N_{oc}$ to be fulfilled. within $BW_{occupied}$<br>NOTE 3: $\hat{E}_s/I_{ot}$ , Io, and SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>NOTE 4: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.<br>NOTE 5: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.<br>NOTE 6: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$. |

**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 | | |
| $BW_{channel}$ | 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 | | |
| $BW_{occupied}$ | 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 | | Conf 1, 4, 7 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| | | Conf 2, 5, 8 | SR.1.1 TDD | | | SR.1.1 TDD | | |

| | | | | |
|---|---|---|---|---|
| channel as defined in A.3.1.1 | | 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 | | | | | | | | |
| $N_{oc}$ 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 | | |
| $\hat{E}_s/N_{oc}$ | dB | Conf 1, 2, 3, 4, 5, 6, 7, 8, 9 | 16 | 16 | 16 | 16 | 16 | 16 |
| $\hat{E}_s/I_{ot}$ 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/ 38.16 MHz | 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 $N_{oc}$ to be fulfilled within $BW_{occupied}$. |
| NOTE 3: | $\hat{E}_s/I_{ot}$ , 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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| NOTE 5: | All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured. |
| NOTE 6: | $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$. |

#### 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 $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. 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 $q_0$ 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 $q_1$ 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 Test 1 | Comment |
|---|---|---|---|---|
| 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 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.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 ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection 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 | 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 $Q_{in\_LR\_SSB}$ |
| | 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 $q_0$ | 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 $q_1$ | 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 $q_1$ | Config 1, 4 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |
| | Config 2, 5 | | -108 | -108 | -88 | -88 | -88 |
| | Config 3, 6 | | -105 | -105 | -85 | -85 | -85 |
| $N_{oc}$ | 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**

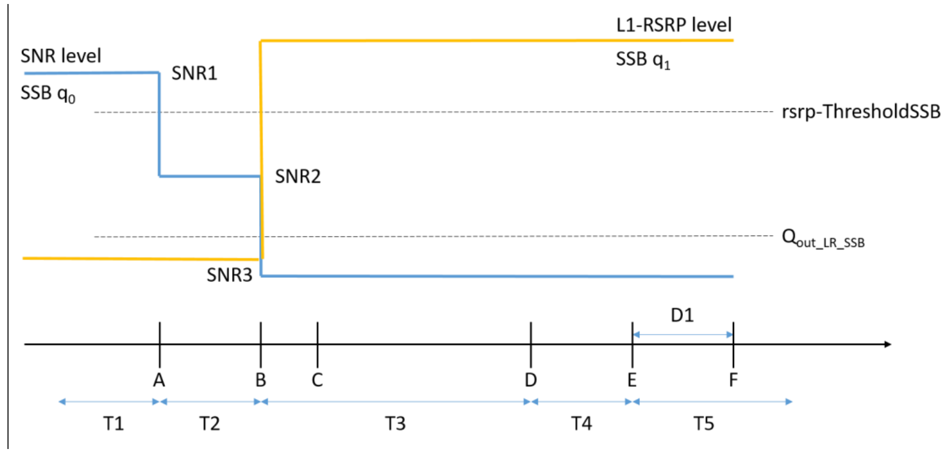


**Figure A.4.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### 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 $q_1$.

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 $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ 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 $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. 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 $q_0$ 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 $q_1$ 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 | |
| CORESET Reference Channel | Config 1, 4 | | CR.1.1 FDD | |
| | Config 2, 5 | | CR.1.1 TDD | |
| | Config 3, 6 | | CR.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 ($q_0$) | | | 0 | |
| SSB Index assigned as CBD RS ($q_1$) | | | 1 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection 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 | 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 $Q_{in\_LR\_SSB}$ |
| | 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 $q_0$ | 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 $q_1$ | 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 $q_1$ | Config 1, 4 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |
| | Config 2, 5 | | -108 | -108 | -88 | -88 | -88 |
| | Config 3, 6 | | -105 | -105 | -85 | -85 | -85 |
| $N_{oc}$ | 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**

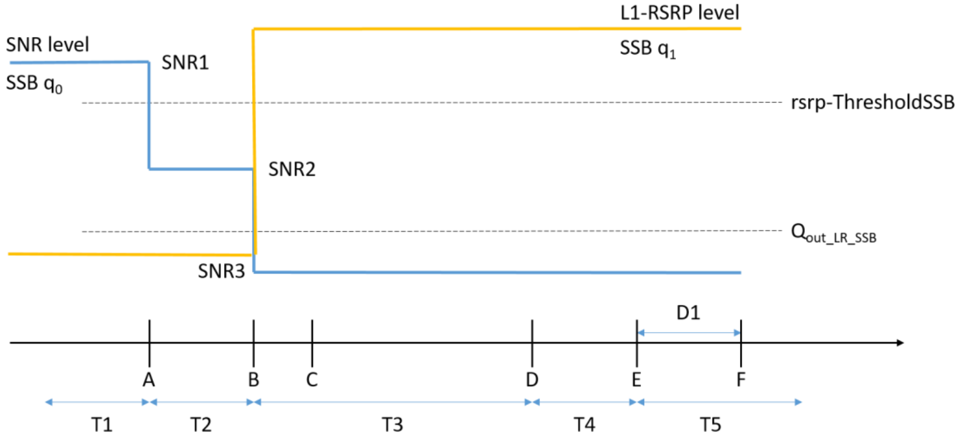


**Figure A.4.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

### 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 $q_1$.

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 $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ 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 $q_0$ configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set $q_1$. 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 $q_0$ 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 $q_1$ 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<br>Test 1 | Comment |
|---|---|---|---|---|
| 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 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| 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 | |
| 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 $q_0$ | | | 0 | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection 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 | 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 $q_1$ | | | 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 $Q_{in\_LR\_SSB}$ |
| | 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 $q_0$ and $q_1$ | Config 1, 4 | | CSI-RS.1.2 FDD | A.3.14 |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | A.3.14 |
| | 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 assigned as RLM RS | Config 1, 4 | | CSI-RS.1.2 FDD | A.3.14 |
| | 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 | 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 $q_0$ | 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 $q_1$ | 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 $q_1$ | Config 1, 4 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |
| | Config 2, 5 | | -108 | -108 | -88 | -88 | -88 |
| | Config 3, 6 | | -105 | -105 | -85 | -85 | -85 |
| $N_{oc}$ | 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.

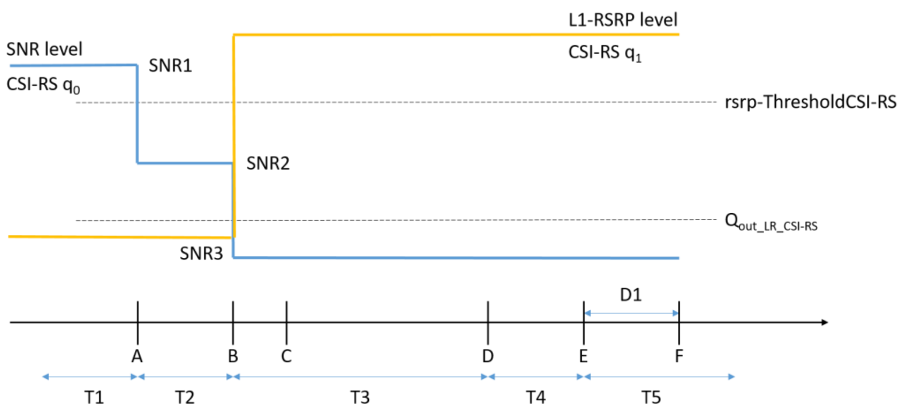


**Figure A.4.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in non-DRX mode**

### 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 $q_1$.

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 $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ 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 $q_0$ configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set $q_1$. 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 $q_0$ 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 $q_1$ 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 | |
| TDD Configuration | Config 1, 4 | | Not Applicable | |
| | Config 2, 5 | | TDDConf.1.1 | |
| | Config 3, 6 | | TDDConf.2.1 | |
| 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 | |
| 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 $q_0$ | | | 0 | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection 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 | 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 $q_1$ | | | 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 $Q_{in\_LR\_SSB}$ |
| | 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 $q_0$ and $q_1$ | Config 1, 4 | | CSI-RS.1.2 FDD | A.3.14 |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | A.3.14 |
| | 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 assigned as RLM RS | Config 1, 4 | | CSI-RS.1.2 FDD | A.3.14 |
| | 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 $q_0$ | 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 $q_1$ | 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 $q_1$ | Config 1, 4 | dBm/SCS kHz | -108 | -108 | -88 | -88 | -88 |
| | Config 2, 5 | | -108 | -108 | -88 | -88 | -88 |
| | Config 3, 6 | | -105 | -105 | -85 | -85 | -85 |
| $N_{oc}$ | 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**

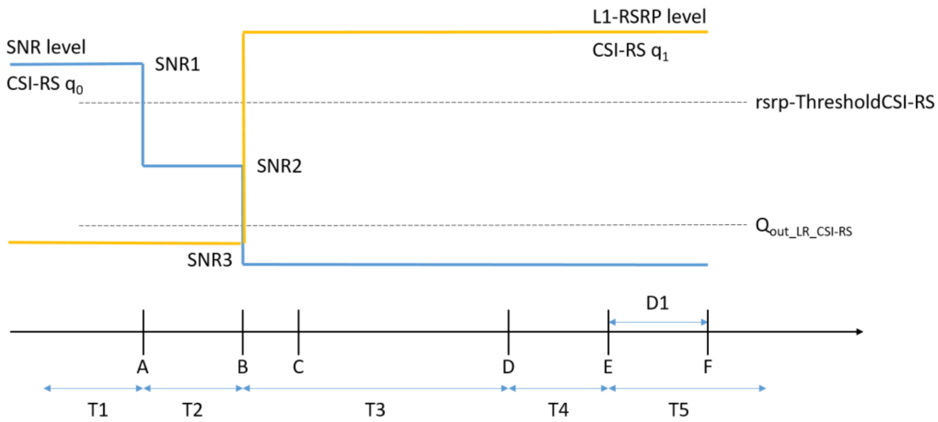


**Figure A.4.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

### 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 $q_1$.

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 $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ 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.4.5.5.5 EN-DC Beam Failure Detection and Link Recovery Test for FR1 SCell configured with CSI-RS-based BFD and SSB-based LR in non-DRX mode

### A.4.5.5.5.1 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 $q_0$ configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candicate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.5.1-1, A.4.5.5.5.1-2, and A.4.5.5.5.1-3 below. There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PSCell and cell 3 is the SCell, in the test. UE is not provided by *schedulingRequestID-BFR-SCell-r16,* i.e., no configuration for PUCCH transmission resources, and UE shall perform the random access procedure to recover the beam failure. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.5.1-1 shows the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate beam failure. Figure A.4.5.5.5.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set $q_1$ 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, cell 2 and cell3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is not enabled.

**Table A.4.5.5.5.1-1: Supported test configurations for FR1 PCell and SCell**

| 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.4.5.5.5.1-2: General test parameters for FR1 SCell for 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 | |
| Active SCell | | | Cell 3 | |
| RF Channel Number | | | 3 | |
| 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 | |
| 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 | |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 | A.3.10 |
| | Config 2, 5 | | SSB.1 FR1 | |
| | Config 3, 6 | | SSB.2 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 | | Table A.3.8.2.1-1 | |
| | Config 3, 6 | | Table A.3.8.2.1-1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell | | | 0 | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection 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 | 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. | |

| | | | | |
|---|---|---|---|---|
| schedulingRequestID-BFR-SCell-r16 | | | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | | 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 $Q_{in\_LR\_SSB}$ |
| | 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 $q_0$ | Config 1, 4 | | CSI-RS.1.2 FDD | A.3.14 |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | A.3.14 |
| | 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 assigned as RLM RS | Config 1, 4 | | CSI-RS.1.2 FDD | A.3.14 |
| | 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 | 0.18 | |
| T3 | | s | 0.14 | |
| T4 | | s | 0 | |
| T5 | | s | 0.17 | |
| D1 | | s | 0.13 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

**Table A.4.5.5.5.1-3: Cell specific test parameters for FR1 PSCell and SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Cell2 | Test 1 Cell3 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 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 $q_0$ | Config 1, 4 | dB | 5 | 5 | -3 | -12 | -12 | -12 |
| | Config 2, 5 | | 5 | 5 | -3 | -12 | -12 | -12 |
| | Config 3, 6 | | 5 | 5 | -3 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1, 4 | dB | -10 | -10 | -10 | 10 | 10 | 10 |
| | Config 2, 5 | | -10 | -10 | -10 | 10 | 10 | 10 |
| | Config 3, 6 | | -10 | -10 | -10 | 10 | 10 | 10 |
| SSB_RP of set q1 | Config 1, 4 | dBm/SCS kHz | -108 | -108 | -108 | -88 | -88 | -88 |
| | Config 2, 5 | | -108 | -108 | -108 | -88 | -88 | -88 |
| | Config 3, 6 | | -105 | -105 | -105 | -85 | -85 | -85 |
| $N_{oc}$ | Config 1, 4 | dBm/15 kHz | -98 | -98 | | | | |
| | Config 2, 5 | | -98 | -98 | | | | |
| | Config 3, 6 | | -98 | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | 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].

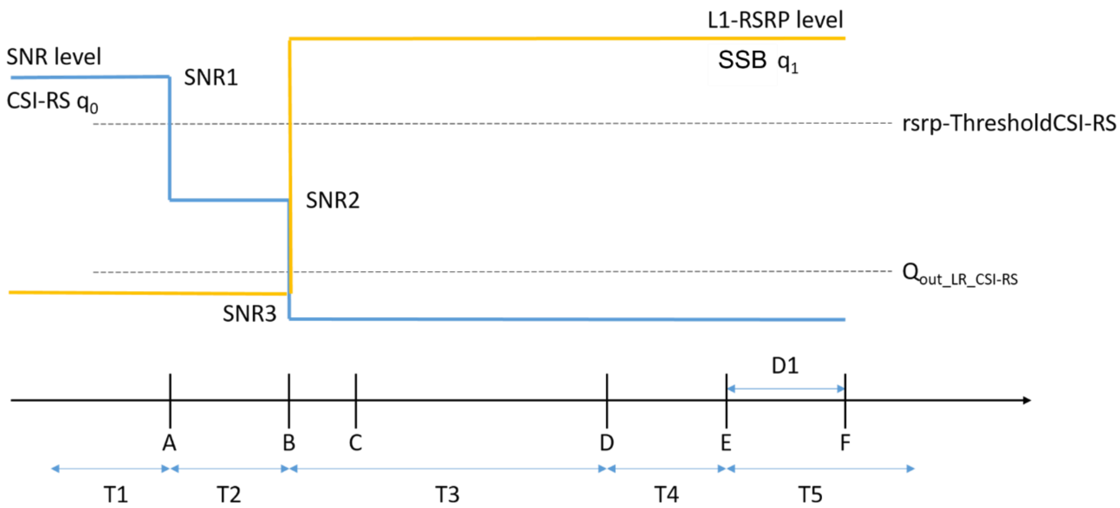


**Figure A.4.5.5.5.1-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in non-DRX mode**

### A.4.5.5.5.2 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 2.

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

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 $q_1$.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

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

### A.4.5.5.6.1 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 $q_0$ configured for a serving SCell and that the UE performs correct SSB-based link recovery based on beam candicate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.4.5.5.6.1-1, A.4.5.5.6.1-2, and A.4.5.5.6.1-3below. There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PSCell and cell 3 is the SCell, in the test. UE is not provided by *schedulingRequestID-BFR-SCell-r16*, i.e., no configuration for PUCCH transmission resources, and UE shall perform the random access procedure to recover the beam failure. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.4.5.5.6.1-1 shows the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate beam failure. Figure A.4.5.5.6.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ 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, cell 2 and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is enabled in SCell 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.4.5.5.6.1-1: Supported test configurations for FR1 PCell and SCell**

| 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.4.5.5.6.1-2: General test parameters for FR1 SCell for 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 | |
| Active SCell | | | Cell 3 | |
| RF Channel Number | | | 3 | |
| 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 | |
| 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 | |
| SSB Configuration | Config 1, 4 | | SSB.1 FR1 | A.3.10 |
| | Config 2, 5 | | SSB.1 FR1 | |
| | Config 3, 6 | | SSB.2 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 | | Table A.3.8.2.1-1 | |
| | Config 3, 6 | | Table A.3.8.2.1-1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell | | | 0 | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Correlation Matrix and Antenna Configuration | | | 2x2 Low | |
| Beam failure detection 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 | 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. | |
| schedulingRequestID-BFR-SCell-r16 | | | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | | 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 $Q_{in\_LR\_SSB}$ |
| | 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 $q_0$ | Config 1, 4 | | CSI-RS.1.2 FDD | A.3.14 |
| | Config 2, 5 | | CSI-RS.1.2 TDD | |
| | Config 3, 6 | | CSI-RS.2.2 TDD | |
| CSI-RS configuration for CSI reporting | Config 1, 4 | | CSI-RS.1.1 FDD | A.3.14 |
| | 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 assigned as RLM RS | Config 1, 4 | | CSI-RS.1.2 FDD | A.3.14 |
| | 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.4.5.5.6.1-3: Cell specific test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Cell2 | Test 1 Cell3 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 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 $q_0$ | Config 1, 4 | dB | 5 | 5 | -3 | -12 | -12 | -12 |
| | Config 2, 5 | | 5 | 5 | -3 | -12 | -12 | -12 |
| | Config 3, 6 | | 5 | 5 | -3 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1, 4 | dB | -10 | -10 | -10 | 10 | 10 | 10 |
| | Config 2, 5 | | -10 | -10 | -10 | 10 | 10 | 10 |
| | Config 3, 6 | | -10 | -10 | -10 | 10 | 10 | 10 |
| SSB_RP of set q1 | Config 1, 4 | dBm/SCS kHz | -108 | -108 | -108 | -88 | -88 | -88 |
| | Config 2, 5 | | -108 | -108 | -108 | -88 | -88 | -88 |
| | Config 3, 6 | | -105 | -105 | -105 | -85 | -85 | -85 |
| $N_{oc}$ | Config 1, 4 | dBm/ 15 kHz | -98 | -98 | | | | |
| | Config 2, 5 | | -98 | -98 | | | | |
| | Config 3, 6 | | -98 | -98 | | | | |
| Propagation condition | | | TDL-C 300ns 100Hz | 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.

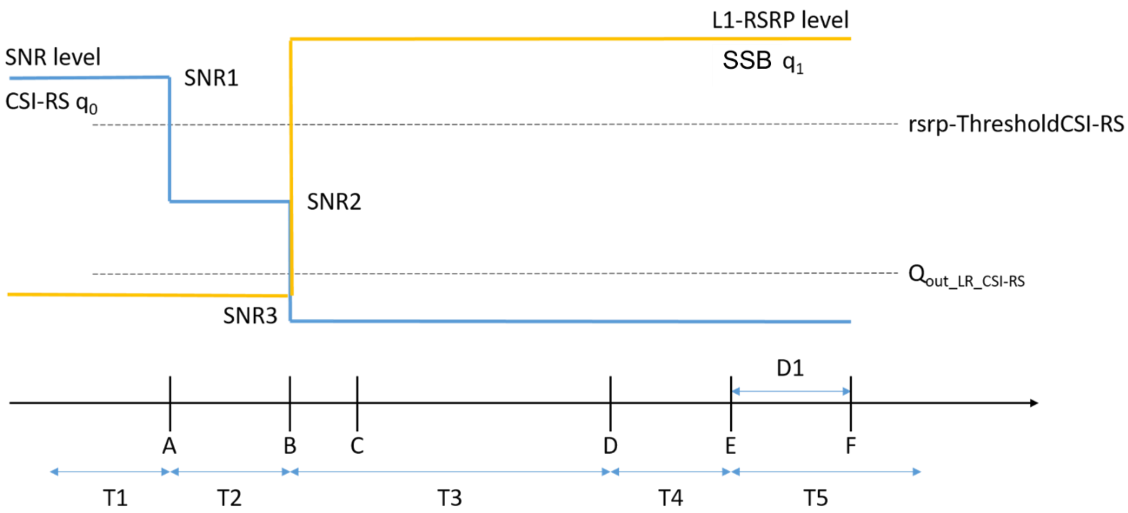


**Figure A.4.5.5.6.1-1: SNR and L1-RSRP variation for beam failure detection and LR testing for SCell in DRX mode**

### A.4.5.5.6.2 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 2.

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

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 $q_1$.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

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 NR 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 NR PSCell is specified in Table A.4.5.6.1.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on 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 (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 BWP is 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 at the beginning of the DL slot right after PSCell's DL slot ($i+T_{BWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after DL slot ($i+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after DL slot ($i+T_{BWPswitchDelay}$).

The starting time of 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 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 PSCell's DL slot ($j+T_{BWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after DL slot ($j+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after DL slot ($j+T_{BWPswitchDelay}$).

The starting time of 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 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 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 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.<br>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 |
| $BW_{channel}$ | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 |
| | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 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 Configuration | Config 1,4 | | ULBWP.1.3 Note 4 |
| | 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.1.1 FDD |
| | 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 | | 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) | | | |
| $N_{oc}$ Note 2 | Config 1,2,4,5 | dBm/SCS | [-104] |

| | | | |
|---|---|---|---|
| | Config 3,6 | | [-101] |
| $N_{oc}$ Note 2 | | dBm/15kHz | -104 |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | [-87] |
| | Config 3,6 | | [-90] |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | 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.<br>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.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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 for PSCell in the DL slot right after DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot ($j+T_{BWPswitchDelay}+k1$).

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 $T_{BWPswitchDelay}$ 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 PCell interruption during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption of during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of 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 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 in the DL slot right after DL slot ($i+T_{BWPswitchDelay}+k1$), ($j+T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

### 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 are shown in Table A.4.5.6.1.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR 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 NR PSCell and SCell are specified in Table A.4.5.6.1.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on 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 (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 BWP is BWP-1 in SCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is 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 at the beginning of the DL slot right after SCell's DL slot ($i+T_{BWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell no later than at the beginning of the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on SCell's BWP-2 starting from the beginning of the DL slot right after slot ($i+T_{BWPswitchDelay}$).

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 beginning slot of the DL subframe immediately after the slot wherein *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 SCell's DL slot ($j+T_{BWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell at latest at the beginning of the DL slot right after slot ($j+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on SCell's BWP-1 starting from the beginning of the DL slot right after slot ($j+T_{BWPswitchDelay}$).

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 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 PCell and PSCell during BWP switch of SCell, respectively.

**Table A.4.5.6.1.2.1-1: 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<br>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.<br>Note 3: NR configuration is the same for PSCell and SCells.<br>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 ($BW_{channel}$) 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 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. |
| 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 DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| 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 | |
| $BW_{channel}$ | Config 1,4 | | Note 7 | |
| | Config 2,5 | | Note 7 | |
| | Config 3,6 | | Note 7 | |
| $BW_{occupied}$ | Config 1,4 | RB | 52 Note 5 | |
| | Config 2,5 | | 52 Note 5 | |
| | Config 3,6 | | 106 Note 6 | |
| Active BWP ID | | | 0 | 1.2 |
| Initial BWP Configuration | Config 1,4 | | DLBWP.0.2 | DLBWP.0.2 |
| | Config 2,5 | | | |
| | Config 3,6 | | | |
| Active BWP-0 Configuration | Config 1,4 | | DLBWP.0.2 | N.A. |
| | Config 2,5 | | | |
| | Config 3,6 | | | |
| Active BWP-1 Configuration | Config 1,4 | | N.A. | DLBWP.1.3 |
| | Config 2,5 | | | |
| | Config 3,6 | | | |
| Active BWP-2 Configuration | Config 1,4 | | N.A. | DLBWP.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 | | SR2.1 TDD | |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | |
| | Config 3,6 | | CR2.1 TDD | |
| Dedicated CORESET parameters | Config 1,4 | | CCR.1.1 FDD | |
| | Config 2,5 | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR.2.3 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 | 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 | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | [-104] | [-104] |
| SS-RSRP Note 3 | | dBm/15 kHz | [-87] | [-87] |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | [-59] | [-59] |

| | | | | |
|---|---|---|---|---|
| | Config 3,6 | dBm/38.16MHz | [-61.9] | [-61.9] |

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 $N_{oc}$ to be fulfilled within $BW_{occupied}$.
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 $BW_{occupied}$ (i.e. 10 MHz, 52 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 6: All UL/DL transmission shall be confined within $BW_{occupied}$ (i.e. 40 MHz, 106 RBs) from $F_{C,low}$, and Io is independent of the $BW_{channel}$ configured.
Note 7: $N_{RB,c}$. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured $BW_{channel}$.

#### A.4.5.6.1.2.2 Test Requirements

During T1, the UE shall start to send the ACK for SCell on PSCell in the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for SCell on PSCell in the DL slot right after slot ($j+T_{BWPswitchDelay}+k11$).

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 PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of 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 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 in the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$), ($j+T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

*Editor's note: FFS value of k1 for type 1 and type 2 UE.*

## 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 NR 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 NR PSCell are specified in Table A.4.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) 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 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 BWP is 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 at the beginning of the DL slot right after PSCell's DL slot ($i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$) as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ($i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ($i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$).

$T_{RRCprocessingDelay}$ and $T_{BWPswitchDelayRRC}$ 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 RRC Reconfiguration message including updated BWP configurationis sent till the time when RRC Reconfiguration Complete message 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 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.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 |
| $BW_{channel}$ | | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 |
| | | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 |
| Active DL BWP ID | | | | 1, 2 |
| Initial DL BWP Configuration | | Config 1,4 | | DLBWP.0.2 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Initial UL BWP Configuration | | Config 1,4 | | ULBWP.0.2 |
| | | 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 | | |
| Initial UL BWP Configuration | | Config 1,4 | | ULBWP.0.2 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Active UL BWP-1 Configuration | | Config 1,4 | | ULBWP.1.3 |
| | | Config 2,5 | | |
| | | Config 3,6 | | |
| Active UL BWP-2 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 | | SR2.1 TDD |
| RMSI CORESET parameters | | Config 1,4 | | CR.1.1 FDD |
| | | Config 2,5 | | CR.1.1 TDD |
| | | Config 3,6 | | CR2.1 TDD |
| Dedicated CORESET parameters | | Config 1,4 | | CCR.1.1 FDD |
| | | 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 |
| 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) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | [-104] |
| SS-RSRP Note 3 | | dBm/15 kHz | [-87] |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | [-59] |
| | Config 3,6 | dBm/38.16MHz | [-61.9] |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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 for PSCell in the beginning of the DL slot right after slot ($i+ T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$ ).

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%.

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

### A.4.5.6.3 Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

#### A.4.5.6.3.1 Simultaneous E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in EN-DC on multiple CCs

##### A.4.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirement of DL BWP switch delay on multiple CCs in TS38.133 clause 8.6.2A.1, 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.4.5.6.3.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.4.5.6.3.1.1-2. 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.4.5.6.3.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on 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 T2 when BWPs are switching on Cell 2 and Cell 3.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC) and Cell 3(SCell) on radio channel 3.
- UE is configured with 2 different UE-specific downlink bandwidth parts for PSCell, BWP-1 and BWP-2, before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-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 BWP is BWP-1 in PSCell
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell and 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 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 PSCell bandwidth part from BWP-1 to BWP-2. On the same slot on Cell 3 test equipment shall send a DCI format 1_1 command for SCell DL BWP switch. The UE shall switch its SCell bandwidth part from BWP-1 to BWP-2.

The UE shall be able to receive PDSCH on PSCell and SCell at the beginning of the DL slot right after DL slot ($i+ T_{MultipleBWPswitchDelay}$) as defined in clause 8.6.2A.1 and starts to report valid ACK/NACK for the PSCell and SCell no later than at the beginning of the DL slot right after DL slot ($i+ T_{MultipleBWPswitchDelay}+k1$). The UE shall be continuously scheduled on both PCell's and SCell's BWP-2 starting from the beginning of the DL slot right after DL slot ($i+ T_{MultipleBWPswitchDelay}$).

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

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell(Cell 2) and SCell(Cell 3).

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 on PSCell. *bwp-InactivityTimer* timer on SCell shall also expire on slot #$j$. The UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1 on both PSCell and SCell. The UE shall be able to receive PDSCH on both PSCell and SCell at the beginning of the DL slot right after DL slot ($j+ T_{MultipleBWPswitchDelay}$) as defined in clause 8.6.2B.1 and starts to report valid ACK/NACK for the PSCell and SCell at latest at the beginning of the DL slot right after DL slot ($j+ T_{MultipleBWPswitchDelay} +k1$). The UE shall be continuously scheduled on both PSCell's and SCell's BWP-1 starting from the beginning of the DL slot right after DL slot ($j+ T_{MultipleBWPswitchDelay}$).

The starting time of 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 and SCell 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 PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell and SCell.

**Table A.4.5.6.3.1.1-1: 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.4.5.6.3.1.1-2: 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 | | 2,3 | 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 | For both PCell and PSCell |
| *bwp-InactivityTimer* | ms | [200] | For both PSCell and SCell |
| 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 EN-DC |
| T1 | s | [0.2] | |
| T2 | s | [0.2] | |
| T3 | s | [0.2] | |

**Table A4.5.6.3.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| 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 | |
| $BW_{channel}$ | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 | |
| | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 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 Configuration | Config 1,4 | | ULBWP.1.3 Note 4 | |
| | 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.1.1 FDD | |
| | Config 2,5 | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR.2.1 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) | | | | |

| | | | |
|---|---|---|---|
| $N_{oc}$ Note 2 | Config 1,2,4,5 | dBm/SCS | [-104] |
| | Config 3,6 | | [-101] |
| $N_{oc}$ Note 2 | | dBm/15kHz | [-104] |
| SS-RSRP Note 3 | Config 1,2,4,5 | dBm/SCS | [-87] |
| | Config 3,6 | | [-90] |
| $\hat{E}_s/I_{ot}$ | | dB | [17] |
| $\hat{E}_s/N_{oc}$ | | dB | [17] |
| Io Note3 | 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.<br>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.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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.4.5.6.3.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell and SCell in the DL slot right after DL slot ($i$+ $T_{MultipleBWPswitchDelay}$ +$k1$).

During T3, the UE shall start to send the ACK for PSCell and SCell in the DL slot right after DL slot ($j$+ $T_{MultipleBWPswitchDelay}$ +$k1$).

Where, $k1$ is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability, UE shall finish BWP switch within the time duration $T_{MultipleBWPswitchDelay}$ defined in 8.6.2A.1.

All of the above test requirements shall be fulfilled in order for the observed PSCell and 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 time of PCell interruption during PSCell and SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption of during PSCell and SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of 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 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 in the DL slot right after DL slot ($i$+ $T_{MultipleBWPswitchDelay}$ +$k1$), ($j$+ $T_{MultipleBWPswitchDelay}$ +$k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

### A.4.5.6.4 Simultaneous RRC-based Active BWP Switch on multiple CCs

#### A.4.5.6.4.1 E-UTRAN – NR PSCell FR1 DL active BWP switch in non-DRX in synchronous EN-DC on multiple CCs

##### A.4.5.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement on multiple CCs for RRC-based BWP switch defined in clause 8.6.3A.1. Supported test configurations are shown in Table A.4.5.6.4.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell(Cell 3) as given in Table A.4.5.6.4.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and NR SCell are specified in Table A.4.5.6.4.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) 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), PSCell (Cell 2) on radio channel 2 (PSCC) and SCell (Cell 3) on radio channel 3 (SCC).
- UE has bandwidth part BWP-1 in its RRC-configuration for PSCell (Cell 2) and SCell (Cell 3)
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell (Cell 2) and SCell (Cell 3).

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 for both PSCell(Cell 2) and SCell(Cell 3), 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 configuration on PSCell(Cell 2) and SCell(Cell 3).
>
> The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ($i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length}$) as defined in clause 8.6.3A.1 and be ready for the reception of uplink grant for the PSCell(Cell 2) and SCell(Cell 3) no later than at the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length}$). The UE shall be continuously scheduled on PSCell's BWP-1 and SCell's BWP-1 starting from the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length}$).
>
> $T_{RRCprocessingDelay}$ , $T_{BWPswitchDelayRRC}$, $D_{RRC}$ are defined in clause 8.6.3A.1 .

The test equipment verifies the DL BWP switch time in PSCell(Cell 2) and SCell(Cell 3) by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration sent till the time when RRC Reconfiguration Complete message is received.

**Table A.4.5.6.4.1.1-1: 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.4.5.6.4.1.1-2: 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 | | 2,3 | Two 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. |
| Active SCell | | Cell 3 | SCell on RF channel number 3. |
| 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. |
| 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] | |

**Table A.4.5.6.4.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|---|
| 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.1.2 | |
| $BW_{channel}$ | | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 | |
| | | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 | |
| Active DL BWP ID | | | | 1 | |
| Initial DL BWP Configuration | | Config 1,4 | | DLBWP.0.2 | |
| | | Config 2,5 | | | |
| | | Config 3,6 | | | |
| Initial UL BWP Configuration | | Config 1,4 | | ULBWP.0.2 | |
| | | 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 | | SR2.1 TDD | |
| RMSI CORESET parameters | | Config 1,4 | | CR.1.1 FDD | |
| | | Config 2,5 | | CR.1.1 TDD | |
| | | Config 3,6 | | CR2.1 TDD | |
| Dedicated 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 | |
| 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) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | [-104] |
| SS-RSRP Note 3 | | dBm/15 kHz | [-87] |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/ 9.36MHz | [-59] |
| | Config 3,6 | dBm/ 38.16MHz | [-61.9] |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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.4.5.6.4.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell and SCell in the beginning of the DL slot right after slot $(i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length})$ .

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell active BWP switch delay to be counted as correct.

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

### A.4.5.6.5 SCell dormancy switch

#### A.4.5.6.5.1 E-UTRAN – NR FR1 PSCell SCell dormancy switch of single FR1 SCell outside active time

##### A.4.5.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL dormant BWP switch delay requirement defined in clause 8.6, and interruption requirements for NR victim cell defined in clause 8.2.1.2.15 and interruption requirement for E-UTRA victim cell defined in clause 7.32 of TS 36.133 [15]. Supported test configurations are shown in Table A.4.5.6.5.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.4.5.6.5.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.4.5.6.5.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on 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 the SCell is in dormancy during T2.

The UE is configured to monitor PDCCH for DCI format 2_6 at *ps-Offset* before the start of *onDuration*. Two tests are specified, where a UE that only supports triggering within the first three OFDM symbols of a slot shall undergo Test1 only, and a UE that supports triggering also in remaining OFDM symbols of a slot shall undergo both Test1 and Test2. In the tested scenario, *ps-Offset* is selected to correspond to the dormancy switching time specified in clause 8.6.2A.

Before the test starts,

- UE is connected to Cell 1 (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 1 UE-specific downlink bandwidth parts the same as initial BWP for PSCell, BWP-1 in Cell 3 before starting the test.
- 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. BWP-1 is configured in *OutsideActiveTimeConfig* as *firstOutsideActiveTimeBWP*. BWP-2 is configured as *dormantBWP*.
- UE is configured with RRM measurement on SCC.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in PSCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
- UE is configured to monitor DCI format 2_6, and to be active during onDuration even when no DCI format 2_6 is detected (ps-WakeUp).

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.

Time period T1 starts when a DCI format 2_6 command for SCell switch from non-dormany to dormancy, sent from the test equipment to the UE, is received at the UE side at *ps-Offset* before *onDuration*. The UE shall switch its SCell bandwidth part from BWP-1 to BWP-2 into dormancy. During T1, test equipement verifies that:

The UE shall be able to receive CSI-RS on SCell BWP-2 at the beginning of the DL slot right after SCell's DL slot ($i+T_{dormantBWPswitchDelay}$) as defined in clause 8.6. TE shall observe the periodic reporting of CQI for SCell starting from slot ($i+T_{dormantBWPswitchDelay}$).

PCell (Cell 1) interruption due to dormancy switch on SCell shall occur within the dormancy switch delay.

PSCell (Cell 2) interruption due to dormancy switch on SCell shall occur within the dormancy switch delay.

Time period T2 starts when T1 is completed. During T2, the test equipment continues to schedule the UE continuously in PCell and PSCell. The UE shall carry out CSI and RRM measurements on the dormant SCells. The UE shall report ACK/NACK in PCell and PSCell in response to scheduled PDSCH, with the maximum loss of transmitted ACK/NACKs fulfilling the requirement in clause 8.2.1.2.15. The test equipment verifies that the loss of ACK/NACKs is no larger than 1.5%.

Time period T3 starts when T2 is completed. During T3, the test equipment does not schedule the UE, by which the inactivity timer expires and the UE stops monitoring PDCCH except for signalling using DCI format 2_6 at wake-up signalling occasions.

Time period T4 starts when the UE at *ps-Offset* before *onDuration* detects a DCI format 2_6 carrying dormancy indication that indicates that SCell1 and SCell2 are to be switched from dormancy to non-dormancy. During T4, the test equipment schedules the UE with new data indication in PCell, PSCell and SCell during *onDuration.* The test equipment verifies that:

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ($j+T_{dormantBWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell at latest at the beginning of the DL slot right after slot ($j+T_{dormantBWPswitchDelay}+k1$). The UE shall be continuously scheduled on SCell's BWP-1 starting from the beginning of the DL slot right after slot ($j+T_{dormantBWPswitchDelay}$).

PCell (Cell 1) interruption due to dormancy switch on SCell shall occur within the dormancy switch delay.

PSCell (Cell 2) interruption due to dormancy switch on SCell shall occur within the dormancy switch delay.

**Table A.4.5.6.5.1.1-1: 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<br>Note 2: A UE which fulfils the requirements in test case A.4.5.6.X.1 can skip the test cases in A.4.5.6.X.1.<br>Note 3: NR configuration is the same for PSCell and SCells. | |

**Table A.4.5.6.5.1.1-2: General test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| | | Test1 | Test2 | |
| 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 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. |
| Active SCell | | Cell 3 | | SCell on RF channel number 3. |
| CP length | | Normal | | |
| CSI reporting periodicity, Non-dormant BWP | ms | 2 | | CSI reporting periodicity for periodic reporting of CQI for PCell and non-dormant SCells |
| CSI reporting periodicity, Dormant BWP | ms | 40 | | CSI reporting periodicity for periodic reporting of CQI for dormant SCells |
| ps-Offset | | Depending on UE capability | | Monitoring of DCI 2_6 ahead of start of drx-onDurationTimer. Value of ps-Offset shall correspond to SCell dormancy switching time for switching of two SCells, as specified in clause 8.6.2A. Actual value depends on reported UE capabilities. |
| ps-WakeUp | | true | | Wake up for onDuration in case DCI format 2_6 is not detected. |
| DRX | | DRX.1 | | |
| *'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 |
| Number of CSI-RS ports | | 4 | | The number of CSI-RS ports in a single resource without CRI report |
| OFDM symbol range in slot for transmission of DCI with dormancy indication | | 0 – 2 | 3 – 11 | Test1 is based on that triggering DCI is received within the first three OFDM symbols of a slot. Test2 is based on that the triggering DCI is received later than within the first three OFDM symbols of a slot. |
| T1 | s | [0.2] | | |
| T2 | s | [10] | | |
| T3 | s | [0.2] | | |
| T4 | s | [0.2] | | |

**Table A.4.5.6.5.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| 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.1.2 | |
| $BW_{channel}$ | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 | |
| | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 | |
| | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 | |
| Active BWP ID | | | 1, 2 | 0 |
| Initial BWP Configuration | Config 1,4 | | DLBWP.0.2 | DLBWP.0.2 |
| | Config 2,5 | | | |
| | Config 3,6 | | | |
| Active BWP-0 Configuration | Config 1,4 | | NA | DLBWP.0.2 |
| | Config 2,5 | | | |
| | Config 3,6 | | | |
| Active BWP-1 Configuration | Config 1,4 | | DLBWP.1.3 | NA |
| | Config 2,5 | | | |
| | Config 3,6 | | | |
| Active BWP-2 Configuration | Config 1,4 | | DLBWP.1.1 | NA |
| | 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 | | SR2.1 TDD | |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD | |
| | Config 2,5 | | CR.1.1 TDD | |
| | Config 3,6 | | CR2.1 TDD | |
| Dedicated CORESET parameters, Test 1 | Config 1,4 | | CCR.1.1 FDD | |
| | Config 2,5 | | CCR.1.1 TDD | |
| | Config 3,6 | | CCR.2.1 TDD | |
| Dedicated CORESET parameters, Test 2 | Config 1,4 | | CCR.1.5 FDD | |
| | Config 2,5 | | CCR.1.5 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 | |
| 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 | 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 | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | [-104] | [-104] |
| SS-RSRP Note 3 | | dBm/15 kHz | [-87] | [-87] |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | [-59] | [-59] |
| | Config 3,6 | dBm/38.16MHz | [-61.9] | [-61.9] |

| | |
|---|---|
| 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 $N_{oc}$ 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.4.5.6.5.1.2 Test Requirements

During T1, any interruption on PCell and PSCell due to dormancy switching of SCell shall be within the requirement specified in in clause 8.2.1.2.15.1 for NR victim cell, and clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell. Starting from *onDuration* in time period T1, the UE shall transmit ACK/NACK in response to scheduling in PCell and PSCell. There shall be no loss of ACK/NACK.

During time period T2, the UE shall transmit ACK/NACKs in response to scheduling in PCell and the rate of missed ACK/NACKs shall be no more than 1.5%.

During T1, any interruption on PCell and PSCell due to dormancy switching of SCell shall be within the requirement specified in in clause 8.2.1.2.15.1 for NR victim cell, and clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell. Starting from *onDuration* in time period T4, the UE shall transmit ACK/NACK in response to scheduling in PCell, SCell1 and SCell2. There shall be no loss of ACK/NACK.

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

#### A.4.5.6.5.2 E-UTRAN – NR FR1 PSCell SCell dormancy switch of two FR1 SCells inside active time

##### A.4.5.6.5.2.1 Test Purpose and Environment

The purpose of this test is to verify the delay requirement of BWP switching from dormancy to non-dormancy and from non-dormancy to dormancy on SCell defined in clause 8.6.2, and interruption requirements for NR victim cell defined in clause 8.2.1.2.15 and interruption requirement for E-UTRA victim cell defined in clause 7.32.2.7 of TS 36.133 [15]. Supported test configurations are shown in Table A.4.5.6.5.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and two NR SCells (Cell 3, and Cell 4) as given in Table A.4.5.6.5.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCells are specified in Table A.4.5.6.5.2.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on 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, and Cell 4) to ensure that the UE would have ACK/NACK sending except for the time duration when SCell (Cell2) performs the dormancy switching and stays in the dormant BWP.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC),, Cell 3 (SCell) on radio channel 3 (SCC) and Cell 4 (SCell) on radio channel 4 (SCC).
- 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. BWP-0 always include bandwidth of the initial DL BWP and SSB.

- UE is configured with 2 UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2 in Cell 3 and Cell 4 before starting the test.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-0 in PSCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in all SCells.
- UE is indicated in *dormantBWP -Id* that the dormant BWP is BWP-2 in all SCells.

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 enterning dormant BWP in SCell, sent from the test equipment to the UE, is received at the UE side in PCell's slot # denoted *i*. Upon reception of the PDCCH indicating entering dormant BWP in PCell, UE shall switch the DL BWP-1 to DL BWP-2 in all SCells, i.e., switching from non-dormant BWP to dormant BWP.

The UE shall be able to receive PDSCH and report valid ACK/NACK on the PCell and PSCell all the time except interruption.

The starting time of PCell (Cell 1) interruption due to dormancy switching on SCells shall occur within the dormant BWP switch delay.

The starting time of PSCell (Cell 2) interruption due to dormancy switching on SCells shall occur within the dormant BWP switch delay.

During T2, the test equipment won't transmit DCI format for PDSCH reception on all SCells.

The UE shall be able to receive PDSCH and report valid ACK/NACK on the PCell and PSCell all the time except interruption.

During T3,

Time period T3 starts when a DCI format 1_1 command for leaving dormant BWP in SCells, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted *j*. Upon reception of the PDCCH indicating leaving dormant BWP in PSCell, UE shall switch the DL BWP-2 to DL BWP-1 in SCells, i.e., switching from dormant BWP to non-dormant BWP.

The UE shall be able to receive PDSCH on all SCells no later than the first DL slot that occurs after the beginning of PSCell's DL slot ($j$+ $T_{\text{mutipledormantBWPswitchDelay}}$) as defined in clause 8.6 and starts to report valid ACK/NACK on all SCells no later than the first UL slot that occurs after the beginning of slot ($j+N$) as defined in clause 10.3 in TS38.213.

The UE shall be able to receive PDSCH and report valid ACK/NACK on the PCell and PSCell all the time except interruption.

The starting time of PCell (Cell 1) interruption due to dormancy switching on SCells shall occur within the dormant BWP switch delay.

The starting time of PSCell (Cell 2) interruption due to dormancy switching on SCells shall occur within the dormant BWP switch delay.

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 PCell and PSCell during dormant BWP switch of SCells, respectively.

**Table A.4.5.6.5.2.1-1: Dormant 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<br>Note 2: A UE which fulfils the requirements in test case A.4.5.X.1.2 can skip the test cases in A.4.5.X.1.1.<br>Note 3: NR configuration is the same for PSCell and SCells. | |

**Table A.4.5.6.5.2.1-2: General test parameters for Dormant BWP switch in synchronous EN-DC**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| | | Test 1 | Test 2 | |
| E-UTRA RF Channel Number | | 1 | | One E-UTRA radio channel is used for this test |
| NR RF Channel Number | | 2, 3, 4 | | Three 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. |
| Active SCell | | Cell 4 | | SCell on RF channel number 4. |
| 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 |
| Cell4 timing offset to cell2 | μs | 3 | | Synchronous cells |
| OFDM symbol range in slot for transmission of DCI with dormancy indication | | 0 – 2 | 3 – 11 | |
| T1 | s | [0.2] | | |
| T2 | s | [0.2] | | |
| T3 | s | [0.2] | | |

**Table A.4.5.6.5.2.1-3: NR Cell specific test parameters for Dormant BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 | Cell 4 |
|---|---|---|---|---|---|
| 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.1.2 | | |
| $BW_{channel}$ | Config 1,4 | | 10 MHz: $N_{RB,c}$ = 52 | | |
| | Config 2,5 | | 10 MHz: $N_{RB,c}$ = 52 | | |
| | Config 3,6 | | 40 MHz: $N_{RB,c}$ = 106 | | |
| Active BWP ID | | | 0 | 1, 2 | |
| Initial BWP Configuration | Config 1,4 | | DLBWP.0.2 | NA | |
| | Config 2,5 | | | | |
| | Config 3,6 | | | | |
| Active BWP-0 Configuration | Config 1,4 | | DLBWP.0.2 | NA | |
| | Config 2,5 | | | | |
| | Config 3,6 | | | | |
| Active BWP-1 Configuration | Config 1,4 | | NA | DLBWP.1.1 | |
| | Config 2,5 | | | | |
| | Config 3,6 | | | | |
| Active BWP-2 Configuration | Config 1,4 | | NA | DLBWP.1.3 | |
| | 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 | | SR2.1 TDD | | |
| RMSI CORESET parameters | Config 1,4 | | CR.1.1 FDD | | |
| | Config 2,5 | | CR.1.1 TDD | | |
| | Config 3,6 | | CR2.1 TDD | | |
| Dedicated CORESET parameters, Test 1 | Config 1,4 | | CCR.1.1 FDD | | |
| | Config 2,5 | | CCR.1.1 TDD | | |
| | Config 3,6 | | CCR.2.1 TDD | | |
| Dedicated CORESET parameters, Test 2 | Config 1,4 | | CCR.1.5 FDD | | |
| | Config 2,5 | | CCR.1.5 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 | | |
| 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 | 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 | | | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | [-104] | [-104] | |
| SS-RSRP Note 3 | | dBm/15 kHz | [-87] | [-87] | |
| $\hat{E}_s/I_{ot}$ | | dB | 17 | 17 | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | 17 | |
| Io Note3 | Config 1,2,4,5 | dBm/9.36MHz | [-59] | [-59] | |
| | Config 3,6 | dBm/38.16MHz | [-61.9] | [-61.9] | |

| | |
|---|---|
| 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 $N_{oc}$ 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.4.5.6.5.2.2 Test Requirements

During T1, the UE shall be able to to send the ACK/NACK for all SCells before UE PDCCH indicating entering dormant BWP is received in PSCell's slot # denoted.

During T3, the UE shall start to send the ACK/NACK for all SCells from the first UL slot that occurs after the beginning of DL slot ($j$+$N$).

Where, $N$ is the timing that UE provide HARQ-ACK information in response to a detection of a DCI format 1_1 indicating SCell dormancy as specified in [3].

All of the above test requirements shall be fulfilled in order for the observed SCell dormant 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 PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during SCell active BWP switch shall not happen outside the BWP switch delay.

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 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].

The interruption of PSCell shall not be longer than the interruption duration specified for dormant BWP switch in clause 8.6.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first DL slot that occurs after the beginning of DL slot ($i$+ $N$), ($j$+ $N$), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

### 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 A4 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 A4. After receiving the Event A4, the test system shall send a RRC message to the UE to release the measurement gaps.

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 T2, after the measurement gaps are released by the test system. 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 T3.

The test system shall observe the periodic reporting of CSI for PSCell during T4. The point in time at which the UE has sent PRACH to the PSCell (Cell 2) defines the start of period T4.

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 T4, 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 T5.

**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 | 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 | -93 | 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 |
| Measurement gap pattern Id | | | 0 | Gaps are configured before T2 and released before T3. |
| PRACH configuration on cell2 | | | FR1 PRACH configuration 2 | 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 | During this time the UE shall identify neighbour cell (cell2) and report event B1. |
| T3 | | s | 0.5 | During this time the UE adds the PSCell. |
| T4 | | s | 0.5 | During this time the UE sends CSI reports for PSCell. |
| T5 | | 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 | |
| $BW_{channel}$ | MHz | 1,4 | 10: $N_{RB,c}$ = 52 | |
| | | 2,5 | 10: $N_{RB,c}$ = 52 | |
| | | 3,6 | 40: $N_{RB,c}$ = 106 | |
| Initial BWP Configuration | | 1,2,3 | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP Configuration | | 1,2,3 | DLBWP.1.1<br>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) | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | 1,2,3,4,5,6 | N/A | -85 |
| $N_{oc}$ Note2 | dBm/SCS | 1,2,4,5 | N/A | -85 |

| | | | | |
|---|---|---|---|---|
| | | 3,6 | N/A | -82 |
| $\hat{E}_s/I_{ot}$ | | 1,2,3,4,5,6 | -infinity | 0 |
| $\hat{E}_s/N_{oc}$ | | 1,2,3,4,5,6 | -infinity | 0 |
| SS-RSRP[Note3] | dBm/SCS | 1,2,4,5 | -infinity | -85 |
| | | 3,6 | -infinity | -82 |
| Io[Note3] | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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 at latest 82 ms[Note1] 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.

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]:

$$T_{config\_PSCell} = T_{RRC\_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell\_DU} + 2ms$$

Where:

$T_{RRC\_delay}$ = 20ms

$T_{processing}$ = 20ms

$T_{search}$ = 0

$T_{\Delta}$ = 20ms

$T_{PSCell\_DU}$ = 1*10+10 = 20ms

## A.4.5.8 DL Interruptions at switching between two uplink carriers

### A.4.5.8.1 Test Purpose and Environment

The purpose of this test is to verify DL interruption requirements during UE dynamic switching between two uplink carriers defined in clause 8.2.1.2.14. The test case is applicable for an uplink band pair of an inter-band EN-DC configuration when the capability *uplinkTxSwitchingPeriod* is present.

There are two cells: E-UTRAN FDD PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters for PSCell are given in Table A. 4.5.8.1-1, Table A. 4.5.8.1-2 and Table A. 4.5.8.1-3 below.

Aperiodic CSI-RS for L1-RSRP reporting is triggered with power boosting [6dB] on the following symbol on the special slot on NR TDD carrier (Cell 2):

- symbol#10 if UE does not report *uplinkTxSwitching-DL-Interruption-r16;*
- otherwise,
    - symbol#5 if UE capability *uplinkTxSwitchingPeriod* is 140us or
    - symbol #8 if UE capability *uplinkTxSwitchingPeriod* is 35us.

The test parameters and applicability for E-UTRAN FDD PCell are defined in A.3.7.2. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, *uplinkTxSwitching* is indicated to UE. This test verifies that the UE correctly report the L1-RSRP reporting.

**Table A. 4.5.8.1-1: Supported test configurations**

| Configuration | PSCell (Cell2) |
|---|---|
| 1 | 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |

**Table A. 4.5.8.1-2: General test parameters for DL Interruptions at switching between two uplink carriers in EN-DC**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| RF Channel Number | | Config 1 | 1, 2 | Two radio channels are used for the test. |
| Active cell | | Config 1 | Cell 1: E-UTRAN FDD PCell<br>Cell 2: FR1 PSCell | E-UTRAN FDD PCell on RF channel number 1<br>FR1 PSCell on RF channel number 2 |
| CP length | | Config 1 | Normal | |
| DRX | | Config 1 | OFF | |
| Measurement gap pattern Id | | Config 1 | OFF | |
| Filter coefficient | | Config 1 | 0 | L3 filtering is not used |
| CSI-RS configuration for L1-RSRP reporting | | Config 1 | CSI-RS.2.5 TDD | |
| T1 | s | Config 1 | 5 | |

**Table A. 4.5.8.1-3: NR Cell specific test parameters for DL Interruptions at switching between two uplink carriers in EN-DC (Cell 2)**

| Parameter | | Unit | Cell2 |
|---|---|---|---|
| Frequency Range | | | FR1 |
| Duplex mode | Config 1 | | TDD |
| TDD configuration | Config 1 | | TDDConf.2.1 except that:<br>S='11DL: 1GP:2UL';<br>*nrofDownlinkSymbols: 11*<br>*nrofUplinkSymbols: 2* |
| $BW_{channel}$ | Config 1 | | 40 MHz: $N_{RB,c}$ = 106 |
| Initial BWP Configuration | Config 1 | | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1 | | DLBWP.1.1 |
| UL dedicated BWP configuration | | | ULBWP.1.1 |
| SRS configuration | | | SRSConf.1 in Table A.4.4.1.1.1-3 is applied except that:<br>resourceMappingstartPosition: 0<br>resourceMappingnrofSymbols: n2 |
| PDSCH Reference measurement channel | Config 1 | | SR.2.1 TDD |
| RMSI CORESET parameters | Confiq 1 | | CR.2.1 TDD |
| Dedicated CORESET parameters | Config 1 | | CCR.2.1 TDD |
| OCNG Patterns | | | OP.1 |
| SMTC Configuration | | | SMTC.1 |
| SSB Configuration | Config 1 | | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | | | 2x2 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) | | | |
| $N_{oc}$ Note 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/SCS | 84 |
| $\hat{E}_s/I_{ot}$ | | dB | 17 |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| $N_{oc}$ Note 2 | Config 1 | dBm/SCS | -101 |
| Io Note3 | Config 1 | dBm/ 38.16MHz | -52.86 |
| Time offset to Cell1 Note 5 | | µs | 0 |
| 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 $N_{oc}$ 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: | Void |
| 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. |

#### A.4.5.8.2 Test Requirements

The UE behaviour follows the requirements defined in clause 8.2.1.2.14.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in clause 10.1.19.1.

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

## 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<br>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<br>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 $\mu$s | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | 2, 5 | 3 $\mu$s | Synchronous cells |
| | | 3, 6 | 3 $\mu$s | 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 T1 | Cell 2 T2 | Cell 3 T1 | Cell 3 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 RMC configuration | | 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 RMC configuration | | 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 | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 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 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2, 5 | -98 | | | |
| | | 3, 6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
| | | 2, 5 | | | | |
| | | 3, 6 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2, 5 | | | | |
| | | 3, 6 | | | | |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ 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 $2xTTI_{DCCH}$ 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 500ms 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<br>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<br>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.<br>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 RMC configuration | | 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 RMC configuration | | 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 | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 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 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2, 5 | -98 | | | |
| | | 3, 6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
| | | 2, 5 | | | | |
| | | 3, 6 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2, 5 | | | | |
| | | 3, 6 | | | | |
| $\hat{E}_s/N_{oc}$ | 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 | -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 $N_{oc}$ 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 $2xTTI_{DCCH}$ 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<br>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<br>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 $\mu$s | 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 $\mu$s | Synchronous cells |
| | | 3, 6 | 3 $\mu$s | 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 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 RMC configuration | | 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 RMC configuration | | 1, 4 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.2 TDD | | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 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<br>ULBWP.0.1 | | DLBWP.0.1<br>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 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2, 5 | -98 | | | |
| | | 3, 6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
| | | 2, 5 | | | | |
| | | 3, 6 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2, 5 | | | | |
| | | 3, 6 | | | | |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ 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 $2xTTI_{DCCH}$ 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 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<br>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<br>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 $\mu$s | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | 1, 4 | 3 ms | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | 2, 5 | 3 $\mu$s | | Synchronous cells |
| | | 3, 6 | 3 $\mu$s | | 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 T1 | Cell 2 T2 | Cell 3 T1 | Cell 3 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 RMC configuration | | 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 RMC configuration | | 1, 4 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| | | 2, 5 | CCR.1.2 TDD | | CCR.1.1 TDD | |
| | | 3, 6 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 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 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 4 | -98 | | | |
| | | 2, 5 | -98 | | | |
| | | 3, 6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 KHz | 1, 4 | -98 | | | |
| | | 2, 5 | | | | |
| | | 3, 6 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2, 5 | | | | |
| | | 3, 6 | | | | |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ 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 $2xTTI_{DCCH}$ 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<br>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<br>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.<br>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 | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| 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 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ 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 2x$TTI_{DCCH}$ 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<br>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<br>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 $\mu$s | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | 1, 2 | 3 ms | Asynchronous cells.<br>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 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 | | CR.1.1 FDD | |
| Dedicated CORESET RMC configuration | | 1, 2 | CCR.1.2 FDD | | CCR.1.1 FDD | |
| 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 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -98 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2 | -98 | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1, 2 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | 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.<br>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 $N_{oc}$ to be fulfilled.<br>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 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.1.7 EN-DC event triggered reporting tests under DRX for UE configured with highSpeedMeasFlag-r16

#### A.4.6.1.7.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event for UE configured with highSpeedMeasFlag-r16. This test will partly verify the intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

#### A.4.6.1.7.2 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.4.6.1.7.1-1, A.4.6.1.7.1-2, A.4.6.1.7.1-3 and A.4.6.1.7.1-4 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.4.6.1.7.2-1: Supported test configurations**

| 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 1: The UE is only required to be tested in one of the supported test configurations.<br>Note 2: Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2 | |

**Table A.4.6.1.7.2-2: General test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX for UE configured with highSpeedMeasFlag-r16**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| *highSpeedMeasFlag-r16* | | 1,2,3,4,5,6 | Present | To enable high speed measurement enhancements |
| 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<br>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. 7. | 640ms DRX cycle |
| 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.<br>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 | 6 | |

**Table A.4.6.1.7.2-3: NR Cell specific test parameters for EN-DC intra-frequency event triggered reporting without gap for PSCell in FR1 with DRX for UE configured with highSpeedMeasFlag-r16**

| 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 RMC configuration | | 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 RMC configuration | | 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 | |
| OCNG Patterns | | 1, 2, 3,4,5,6 | OP.1 | | OP.1 | |
| TRS configuration | | 1,4 | TRS.1.1 FDD | | N/A | |
| | | 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<br>ULBWP.0.1 | | DLBWP.0.1<br>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 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,4 | -98 | | | |
| | | 2,5 | -98 | | | |
| | | 3,6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1,4 | -98 | | | |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| $\hat{E}_s/I_{ot}$ | dB | 1,4 | 4 | -1.46 | -Infinity | -1.46 |
| | | 2,5 | | | | |
| | | 3,6 | | | | |
| $\hat{E}_s/N_{oc}$ | 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, 2,4,5 | AWGN | | AWGN 1944 Hz Note 4 | |
| | | 3,6 | AWGN | | AWGN 3334 Hz Note 5 | |

| | |
|---|---|
| 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 $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | The AWGN 1944 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 1944Hz. |
| Note 5: | The AWGN 3334 Hz condition is a non fading propagation channel with one tap. Doppler shift is a constant 3334Hz. |

##### A.4.6.1.7.3 Test Requirements

The UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 5120 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 $2xTTI_{DCCH}$ 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<br>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.<br>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.<br>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 T1 | Cell 2 T2 | Cell 3 T1 | Cell 3 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 | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 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) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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 $2xTTI_{DCCH}$ 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 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<br>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.<br>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.<br>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 | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | |
| 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 | 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) | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16 MHz | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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 $2xTTI_{DCCH}$ 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<br>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.<br>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.<br>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 T1 | Cell 2 T2 | Cell 3 T1 | Cell 3 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 | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| 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 | | 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 | 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 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) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | 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 $N_{oc}$ 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 $2xTTI_{DCCH}$ 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<br>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.<br>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.<br>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 T1 | Cell 2 T2 | Cell 3 T1 | Cell 3 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 | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 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 | SR2.1 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 | | | |
| 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 | | | |
| | | 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 | | | |
| | | Config 2,5 | SSB.1 FR1 | | | |
| | | Config 3,6 | SSB.2 FR1 | | | |
| SMTC configuration defined in A.3.11 | | Config 1,4 | SMTC.2 | | | |
| | | Config 2,3,5,6 | SMTC.1 | | | |
| 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) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | 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 $N_{oc}$ 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 $2xTTI_{DCCH}$ 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>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 SSS Note 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 |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| | 3,6 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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.<br>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 $N_{oc}$ to be fulfilled.<br>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 2xTTI$_{DCCH}$ 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>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 SSS Note 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 |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| | 3,6 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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.<br>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 $N_{oc}$ to be fulfilled.<br>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 2x$TTI_{DCCH}$ 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>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 SSS Note 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 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~6 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| | 3,6 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ to be fulfilled.<br>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 2xTTI$_{DCCH}$ 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>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 SSS Note 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 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~6 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| | 3,6 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ to be fulfilled.<br>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 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.4.5 SSB based L1-RSRP measurement when DRX is used for UE configured with *highSpeedMeasFlag-r16*

#### A.4.6.4.5.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-RSRP measurement when UE is configured with *highSpeedMeasFlag-r16*. This test will partly verify the L1-RSRP measurement requirements for UE configured with *highSpeedMeasFlag-r16* in clause 9.5.4.1, with the testing configurations for NR cells in Table A.4.6.4.5.1-1.

**Table A.4.6.4.5.1-1: 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.4.6.4.5.2 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.4.6.4.5.2-1 and Table A.4.6.4.5.2-2 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.4.6.4.5.2-1: General test parameters for UE configured with *highSpeedMeasFlag-r16***

| 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>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.8 |
| 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 | 2 |
| 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 SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |

| | | | |
|---|---|---|---|
| Propagation condition | 1,2,4,5 | | AWGN 1944 Hz |
| | 3,6 | | AWGN 3334 Hz |
| 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.4.6.4.5.2-2: SSB specific test parameters for UE configured with *highSpeedMeasFlag-r16***

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| | 3,6 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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.<br>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 $N_{oc}$ to be fulfilled.<br>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 [1920ms] 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 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.5 CLI measurements

### A.4.6.5.1 SRS-RSRP measurement with non-DRX

#### A.4.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 9.7.2.5 with the testing configurations for NR cells in Table A.4.6.5.1.1-1.

**Table A.4.6.5.1.1-1: Applicable NR configurations for FR1 SRS-RSRP test**

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

### A.4.6.5.1.2 Test Parameters

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters for PSCell is given in Table A.4.6.5.1.2-1 and A.4.6.5.1.2-2 below 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 I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table A.4.6.5.1.2-4 and the test parameters for the (virtual) neighbour cell UE in Table A.4.6.5.1.2-3. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

**Table A.4.6.5.1.2-1: General test parameters for SRS-RSRP event triggered reporting for PSCell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | E-UTRAN Cell 1 and NR Cell 2 | |
| RF Channel Number | | 1, 2 | 1: Cell 1<br>2: Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.1 | |
| | | 2 | SMTC.1 | |
| SRS configuration | | 1 | SRSConf.1 | Table A.4.6.5.1.2-3 |
| | | 2 | SRSConf.2 | |
| CP length | | 1, 2 | Normal | |
| i1-Threshold | dBm | 1 | -97 | |
| | | 2 | -95 | |
| 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 | OFF | Non-DRX |
| Time offset between DL from serving cell and SRS from test system | μs | 1,2 | 17.67 | |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 1 | |

**Table A.4.6.5.1.2-2: NR Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell in FR1**

| Parameter | Unit | Test configuration | Cell 2 T1 | Cell 2 T2 |
|---|---|---|---|---|
| TDD configuration | | 1 | TDDConf.1.1 | |
| | | 2 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 TDD | |
| | | 2 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 TDD | |
| | | 2 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 TDD | |
| | | 2 | CCR.2.1 TDD | |
| OCNG Patterns | | 1, 2 | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 TDD | |
| | | 2 | TRS.1.2 TDD | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | |
| | | 2 | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | |
| | | 2 | -95 | |
| 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.<br>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 $N_{oc}$ to be fulfilled. | | | | |

**Table A.4.6.5.1.2-3: NR Cell specific test parameters for SRS-RSRP event triggered reporting for neighbour cell UE**

| Parameter | Unit | Test configuration | Neighbour cell UE | |
|---|---|---|---|---|
| | | | T1 | T2 |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | |
| | | 2 | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -98 | |
| | | 2 | -95 | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | -infinity | 4 |
| | | 2 | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | -infinity | 4 |
| | | 2 | | |
| SRS-RSRP Note 3 | dBm/SCS kHz | 1 | -infinity | -94 |
| | | 2 | -infinity | -91 |
| Io | dBm/9.36 MHz | 1 | -70.05 | -64.59 |
| | dBm/38.16 MHz | 2 | -63.96 | -58.50 |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

**Table A.4.6.5.1.2-4: SRS configuration for measurement reporting**

| | 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 | 12 | 12 | |
| | freqHopping b-SRS | 0 | 0 | |
| | freqHopping b-hop | 0 | 0 | |
| | groupOrSequenceHopping | Neither | Neither | |
| | resourceType | Periodic | Periodic | |
| | periodicityAndOffset | sl20, 9 | sl40, 19 | |
| | sequenceId | 0 | 0 | Any 10 bit number |

#### A.4.6.5.1.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 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%.

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

### A.4.6.5.2 CLI-RSSI measurement with non-DRX

#### A.4.6.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of CLI-RSSI measurement. This test will verify the CLI-RSSI measurement requirements in clause 9.7.3.5 with the testing configurations for NR cells in Table A.4.6.5.2.1-1.

**Table A.4.6.5.2.1-1: Applicable NR configurations for FR1 CLI-RSSI test**

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

#### A.4.6.5.2.2 Test Parameters

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR1 PSCell (Cell 2). The test parameters for PSCell is given in Table A.4.6.5.2.2-1 and A.4.6.5.2.2-2 below 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 I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI measurement resource and on 1 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.4.6.5.2.2-3.

**Table A.4.6.5.2.2-1: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR1**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1, 2 | E-UTRAN Cell 1 and NR Cell 2 | |
| RF Channel Number | | 1, 2 | 1: Cell 1<br>2: Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR1 | |
| | | 2 | SSB.2 FR1 | |
| SMTC configuration | | 1 | SMTC.1 | |
| | | 2 | SMTC.1 | |
| CLI-RSSI configuration | | 1 | CLI-RSSIConf.1 | Table A.4.6.5.2.2-3 |
| | | 2 | CLI-RSSIConf.2 | |
| CP length | | 1, 2 | Normal | |
| i1-Threshold | dBm | 1 | -93 | |
| | | 2 | -93 | |
| 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 | OFF | Non-DRX |
| Time offset between DL from serving cell and OCNG from test system | μs | 1,2 | 17.67 | |
| T1 | s | 1, 2 | 5 | |
| T2 | s | 1, 2 | 1 | |

**Table A.4.6.5.2.2-2: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR1**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.1.1 | |
| | | 2 | TDDConf.2.1 | |
| PDSCH RMC configuration | | 1 | SR.1.1 TDD | |
| | | 2 | SR.2.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.1.1 TDD | |
| | | 2 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.1.1 TDD | |
| | | 2 | CCR.2.1 TDD | |
| OCNG Patterns Note 3 | | 1, 2 | OP.1 | |
| TRS Configuration | | 1 | TRS.1.1 TDD | |
| | | 2 | TRS.1.2 TDD | |
| Initial BWP configuration | | 1, 2 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1, 2 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1, 2 | ULBWP.1.1 | |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/15 kHz | 1 | -116 | -108 |
| | | 2 | | |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/SCS | 1 | -116 | -108 |
| | | 2 | -113 | -105 |
| Io on CLI-RSSI measurement resource | dBm/9.36 MHz | 1 | -88.05 | -80.05 |
| | dBm/38.16 MHz | 2 | -81.96 | -74.00 |
| Io on CLI-RSSI measurement resource | dBm/1.08 MHz | 1 | -97.43 | -89.43 |
| | dBm/1.08 MHz | 2 | -97.44 | -89.44 |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

**Table A.4.6.5.2.2-3: CLI-RSSI measurement resource configuration for measurement reporting**

| | Field | CLI-RSSIConf.1 | CLI-RSSIConf.2 |
|---|---|---|---|
| RSSI-Resource | rssi-ResourceId | 0 | 0 |
| | rssi-SCS | 15 | 30 |
| | startPRB | 0 | 0 |
| | nrofPRBs | 52 | 106 |
| | startPosition | 3 | 3 |
| | nrofSymbols | 11 | 11 |
| | rssi-PeriodicityAndOffset | sl20, 9 | sl40, 19 |

### A.4.6.5.2.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

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 $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.6 Measurements with autonomous gaps

### A.4.6.6.1 EN-DC-intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC

#### A.4.6.6.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements for intra-frequency identification of a new CGI of NR FR1 cell with autonomous gaps in clause 8.1.2.4.27 and 8.1.2.4.28 in 36.133 [15] for EN-DC.

The test scenario comprises of one E-UTRA carrier and one NR FR1 carrier. Three cells are deployed in the test, which are E-UTRAN PCell (Cell 1) on E-UTRA RF channel 1, NR FR1 PSCell (Cell 2) and NR FR1 neighbour cell (Cell 3) on NR RF channel 1. The supported test configurations are shown in table A.4.6.6.1.1-1 below. The test parameters for NR Cells are given in Table A.4.6.6.1.2-2, A.4.6.6.1.2-3 below. The test parameters and applicability for the E-UTRAN PCell are defined in A.3.7.2.1. The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of Cell 3. Starting T2, Cell 3 becomes detectable and the UE is expected to detect and send a measurement report.

A RRC message implying SI reading shall be sent to the UE during period T2, after the UE has reported Event A3. The RRC message shall create a measurement report configuration with purpose *reportCGI* which *cellForWhichToReportCGI* set to the physical cell identity of Cell 3. The start of T3 is the instant when the last TTI containing the RRC message implying SI reading of the neighbour cell (Cell 3) using autonomous gap is sent to the UE.

**Table A.4.6.6.1.1-1: intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC**

| 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<br>Note 2: target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2 | |

**Table A.4.6.6.1.1-2: General test parameters for intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One E-UTRAN radio channel is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1 | One NR FR1 radio channel 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.<br>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 1. |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -4.5 | |
| 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.<br>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 | ≤10 | |
| T3 | s | Config 1,2,3,4,5,6 | 5 | |

**Table A.4.6.6.1.1-3: Cell specific test parameters for intra-frequency CGI identification of NR FR1 cell with autonomous gaps in synchronous EN-DC**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Duplex mode | | Config 1,4 | FDD | | | |
| | | Config 2,3,5,6 | TDD | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| TDD configuration | | Config 1,4 | N/A | | N/A | |
| | | 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 | | | |
| | | Config 3,6 | TRS.1.2 TDD | | | |
| 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 | | NA | |
| | | Config 2,5 | SR.1.1 TDD | | | |
| | | Config 3,6 | SR2.1 TDD | | | |
| RMSI CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | NA | |
| | | Config 2,5 | CR.1.1 TDD | | NA | |
| | | Config 3,6 | CR2.1 TDD | | NA | |
| RMC CORESET Reference Channel | | 1, 4 | CCR.1.1 FDD | | NA | |
| | | 2, 5 | CCR.1.1 TDD | | NA | |
| | | 3, 6 | CCR.2.1 TDD | | NA | |
| SSB parameters | | Config 1,2,4,5 | SSB.1 FR1 | | | |
| | | Config 3,6 | SSB.2 FR1 | | | |
| SMTC configuration defined in A.3.11 | | Config 1,4 | SMTC.2 | | | |
| | | Config 2,3,5,6 | SMTC.1 | | | |
| RMSI scheduling periodicity | ms | Config 1,2,3,4,5,6 | 20ms | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
| | | Config 3,6 | 30 | | | |
| RLM-RS | | Config 1,2,3,4,5,6 | SSB | | SSB | |
| 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) | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | dBm/15 kHz | | -98 | | -98 | |
| $N_{oc}$ 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 | -94 |
| | | Config 3,6 | -91 | -91 | -Infinity | -91 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 4 |
| Io Note3 | dBm/9.36MHz | Config 1,2,4,5 | -64.60 | -62.25 | -64.60 | -62.25 |
| | dBm/38.16MHz | Config 3,6 | -58.50 | -56.16 | -58.50 | -56.16 |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

#### A.4.6.6.1.2 Test Requirements

The UE shall transmit a measurement report containing the cell global identifier of Cell 3 within 257 ms from the start of T3.

Test requirement = RRC Procedure delay + $T_{identify\_CGI\_NR}$ + reporting delay

= 15 + 240 + 2

= 257 ms, allow 260ms.

The UE shall be scheduled continuously throughout the test, and from the start of T3 until 257 ms the number of interrupted slots shall not exceed the allowed number specified in 8.2.1.2.16 .

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 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.7 L1-SINR measurement for beam reporting

### A.4.6.7.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR when DRX is not used

#### A.4.6.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement based on CSI-RS CMR without dedicated IMR. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.1, with the testing configurations for NR cells in Table A.4.6.7.1.1-1.

**Table A.4.6.7.1.1-1: Applicable NR configurations for FR1 CSI-RS based L1-SINR 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.4.6.7.1.2 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.4.6.7.1.2-1 and Table A.4.6.7.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR 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-SINR on aperiodic CSI-RS resources. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 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.4.6.7.1.2-1.

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.4.6.7.1.2-1: 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| DRX configuration | 1~6 | | Off |
| reportConfigType | 1~6 | | aperiodic |
| reportQuantity-r16 | 1~6 | | cri-SINR-r16 |
| 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 | 26 |
| 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 SSS Note 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.4.6.7.1.2-2: CSI-RS specific test parameters**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~6 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| | 3,6 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 1~6 | dB | 0 | 3 |
| CSI-RS RSRP Note3 | 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 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ to be fulfilled.<br>Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

#### A.4.6.7.1.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the absolute accuracy requirement in clause 10.1.27.1.1 and relative accuracy requirement in clause 10.1.27.1.2.

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 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.7.2 L1-SINR measurement with SSB based CMR and dedicated IMR when DRX is used

#### A.4.6.7.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with SSB based CMR and CSI-IM based IMR in clause 9.8.4.2, with the testing configurations for NR cells in Table A.4.6.7.2.1-1.

**Table A.4.6.7.2.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| 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.4.6.7.2.2 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.4.6.7.2.2-1 and Table A.4.6.7.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the SSBs and the associated CSI-IM resources, 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 and BFD measurements based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR.

**Table A.4.6.7.2.2-1: 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 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-IM configuration | 1,4 | | CSI-IM.1.1 FDD |
| | 2,5 | | CSI-IM.1.1 TDD |
| | 3,6 | | CSI-IM.2.1 TDD |
| OCNG Patterns | 1~6 | | OP.1 |
| Initial BWP Configuration | 1~6 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>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-r16 | 1~6 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~6 | | 2 |
| L1-SINR 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 SSS Note 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.4.6.7.2.2-2: SSB specific test parameters**

| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| $N_{oc}$ Note2 | 1~6 | dBm/15kHz | -94.65 | | | |
| $N_{oc}$ Note2 | 1,2,4,5 | dBm/SSB SCS | -94.65 | | | |
| | 3,6 | | -91.65 | | | |
| $\hat{E}_s/I_{ot}$ | 1~6 | dB | 0 | 0 | -Infinity | 3 |
| SS-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 |
| $\hat{E}_s/N_{oc}$ | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

#### A.4.6.7.2.3 Test Requirements

The UE shall send L1-SINR report every 80 slots. No later than 640ms plus 80 slots from the beginning of time period T2, UE shall send L1-SINR report including results of both SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 while meeting the accuracy requirement in clause 10.1.27.2. 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 $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.4.6.7.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR configured when DRX is used

#### A.4.6.7.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with CSI-RS based CMR and dedicated IMR cofigured in clause 9.8.4.3, with the testing configurations for NR cells in Table A.4.6.7.3.1-1.

**Table A. A.4.6.7.3.1-1: Applicable NR configurations for FR1 L1-SINR test with CMR and dedicated IMR**

| 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.4.6.7.3.2 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.4.6.7.3.2-1 and Table A.4.6.7.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the configured CSI-RS as CMR and an associated CSI-RS as IMR, and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources and the associated IMR. After 80ms from the beginning of the test, the DCI trigger comes in slot n (1 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.4.6.7.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs, and UE is configured to perform L1-SINR measurement based on the CSI-RS as CMR and the CSI-RS as IMR.

**Table A.4.6.7.3.2-1: 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 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 as CMR | 1,4 | | CSI-RS.1.3 FDD |
| | 2,5 | | CSI-RS.1.3 TDD |
| | 3,6 | | CSI-RS.2.3 TDD |
| CSI-RS configuration as IMR | 1,4 | | CSI-RS.1.2A FDD |
| | 2,5 | | CSI-RS.1.2A TDD |
| | 3,6 | | CSI-RS.2.2A 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 |
| DRX configuration | 1~6 | | DRX.3 |
| reportConfigType | 1~6 | | aperiodic |
| reportQuantity-r16 | 1~6 | | cri-SINR-r16 |
| 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 | 26 |
| 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 SSS Note 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.4.6.7.3.2-2: CSI-RS specific test parameters**

| Parameter | Config | Unit | CSI-RS#0 | CSI-RS#1 |
|---|---|---|---|---|
| $N_{oc}$ Note1 | 1~6 | dBm/15kHz | -94.65 | |
| $N_{oc}$ Note1 | 1,2,4,5 | dBm/SSB SCS | -94.65 | |
| | 3,6 | | -91.65 | |
| $\hat{E}_s/I_{ot}$ | 1~6 | dB | 0 | 3 |
| $\hat{E}_s/N_{oc}$ | 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 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

### A.4.6.7.3.3 Test Requirements

After 80ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-RS#0 as IMR and CSI-RS#1 as CMR + CSI-RS#1 as IMR while meeting the accuracy requirement in clause 10.1.27.3.

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 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.8 CSI-RS based intra-frequency Measurement

### A.4.6.8.1 EN-DC event triggered reporting tests without gap under DRX

#### A.4.6.8.1.1 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 CSI-RS based L3 intra-frequency requirements in clause 9.10.2.

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.4.6.8.1.1-1, A.4.6.8.1.1-2, A.4.6.8.1.1-3 and A.4.6.8.1.1-4 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 for the CSI-RS based L3 intra-frequency measurements. 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 at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.4.6.8.1.1-1: Supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: Target NR Cell 3 has the same SCS, BW and duplex mode as NR serving Cell 2 | |

**Table A.4.6.8.1.1-2: 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 | |
| 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<br>2: Cell 2 and Cell 3 | |
| 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.5 | |
| Time offset between PCell and PSCell | μs | 1, 2, 3, 4, 5, 6 | 3 | Synchronous EN-DC |
| Time offset between serving and neighbour cells | μs | 1, 4 | 4.7 | Asynchronous cells.<br>The timing of Cell 3 is CP later than the timing of Cell 2. |
| | | 2, 5 | 4.7 | Synchronous cells |
| | | 3, 6 | 2.35 | Synchronous cells |
| T1 | s | 1, 2, 3, 4, 5, 6 | 5 | |
| T2 | s | 1, 2, 3, 4, 5, 6 | 7 | |

**Table A.4.6.8.1.1-3: 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 RMC configuration | | 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 RMC configuration | | 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 | |
| OCNG Patterns | | 1, 2, 3, 4, 5, 6 | OP.1 | | OP.1 | |
| TRS configuration | | 1, 4 | TRS.1.1 FDD | | N/A | |
| | | 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 | |
| SSB parameters | | 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
| | | 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| CSI-RS configuration for RRM | | 1,4 | CSI-RS.RRM.FR1.1 FDD | | | |
| | | 2,5 | CSI-RS.RRM.FR1.1 TDD | | | |
| | | 3,6 | CSI-RS.RRM.FR1.2 TDD | | | |
| RLM-RS | | 1, 2, 3, 4, 5, 6 | SSB | | SSB | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,2,4,5 | -98 | | | |
| | | 3, 6 | -95 | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1, 2, 3, 4, 5, 6 | -98 | | | |
| $\hat{E}_s/I_{ot}$ for SSB | dB | 1, 2, 3, 4, 5, 6 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/I_{ot}$ for CSI-RS | dB | 1, 2, 3, 4, 5, 6 | 4 | -1.46 | -Infinity | -1.46 |
| $\hat{E}_s/N_{oc}$ for SSB | dB | 1, 2, 3, 4, 5, 6 | 4 | 4 | -Infinity | 4 |
| $\hat{E}_s/N_{oc}$ for CSI-RS | dB | 1, 2, 3, 4, 5, 6 | 4 | 4 | -Infinity | 4 |
| 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 |
| CSI-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 | -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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and CSI-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

#### A.4.6.8.1.2 Test Requirements

In test 1, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 9280 ms from the beginning of time period T2. The UE is not required to read the SSB index indicated by associatedSSB in the neighbour cell 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 $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.4.6.9 CSI-RS based inter-frequency Measurement

### A.4.6.9.1 EN-DC event triggered reporting tests for FR1 cell when non-DRX is used

#### A.4.6.9.1.1 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 measurement requirements in clause 9.10.3.

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.4.6.9.1.1-1, A.4.6.9.1.1-2, and A.4.6.9.1.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.9.1.1-2 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.4.6.9.1.1-1.

**Table A.4.6.9.1.1-1: EN-DC event triggered reporting tests with SSB index reading for FR1-FR1**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell3 has the same SCS, BW and duplex mode as NR serving cell2 | |

**Table A.4.6.9.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting**

| 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 frequencies is used. |
| NR RF Channel Number | | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are 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.<br>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 | OFF | | DRX is not used |
| Time offset between PCell and PSCell | μs | Config 1,2,3,4,5,6 | 3 | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | μs | Config 1,4 | 4.7 | | Asynchronous cells.<br>The timing of Cell 3 is CP later than the timing of Cell 2. |
| | | Config 2,5 | 4.7 | | Synchronous EN-DC |
| | | Config 3,6 | 2.35 | | Synchronous EN-DC |
| T1 | s | Config 1,2,3,4,5,6 | 5 | | |
| T2 | s | Config 1,2,3,4,5,6 | 1.1 | 1.1 | |

**Table A.4.6.9.1.1-3: Cell specific test parameters for EN-DC inter-frequency event triggered reporting**

| Parameter | Unit | Test configuration | Cell 2 T1 | Cell 2 T2 | Cell 3 T1 | Cell 3 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 | | | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | | |
| 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 | | 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 | SR. 2.1 TDD | | | |
| CORESET Reference Channel | | Config 1,4 | CR.1.1 FDD | | - | |
| | | Config 2,5 | CR.1.1 TDD | | | |
| | | Config 3,6 | CR.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 | | Config 1,4 | SMTC.2 | | | |
| | | Config 2,3,5,6 | SMTC.1 | | | |
| CSI-RS configuration for RRM | | Config 1,4 | CSI-RS.RRM.FR1.1 FDD | | | |
| | | Config 2,5 | CSI-RS.RRM.FR1.1 TDD | | | |
| | | Config 3,6 | CSI-RS.RRM.FR1.2 TDD | | | |
| 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) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz | | -98 | | -98 | |
| $N_{oc}$ 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 |
| CSI-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
| | | Config 3,6 | -91 | -91 | -Infinity | -88 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| Io Note3 | dBm/9.36 MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
| | dBm/38.16 MHz | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

### A.4.6.9.1.2 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 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 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 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.4.7 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 | | | | | |
| $BW_{channel}$ | Config 1,4 | | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | | 40: $N_{RB,c}$ = 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) | | | | | | | | | |
| $N_{oc}$ 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_F | | | | | | -111.5 | |
| | | 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 applicable[Note 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_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| $N_{oc}$ [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 applicable[Note 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_F | | | | | | -108.5 | |
| | | NR_FDD_FR1_G | | | | | | -108 | |
| | | NR_FDD_FR1_H | | | | | | -107.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | 2.46 | -5.97 | 2.46 | -5.97 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 1 | 6 | 1 | 3 | 0 |
| SS-RSRP[Note3] | 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_F | | | | | | -108.50 | -111.50 |
| | | 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 applicable[Note 5] | Not applicable[Note 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_F | | | | | | -105.50 | -108.50 |
| | | NR_FDD_FR1_G | | | | | | -105.00 | -108.00 |
| | | NR_FDD_FR1_H | | | | | | -104.50 | -107.50 |
| Io[Note3] | 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_F | | | | -77.53 |
| | | 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 applicable Note 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_F | | | | -71.44 |
| | | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 5: Subtest 1 is not used when testing with 30kHz SSB SCS<br>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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 | | DLBWP.0.1<br>ULBWP.0.1 | |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | | DLBWP.1.1<br>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 SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1~6 | dBm/15 kHz | -94.65 | | ( $N_{oc}$ 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 |
| | NF_FDD_FR1_F | | | | | | -112.5 |
| | NR_FDD_FR1_G | | | | | | -112 |
| | NR_FDD_FR1_H | | | | | | -111.5 |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1,2,4,5 | dBm/SS B SCS | -94.65 | | ( $N_{oc}$ 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_F | | | | | | -112.5 |
| | NR_FDD_FR1_G | | | | | | -112 |
| | NR_FDD_FR1_H | | | | | | -111.5 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, NR_SDL_FR1_A | 3,6 | | -91.65 | | ( $N_{oc}$ 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_F | | | | | | -110.50 |
| | NR_FDD_FR1_G | | | | | | -109.00 |
| | NR_FDD_FR1_H | | | | | | -109.50 |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | 10 | 10 | 13 | -3 |
| SS-RSRP Note3 | 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_F | | | | | | -115.50 |
| | 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_F | | | | | | -112.50 |
| | NR_FDD_FR1_G | | | | | | -112.00 |
| | NR_FDD_FR1_H | | | | | | -111.50 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Io[Note3] | 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_F | | | | | | -82.78 |
| | 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_F | | | | | | -76.69 |
| | NR_FDD_FR1_G | | | | | | -76.19 |
| | NR_FDD_FR1_H | | | | | | -75.69 |
| $\hat{E}_s/N_{oc}$ | | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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) | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $N_{oc}$ 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_F | | | | | | -111.5 | |
| | | 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_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | dBm/SCS | -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_F | | | | | | -111.5 | |
| | | 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_F | | | | | | -108.5 | |
| | | NR_FDD_FR1_G | | | | | | -108 | |
| | | NR_FDD_FR1_H | | | | | | -107.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -2.9 | -2.9 | -4 | -4 |
| SS-RSRP Note3 | 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_F | | | | | | -115.5 | -115.5 |
| | | 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_F | | | | | | -112.5 | -112.5 |
| | | 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_F | | | | | | | |
| | | NR_FDD_FR1_G | | | | | | | |
| | | NR_FDD_FR1_H | | | | | | | |
| Io Note3 | 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_F | | | | | | -81 | |
| | | 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_F | | | | | | -74.9 | |
| | | 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 $N_{oc}$ 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 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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) | | | | | | | | | |
| $N_{oc}$ 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 |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| SS-RSRP Note3 | 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<br>NR_TDD_FR1_A<br>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<br>NR_TDD_FR1_D | | | | | | -108.5 | -113.25 |
| | | NR_FDD_FR1_E<br>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<br>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<br>NR_TDD_FR1_D | | | | | | | |
| | | NR_FDD_FR1_E<br>NR_TDD_FR1_E | | | | | | | |
| | | NR_FDD_FR1_G | | | | | | | |
| | | NR_FDD_FR1_H | | | | | | | |
| Io Note3 | Config 1,2,4,5 | NR_FDD_FR1_A<br>NR_TDD_FR1_A<br>NR_SDL_FR1_A | dBm/<br>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<br>NR_TDD_FR1_D | | | | | | -81.78 | -84.33 |
| | | NR_FDD_FR1_E<br>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<br>NR_TDD_FR1_A<br>NR_SDL_FR1_A | dBm/<br>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<br>NR_TDD_FR1_D | | | | | | -75.69 | -78.23 |
| | | NR_FDD_FR1_E<br>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 $N_{oc}$ 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.

#### A.4.7.2.2.3 Test Requirements

The SS-RSRQ measurement accuracy shall fulfil the requirements in clause 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) | | | | | | |
| $N_{oc}$ 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_F | | | | -113.5 | |
| | | NR_FDD_FR1_G | | | | -113 | |
| | | NR_FDD_FR1_H | | | | -112.5 | |
| $N_{oc}$ 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_F | | | | -110.5 | |
| | | NR_FDD_FR1_G | | | | -110 | |
| | | NR_FDD_FR1_H | | | | -109.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | 0 | -3.19 | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 4.54 | 2.66 | -4 | -4 |
| SS-RSRP Note3 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A | 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_F | | | | -117.5 | -117.5 |
| | | 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_F | | | | -114.5 | -114.5 |
| | | 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_F | | | | | |
| | | NR_FDD_FR1_G | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | NR_FDD_FR1_H | | | |
| Io[Note3] | 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_F | | | -83.01 |
| | | 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_F | | | -76.91 |
| | | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-SINR, SS-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: SS-SINR, SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 5: NR operating band groups are as defined in Clause 3.5.2.<br>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 | | | | | |
| 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 | | | | | |
| | 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) | | | | | | |
| $N_{oc}$ 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_F | | | | -117 |
| | | NR_FDD_FR1_G | | | | -116.5 |
| | | NR_FDD_FR1_H | | | | -116 |
| $N_{oc}$ 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_F | | | | -114 |
| | | NR_FDD_FR1_G | | | | -114.5 |
| | | NR_FDD_FR1_H | | | | -113 |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | 20 | -4.0 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | 20 | -4.0 |
| SS-RSRP Note3 | 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_F | | | | -121 |
| | | 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_F | | | | -118 |
| | | 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_F | | | | |
| | | NR_FDD_FR1_G | | | | |
| | | NR_FDD_FR1_H | | | | |
| Io[Note3] | 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_F | | | | -87.59 |
| | | 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_F | | | | -81.5 |
| | | 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 $N_{oc}$ 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>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 SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ Note2 — NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1~6 | dBm/15kHz | -94.65 | -117 |
| $N_{oc}$ Note2 — NR_FDD_FR1_B | | | | -116.5 |
| $N_{oc}$ Note2 — 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_F | | | | -114.5 |
| | NR_FDD_FR1_G | | | | -114 |
| | NR_FDD_FR1_H | | | | -113.5 |
| $N_{oc}$ 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_F | | | | -114.5 |
| | 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_F | | | | -111.5 |
| | NR_FDD_FR1_G | | | | -111 |
| | NR_FDD_FR1_H | | | | -110.5 |
| $\hat{E}_s/I_{ot}$ | | 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_F | | | | -117.5 |
| | 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_F | | | | -114.5 |
| | 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_F | | | | -84.78 |
| | 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_F | | | | -78.69 |
| | NR_FDD_FR1_G | | | | -78.19 |
| | NR_FDD_FR1_H | | | | -77.69 |
| $\hat{E}_s/N_{oc}$ | | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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#0 and 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 |
| $BW_{channel}$ | | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 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<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>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 SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ 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_F | | | | -114.5 |
| | NR_FDD_FR1_G | | | | -114 |
| | NR_FDD_FR1_H | | | | -113.5 |
| $N_{oc}$ 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_F | | | | -114.5 |
| | 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_F | | | | -111.5 |
| | NR_FDD_FR1_G | | | | -111 |
| | NR_FDD_FR1_H | | | | -110.5 |
| $\hat{E}_s/I_{ot}$ | | 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_F | | | | -117.5 |
| | 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_F | | | | -114.5 |
| | 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_F | | | | -84.78 |
| | 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_F | | | | -78.69 |
| | NR_FDD_FR1_G | | | | -78.19 |
| | NR_FDD_FR1_H | | | | -77.69 |
| $\hat{E}_s/N_{oc}$ | | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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#0 and 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 |
| $BW_{channel}$ | | 1,4 | MHz | 10: $N_{RB,c}$ = 52 |
| | | 2,5 | | 10: $N_{RB,c}$ = 52 |
| | | 3,6 | | 40: $N_{RB,c}$ = 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 SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| $N_{oc}$ 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 | | | |
| $N_{oc}$ 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 | | | |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | -3 |
| $\hat{E}_s/N_{oc}$ | | 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 $N_{oc}$ 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**

| 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.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.4.7.6 CLI measurements

### A.4.7.6.1 EN-DC SRS-RSRP measurement accuracy with FR1 serving cell

#### A.4.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.1.1 with the testing configurations for NR cells in Table A.4.7.6.1.1-1.

**Table A.4.7.6.1.1-1: Applicable NR configurations for FR1 SRS-RSRP accuracy test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 30kHz SRS 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.4.7.6.1.2 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.4.7.6.1.2-1 below. The test parameter for the (virtual) neighbor cell UE transmitting SRS are given in Table A.4.7.6.1.2-2.

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table A.4.7.6.1.2-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 1 data symbol before SRS to be transmitted.

**Table A.4.7.6.1.2-1: FR1 test parameters for SRS-RSRP accuracy for PSCell**

| Parameter | | Config | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|---|
| SSB GSCN | | 1~4 | | freq1 | freq1 | freq1 |
| Duplex mode | | 1~4 | | TDD | TDD | TDD |
| TDD configuration | | 1,3 | | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 |
| | | 2,4 | | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 |
| $BW_{channel}$ | | 1,3 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | | 2,4 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | | 1,3 | | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD |
| | | 2,4 | | SR.2.1 TDD | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | | 1,3 | | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD |
| | | 2,4 | | CR.2.1 TDD | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | | 1,3 | | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD |
| | | 2,4 | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| SSB configuration | | 1,3 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
| | | 2,4 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 |
| OCNG Patterns | | 1~4 | | OP.1 | OP.1 | OP.1 |
| TRS configuration | | 1,3 | | TRS.1.1 TDD | TRS.1.1 TDD | TRS.1.1 TDD |
| | | 2,4 | | TRS.1.2 TDD | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP Configuration | | 1~4 | | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 | DLBWP.0.1 ULBWP.0.1 |
| Dedicated BWP configuration | | 1~4 | | DLBWP.1.1 ULBWP.1.1 | DLBWP.1.1 ULBWP.1.1 | DLBWP.1.1 ULBWP.1.1 |
| SMTC configuration | | 1~4 | | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and SRS from test system | | 1~4 | μs | 17.67 | 17.67 | 17.67 |
| EPRE ratio of PSS to SSS | | 1~4 | dB | 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 SSS Note 1 | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| $N_{oc}$ Note2 | NR_TDD_FR1_A Note3 | 1,3 | dBm/15kHz | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A Note3 | 2,4 | | Not applicable Note4 | -91 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| $N_{oc}$ Note2 | NR_TDD_FR1_A Note3 | 1,3 | dBm/SRS SCS | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A Note3 | 2,4 | | Not applicable Note4 | -88 | -111 |
| | NR_TDD_FR1_C | | | | | -110 |
| | NR_TDD_FR1_D | | | | | -109.5 |
| | NR_TDD_FR1_E | | | | | -109 |

Note 1: OCNG shall be used such that 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 $N_{oc}$ to be fulfilled.

Note 3: 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

Note 4: Test 1 is not used when testing with 30kHz SSB SCS

**Table A.4.7.6.1.2-2: FR1 test parameters for SRS-RSRP accuracy for neighbour cell UE**

| Parameter | | Config | Unit | Test 1 | Test 2 | Test 3 |
|---|---|---|---|---|---|---|
| $N_{oc}$ Note2 | NR_TDD_FR1_A NOTE 3 | 1,3 | dBm/15kHz | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | | Not applicable Note 6 | -91 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| $N_{oc}$ Note2 | NR_TDD_FR1_A NOTE 5 | 1,3 | dBm/SRS SCS | -106 | -88 | -114 |
| | NR_TDD_FR1_C | | | | | -113 |
| | NR_TDD_FR1_D | | | | | -112.5 |
| | NR_TDD_FR1_E | | | | | -112 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | | Not applicable Note 6 | -88 | -111 |
| | NR_TDD_FR1_C | | | | | -110 |
| | NR_TDD_FR1_D | | | | | -109.5 |
| | NR_TDD_FR1_E | | | | | -109 |
| $\hat{E}_s/I_{ot}$ on SRS | | 1~4 | dB | 1 | 1 | 1 |
| SRS RSRP Note3 | NR_TDD_FR1_A NOTE 5 | 1,3 | dBm/SRS SCS | -105 | -87 | -113 |
| | NR_TDD_FR1_C | | | | | -112 |
| | NR_TDD_FR1_D | | | | | -111.5 |
| | NR_TDD_FR1_E | | | | | -111 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | | Not applicable Note 6 | -87 | -110 |
| | NR_TDD_FR1_C | | | | | -109 |
| | NR_TDD_FR1_D | | | | | -108.5 |
| | NR_TDD_FR1_E | | | | | -108 |
| Io Note3 | NR_TDD_FR1_A NOTE 5 | 1,3 | dBm/9.36 MHz | -74.51 | -56.51 | -82.51 |
| | NR_TDD_FR1_C | | | | | -81.51 |
| | NR_TDD_FR1_D | | | | | -81.01 |
| | NR_TDD_FR1_E | | | | | -79.51 |
| | NR_TDD_FR1_A NOTE 5 | 2,4 | dBm/38.16 MHz | Not applicable Note 6 | -53.42 | -76.42 |
| | NR_TDD_FR1_C | | | | | -75.42 |
| | NR_TDD_FR1_D | | | | | -74.92 |
| | NR_TDD_FR1_E | | | | | -74.42 |
| $\hat{E}_s/N_{oc}$ on SRS | | 1~4 | dB | 1 | 1 | 1 |
| Propagation condition | | 1~4 | | AWGN | AWGN | AWGN |
| Antenna configuration | | 1~4 | | 1x2 | 1x2 | 1x2 |
| SRS configuration | | 1,3 | | SRSConf.1 | SRSConf.1 | SRSConf.1 |
| | | 2,4 | | SRSConf.2 | SRSConf.2 | SRSConf.2 |

| | |
|---|---|
| Note 1: | The resources for uplink transmission are assigned to the UE prior to the start of the test. |
| 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 $N_{oc}$ 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 |
| Note 6: | Test 1 is not used when testing with 30kHz SSB SCS |

**Table A.4.7.6.1.2-3: SRS configuration parameters for FR1 SRS-RSRP accuracy**

| | Field | SRSConf.1 | SRSConf.2 |
|---|---|---|---|
| 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 | 12 | 12 |
| | freqHopping b-SRS | 0 | 0 |
| | freqHopping b-hop | 0 | 0 |
| | groupOrSequenceHopping | Neither | Neither |
| | resourceType | Periodic | Periodic |
| | periodicityAndOffset-p | sl20, 9 | sl40, 19 |
| | sequenceId | 0 | 0 |

#### A.4.7.6.1.3 Test Requirements

The SRS-RSRP measurement accuracy shall fulfil the requirements in clauses 10.1.22.1.1.

### A.4.7.6.2 EN-DC CLI-RSSI measurement accuracy with FR1 serving cell

#### A.4.7.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.2.1 with the testing configurations for NR cells in Table A.4.7.6.2.1-1.

**Table A.4.7.6.2.1-1: Applicable NR configurations for FR1 CLI-RSSI accuracy test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 2 | LTE FDD, NR 30kHz SRS SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | LTE TDD, NR 15 kHz SRS SCS, 10 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 30kHz SRS 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.4.7.6.2.2 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.4.7.6.2.2-1 below.

Before the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 1 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.4.7.6.2.2-2.

**Table A.4.7.6.2.2-1: FR1 test parameters for CLI-RSSI accuracy**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1~4 | | TDD |
| TDD configuration | 1,3 | | TDDConf.1.1 |
| | 2,4 | | TDDConf.2.1 |
| $BW_{channel}$ | 1,3 | MHz | 10: $N_{RB,c}$ = 52 |
| | 2,4 | | 40: $N_{RB,c}$ = 106 |
| PDSCH Reference measurement channel | 1,3 | | SR.1.1 TDD |
| | 2,4 | | SR.2.1 TDD |
| RMSI CORESET Reference Channel | 1,3 | | CR.1.1 TDD |
| | 2,4 | | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | 1,3 | | CCR.1.1 TDD |
| | 2,4 | | CCR.2.1 TDD |
| SSB configuration | 1,3 | | SSB.1 FR1 |
| | 2,4 | | SSB.2 FR1 |
| OCNG Patterns Note6 | 1~4 | | OP.1 |
| TRS configuration | 1,3 | | TRS.1.1 TDD |
| | 2,4 | | TRS.1.2 TDD |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~4 | | SMTC.1 |
| Time offset between DL from serving cell and OCNG from test system | 1~4 | μs | 17.67 |
| 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 SSS Note 1 | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | |
| $N_{oc}$ on CLI-RSSI measurement resource Note2 | 1,3 | dBm/15kHz | -106 |
| | 2,4 | | -106 |
| $N_{oc}$ on CLI-RSSI measurement resource Note2 | 1,3 | dBm/ BWP SCS | -106 |
| | 2,4 | | -103 |
| $\hat{E}_s/I_{ot}$ on CLI-RSSI measurement resource | 1~4 | dB | -Infinity |
| RSRP on CLI-RSSI measurement resource Note3 | 1~4 | dBm/ BWP SCS | -Infinity |
| Io on CLI-RSSI measurement resource Note3 | 1,3 | dBm/9.36 MHz | -78.05 |

| | | | |
|---|---|---|---|
| | 2,4 | dBm/38.16 MHz | -71.96 |
| Io on CLI-RSSI measurement resource Note3 | 1,3 | dBm/1.08 MHz | -87.43 |
| | 2,4 | | -87.44 |
| $\hat{E}_s/N_{oc}$ on CLI-RSSI measurement resource | 1~4 | dB | -Infinity |
| Propagation condition | 1~4 | | AWGN |
| Antenna configuration | 1~4 | | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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<br>Note 6: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | |

**Table A.4.7.6.2.2-2: CLI-RSSI measurement resource configuration for FR1 CLI-RSSI accuracy**

| | Field | Config | SRSConf.1 |
|---|---|---|---|
| CLI-RSSI measurement resource | rssi-ResourceId | 1~4 | 0 |
| | rssi-SCS | 1,3 | 15kHz |
| | | 2,4 | 30kHz |
| | startPRB | 1~4 | 0 |
| | nrofPRBs | 1,3 | 52 |
| | | 2,4 | 106 |
| | startPosition | 1~4 | 3 |
| | nrofSymbols | 1~4 | 11 |
| | rssi-PeriodicityAndOffset | 1,3 | sl20, 9 |
| | | 2,4 | sl40, 19 |

#### A.4.7.6.2.3 Test Requirements

The CLI-RSSI measurement accuracy shall fulfil the requirements in clauses 10.1.22.2.1.

## A.4.7.7 L1-SINR measurement for beam reporting

### A.4.7.7.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

#### A.4.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clauses 9.8.4.1 and clause 10.1.27.1 for FR1 L1-SINR measurements based on CSI-RS with the testing configurations for NR cells in Table A.4.7.7.1.1-1, which configures the measurement resources for the CSI-RS based CMR and no dedicated IMR.

**Table A.4.7.7.1.1-1: Applicable NR configurations for FR1 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| 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.4.7.7.1.2 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.4.7.7.1.2-1 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.4.7.7.1.2-1.

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.4.7.7.1.2-1: FR1 CSI-RS based L1-SINR 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 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.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<br>ULBWP.0.1 | DLBWP.0.1<br>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-r16 | | 1~6 | | cri-SINR-r16 | cri-SINR-r16 |
| nrofReportedRS | | 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 SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ 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_F | | | | -114.5 |
| | NR_FDD_FR1_G | | | | -114 |
| | NR_FDD_FR1_H | | | | -113.5 |
| $N_{oc}$ 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_F | | | | -114.5 |
| | 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_F | | | | -111.5 |
| | NR_FDD_FR1_G | | | | -111 |
| | NR_FDD_FR1_H | | | | -110.5 |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | 10 | -3 |
| 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_F | | | | -117.5 |
| | 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_F | | | | -114.5 |
| | 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_F | | | | -84.78 |
| | 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_F | | | | -78.69 |
| | NR_FDD_FR1_G | | | | -78.19 |
| | NR_FDD_FR1_H | | | | -77.69 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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.4.7.7.1.3 Test Requirements

The L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.27.1.

### A.4.7.7.2 L1-SINR measurement with SSB based CMR and dedicated IMR

#### A.4.7.7.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.8.4.2 and clause 10.1.27.2 for L1-SINR measurements with SSB based CMR and CSI-IM based IMR, with the testing configurations for NR cells in Table A.4.7.7.2.1-1.

**Table A.4.7.7.2.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with SSB based CMR and CSI-IM based IMR**

| 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.4.7.7.2.2 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.4.7.7.2.2-1 below. The absolute accuracy of L1-SINR measurements are tested by using the parameters in Table A.4.7.7.2.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-IM resource set with two CSI-IM resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-IM resources as IMR.

**Table A.4.7.7.2.2-1: FR1 L1-SINR measurement test parameters with SSB based CMR and CSI-IM based IMR**

| 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 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 |
| CSI-IM configuration | 1,4 | | CSI-IM 1.1 FDD | CSI-IM 1.1 FDD |
| | 2,5 | | CSI-IM 1.1 TDD | CSI-IM 1.1 TDD |
| | 3,6 | | CSI-IM 2.1 TDD | CSI-IM 2.1 TDD |
| 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<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 | SMTC.1 |
| reportConfigType | 1~6 | | periodic | periodic |
| reportQuantity-r16 | 1~6 | | ssb-Index-SINR-r16 | ssb-Index-SINR-r16 |
| Number of reported RS | 1~6 | | 2 | 2 |
| L1-SINR 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 SSS Note 1 | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | |
| $N_{oc}$ 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_F | | | | -114.5 |
| | NR_FDD_FR1_G | | | | -114 |
| | NR_FDD_FR1_H | | | | -113.5 |
| $N_{oc}$ 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_F | | | | -114.5 |
| | 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_F | | | | -111.5 |
| | NR_FDD_FR1_G | | | | -111 |
| | NR_FDD_FR1_H | | | | -110.5 |
| $\hat{E}_s/I_{ot}$ | | 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_F | | | | -117.5 |
| | 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_F | | | | -114.5 |
| | 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_F | | | | -84.78 |
| | 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_F | | | | -78.69 |
| | NR_FDD_FR1_G | | | | -78.19 |
| | NR_FDD_FR1_H | | | | -77.69 |
| $\hat{E}_s/N_{oc}$ | | 1~6 | dB | 10 | -3 |
| Propagation condition | | 1~6 | | AWGN | AWGN |
| ntenna 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 $N_{oc}$ 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.4.7.7.2.3 Test Requirements

The L1-SINR measurement accuracy for SSB#0+CSI-IM#0 and SSB#1+CSI-IM#1 of Cell 2 shall fulfil the requirements in clauses 10.1.27.2.

### A.4.7.7.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR

#### A.4.7.7.3.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will partly verify the requirements in Clauses 9.8.4.3 and clause 10.1.27.3 for L1-SINR measurements based on CSI-RS as both CMR and IMR with the testing configurations for NR cells in Table A.4.7.7.3.1-1.

**Table A.4.7.7.3.1-1: Applicable NR configurations for FR1 L1-SINR measurement test with CSI-RS based both CMR based IMR**

| 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.4.7.7.3.2 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.4.7.7.3.2-1 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.4.7.7.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured two CSI-RS resource sets with two CSI-RS resources for each set. 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. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as both CMR and IMR.

**Table A.4.7.7.3.2-1: FR1 L1-SINR measurement test with CSI-RS based both CMR and IMR**

| 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | 10: $N_{RB,c}$ = 52 |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | 40: $N_{RB,c}$ = 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.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<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~6 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>ULBWP.1.1 |
| SMTC configuration | 1~6 | | SMTC.1 | SMTC.1 |
| CSI-RS configuration as CMR | 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 |
| CSI-RS configuration as IMR | 1,4 | | CSI-RS 1.3A FDD | CSI-RS 1.3A FDD |
| | 2,5 | | CSI-RS 1.3A TDD | CSI-RS 1.3A TDD |
| | 3,6 | | CSI-RS 2.3A TDD | CSI-RS 2.3A TDD |
| reportConfigType | 1~6 | | periodic | periodic |
| reportQuantity-r16 | 1~6 | | cri-SINR-r16 | cri-SINR-r16 |
| nrofReportedRS | 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 SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |

| | | | | | |
|---|---|---|---|---|---|
| $N_{oc}$ 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_F | | | | -114.5 |
| | NR_FDD_FR1_G | | | | -114 |
| | NR_FDD_FR1_H | | | | -113.5 |
| $N_{oc}$ 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_F | | | | -114.5 |
| | 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_F | | | | -111.5 |
| | NR_FDD_FR1_G | | | | -111 |
| | NR_FDD_FR1_H | | | | -110.5 |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | 10 | 0 |
| CSI-RS RSRP Note3 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 1,2,4,5 | dBm/CSI-RS SCS | -84.65 | -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_F | | | | -114.5 |
| | NR_FDD_FR1_G | | | | -114 |
| | NR_FDD_FR1_H | | | | -113.5 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5 | 3,6 | | -81.65 | -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_F | | | | -111.5 |

| | | | | | |
|---|---|---|---|---|---|
| | NR_FDD_FR1_G | | | | -111 |
| | NR_FDD_FR1_H | | | | -110.5 |
| 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_F | | | | -84.78 |
| | 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_F | | | | -78.69 |
| | NR_FDD_FR1_G | | | | -78.19 |
| | NR_FDD_FR1_H | | | | -77.69 |
| $\hat{E}_s/N_{oc}$ | | 1~6 | dB | 10 | 0 |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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.4.7.7.3.3 Test Requirements

The L1-SINR measurement accuracy for CSI-RS#0+CSI-RS#2 and CSI-RS#1+CSI-RS#3 of Cell 2 shall fulfil the requirements in clauses 10.1.27.3.

## A.4.7.8 CSI-RSRP

### A.4.7.8.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.4.7.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.2.3.1 and 10.1.2.3.2 for intra-frequency CSI-RS based L3 measurements.

#### A.4.7.8.1.2 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.4.7.8.1.2-1. Both absolute and relative accuracy of CSI-RSRP intra-frequency measurements are tested by using the parameters in A.4.7.8.1.2-2. 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.4.7.8.1.2-1: CSI-RSRP Intra frequency CSI-RSRP supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB and 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 for each supported band | |

**Table A.4.7.8.1.2-2: CSI-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 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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 |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | | | |
| Time offset with Cell 2 | Config 1,2,4,5 | µs | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 3,6 | µs | - | 2.35 | - | 2.35 | - | 2.35 |
| 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<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ 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_F | | | | | | -111.5 | |
| | | 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 applicable Note 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_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| $N_{oc}$ 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 applicable Note 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_F | | | | | | -108.5 | |
| | | NR_FDD_FR1_G | | | | | | -108 | |
| | | NR_FDD_FR1_H | | | | | | -107.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | 2.46 | -5.97 | 2.46 | -5.97 | -0.01 | -4.76 |
| $\hat{E}_s/N_{oc}$ | | | dB | 6 | 1 | 6 | 1 | 3 | 0 |
| CSI-RSRP Note3 | 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_F | | | | | | -108.50 | -111.50 |
| | | 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 applicable Note 5 | Not applicable Note 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_F | | | | | | -105.50 | -108.50 |
| | | NR_FDD_FR1_G | | | | | | -105.00 | -108.00 |
| | | NR_FDD_FR1_H | | | | | | -104.50 | -107.50 |
| Io Note3 | 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_F | | | | | | -77.53 | |
| | | 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 applicable Note 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_F | | | | | | -71.44 | |
| | | 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 $N_{oc}$ to be fulfilled. |
| Note 3: | CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | CSI-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.4.7.8.1.3 Test Requirements

The CSI-RSRP measurement accuracy for cell 2 and cell 3 shall fulfill absolute requirement in clause 10.1.2.3.1 and relative requirement in clause 10.1.2.3.2.

### A.4.7.8.2 EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.4.7.8.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.4.3.1 and 10.1.4.3.2 for inter-frequency measurements with the testing configurations in Table A.4.7.8.2.1-1.

**Table A.4.7.8.2.1-1: Applicable NR configurations for FR1 inter-frequency CSI-RSRP accuracy test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and 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 on each supported band | |

#### A.4.7.8.2.2 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.4.7.8.2.2-1 below. Both absolute and relative accuracy of CSI-RSRP inter-frequency measurements are tested by using the parameters in Table A.4.7.8.2.2-1. The inter-frequency measurements are supported by a measurement gap.

**Table A.4.7.8.2.2-1: CSI-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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 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 | |
| CSI-RS configuration for RRM | 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | |
| | 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | |
| | 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | |
| 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 | 1,2,4,5 | µs | - | 4.7 | - | 4.7 |
| | 3,6 | µs | - | 2.35 | - | 2.35 |
| SMTC configuration | 1,4 | | SMTC.2 | | SMTC.2 | |
| | 2,3,5,6 | | SMTC.1 | | SMTC.1 | |
| EPRE ratio of PSS to SSS | | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| EPRE ratio of PDCCH to PDCCH DMRS | | 1~6 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PDSCH DMRS to SSS | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | | | | | | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | | |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1~6 | dBm/15 kHz | -94.65 | | ( $N_{oc}$ 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 |
| | NF_FDD_FR1_F | | | | | | -112.5 |
| | NR_FDD_FR1_G | | | | | | -112 |
| | NR_FDD_FR1_H | | | | | | -111.5 |
| $N_{oc}$ Note2 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, | 1,2,4,5 | dBm/SS B SCS | -94.65 | | ( $N_{oc}$ 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_F | | | | | | -112.5 |
| | NR_FDD_FR1_G | | | | | | -112 |
| | NR_FDD_FR1_H | | | | | | -111.5 |
| | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 5, NR_SDL_FR1_A | 3,6 | | -91.65 | | ( $N_{oc}$ for C 3 +8dB) | -112.00 |
| | NR_FDD_FR1_B | | | | | | -112.50 |
| | NR_TDD_FR1_C | | | | | | -112.00 |
| | NR_FDD_FR1_D, NR_TDD_FR1_D | | | | | | -111.50 |
| | NR_FDD_FR1_E, NR_TDD_FR1_E | | | | | | -111.00 |
| | NR_FDD_FR1_F | | | | | | -110.50 |
| | NR_FDD_FR1_G | | | | | | -110.00 |
| | NR_FDD_FR1_H | | | | | | -110.50 |
| $\hat{E}_s/I_{ot}$ | | 1~6 | dB | 10 | 10 | 13 | -3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CSI-RSRP Note3 | 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_F | | | | | -115.50 |
| | 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_F | | | | | -112.50 |
| | NR_FDD_FR1_G | | | | | -112.00 |
| | NR_FDD_FR1_H | | | | | -111.50 |
| Io Note3 | 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_F | | | | | -82.78 |
| | 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_F | | | | | -76.69 |
| | NR_FDD_FR1_G | | | | | -76.19 |
| | NR_FDD_FR1_H | | | | | -75.69 |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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.4.7.8.2.3 Test Requirements

The CSI-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the Absolute requirement in clause 10.1.4.2.1 and Relative requirement in clause 10.1.4.2.2.

## A.4.7.9 CSI-RSRQ

### A.4.7.9.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.4.7.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.7.

#### A.4.7.9.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.9.1.2-1. The absolute accuracy of CSI-RSRQ intra-frequency measurement is test by using the parameters in Table A.4.7.9.1.2-2. 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.4.7.9.1.2-1: CSI-RSRQ Intra frequency CSI-RSRQ supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB and CSI-RS 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.4.7.9.1.2-2: CSI-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 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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 | | 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 | |
| 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 | | | | | |
| Time offset with Cell 2 | Config 1,2,4,5 | µs | - | 4.7 | - | 4.7 | - | 4.7 |
| | Config 3,6 | µs | - | 2.35 | - | 2.35 | - | 2.35 |
| 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 | | | | | |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2, 5 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3, 6 | | CSI-RS.RRM.FR1.2 TDD | | | | | |
| 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) | | | | | | | | | |
| $N_{oc}$ 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_F | | | | | | -111.5 | |
| | | 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_F | | | | | | -111.5 | |
| | | NR_FDD_FR1_G | | | | | | -111 | |
| | | NR_FDD_FR1_H | | | | | | -110.5 | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A NOTE 7 | dBm/SCS | -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_F | | | | | | -111.5 | |
| | | 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_F | | | | | | -108.5 | |
| | | NR_FDD_FR1_G | | | | | | -108 | |
| | | NR_FDD_FR1_H | | | | | | -107.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.76 | | -4.7 | | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 3 | 3 | -2.9 | -2.9 | -4 | -4 |
| CSI-RSRP Note3 | 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_F | | | | | | -115.5 | -115.5 |
| | | 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_F | | | | | | -112.5 | -112.5 |
| | | NR_FDD_FR1_G | | | | | | -112 | -112 |
| | | NR_FDD_FR1_H | | | | | | -111.5 | -111.5 |
| CSI-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_F | | | | | | | |
| | | NR_FDD_FR1_G | | | | | | | |
| | | NR_FDD_FR1_H | | | | | | | |
| Io Note3 | 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_F | | | | | | -81 | |
| | | 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/ 38.16M Hz | -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_F | | | | | | -74.9 | |
| | | 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 $N_{oc}$ to be fulfilled. |
| Note 3: | CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | CSI-RSRQ, CSI-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 and CSI-RS 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.4.7.9.1.3 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in clause 10.1.7.

### A.4.7.9.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.4.7.9.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-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.4.7.9.2.2 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.4.7.9.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test parameters in Table A.4.7.9.2.2-2. 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.4.7.9.2.2-1: CSI-RSRQ Inter frequency CSI-RSRQ supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30kHz SSB and 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 | |

**Table A.4.7.9.2.2-2: CSI-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 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| BWP BW | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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 | |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| OCNG Patterns | | | | OCNG pattern 1 | | | | | |
| Time offset with Cell 2 | | Config 1,2,4,5 | µs | - | 4.7 | - | 4.7 | - | 4.7 |
| | | Config 3,6 | µs | - | 2.35 | - | 2.35 | - | 2.35 |
| 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 | | 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) | | | | | | | | | |
| $N_{oc}$ Note2 | Config 1,2,4,5 | NR_FDD_FR1_A NR_TDD_FR1_A NR_SDL_FR1_A | dBm/15 kHz | -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/15 kHz | -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 |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | -1.75 | -1.75 | -1.75 | 3 | -1.75 |
| CSI-RSRP Note3 | 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 |
| CSI-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 | | | | | | | |
| Io Note3 | 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 $N_{oc}$ to be fulfilled.
Note 3: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-RSRQ, CSI-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.4.7.9.2.3 Test Requirements

The CSI-RSRQ measurement accuracy shall fulfil the requirements in section 10.1.9.

### A.4.7.10 CSI-SINR

#### A.4.7.10.1 EN-DC Intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell

##### A.4.7.10.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.12.

#### A.4.7.10.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.4.7.10.1.2-1. The absolute accuracy of CSI-SINR intra-frequency measurement is tested by using the parameters in Table A.4.7.10.1.2-2. 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. CSI-RS for mobility configured for Cell 2 is associated to the SSB of Cell 2, and CSI-RS for mobility configured for Cell 3 is associated to the SSB of Cell 3.

**Table A.4.7.10.1.2-1: CSI-SINR Intra frequency CSI-SINR supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and 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 | |

**Table A.4.7.10.1.2-2: CSI-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 | | | |
| | Config 2, 5 | | TRS.1.1 TDD | | | |
| | Config 3, 6 | | 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 | | SR.2.1 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 1,2,4,5 | μs | 2.35 | 2.35 | 2.35 | 2.35 |
| | Config 3.6 | μs | 1.17 | 1.17 | 1.17 | 1.17 |
| 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 | | | |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | |
| | Config 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | |
| | Config 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | |
| 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) | | | | | | |
| $N_{oc}$ 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_F | | | | -113.5 | |
| | | NR_FDD_FR1_G | | | | -113 | |
| | | NR_FDD_FR1_H | | | | -112.5 | |
| $N_{oc}$ 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_F | | | | -110.5 | |
| | | NR_FDD_FR1_G | | | | -110 | |
| | | NR_FDD_FR1_H | | | | -109.5 | |
| $\hat{E}_s/I_{ot}$ | | | dB | 0 | -3.19 | -5.46 | -5.46 |
| $\hat{E}_s/N_{oc}$ | | | dB | 4.54 | 2.66 | -4 | -4 |
| CSI-RSRP Note3 | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A | 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_F | | | | -117.5 | -117.5 |
| | | 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_F | | | | -114.5 | -114.5 |
| | | NR_FDD_FR1_G | | | | -114 | -114 |
| | | NR_FDD_FR1_H | | | | -113.5 | -113.5 |
| CSI-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_F | | | | | |
| | | NR_FDD_FR1_G | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | NR_FDD_FR1_H | | | |
| Io[Note3] | Config 1,2,4,5 | NR_FDD_FR1_A, NR_TDD_FR1_A [NOTE 6] | dBm / 9.36 MHz | -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_F | | | -83.01 |
| | | 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_F | | | -76.91 |
| | | 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 $N_{oc}$ to be fulfilled.
Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-SINR, CSI-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.4.7.10.1.3 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.12.

### A.4.7.10.2 EN-DC Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell

#### A.4.7.10.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.14.2.1 and 10.1.14.2.2 for inter-frequency measurement.

### A.4.7.10.2.2 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.4.7.10.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-SINR inter-frequency measurement are tested by using test parameters in Table A.4.7.10.2.2-2. 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. CSI-RS for mobility configured for Cell 2 is associated to the SSB of Cell 2, and CSI-RS for mobility configured for Cell 3 is associated to the SSB of Cell 3.

**Table A.4.7.10.2.2-1: CSI-SINR Inter frequency CSI-SINR supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB and CSI-RS SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB and CSI-RS SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB and 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 | |

**Table A.4.7.10.2.2-1: CSI-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 | | | | | |
| TRS configuration | Config 1, 4 | | TRS.1.1 FDD | | | | | |
| | Config 2, 5 | | TRS.1.1 TDD | | | | | |
| | Config 3, 6 | | 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 | | | | | |
| Time offset with Cell 2 | Config 1,2,4,5 | μs | - | 2.35 | - | 2.35 | - | 2.35 |
| | Config 3,6 | μs | - | 1.17 | - | 1.17 | - | 1.17 |
| 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 | | | | | |
| CSI-RS configuration for RRM | Config 1,4 | | CSI-RS.RRM.FR1.1 FDD | | | | | |
| | Config 2,5 | | CSI-RS.RRM.FR1.1 TDD | | | | | |
| | Config 3,6 | | CSI-RS.RRM.FR1.2 TDD | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 | | | | | |
| | Config 3,6 | | 30 | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH<br>EPRE ratio of OCNG DMRS to SSS(Note 1)<br>EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $N_{oc}$ 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_F | | | | | | -117 | |
| | | NR_FDD_FR1_G | | | | | | -116.5 | |
| | | NR_FDD_FR1_H | | | | | | -116 | |
| $N_{oc}$ 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_F | | | | | | -114 | |
| | | NR_FDD_FR1_G | | | | | | -114.5 | |
| | | NR_FDD_FR1_H | | | | | | -113 | |
| $\hat{E}_s/I_{ot}$ | | | dB | -1.75 | | 20 | | -4.0 | |
| $\hat{E}_s/N_{oc}$ | | | dB | -1.75 | | 20 | | -4.0 | |
| CSI-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_F | | | | | | -121 | |
| | | 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_F | | | | | | -118 | |
| | | NR_FDD_FR1_G | | | | | | -117.5 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | NR_FDD_FR1_H | | | | -117 |
| CSI-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_F | | | | |
| | | NR_FDD_FR1_G | | | | |
| | | NR_FDD_FR1_H | | | | |
| Io Note3 | 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_F | | | | -87.59 |
| | | 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_F | | | | -81.5 |
| | | 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 $N_{oc}$ to be fulfilled.
Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-SINR, CSI-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.4.7.10.2.3 Test Requirements

The CSI-SINR measurement accuracy shall fulfil the requirements in clause 10.1.14.2.1 and 10.1.14.2.2.

## A.4.8 Void

# 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 4-step RA type c ontention 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 | |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 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 |
| 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 +$\Delta_{UL}$ | As defined in TS 38.331 [2]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ($P_{CMAX,f,c}$) | | 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 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ 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 $\Delta_{UL}$ 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 $\Delta_{DL}$ 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 beams Note 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 | |
| | $Es/Iot_{BB}$ | 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 | |
| | $Es/Iot_{BB}$ | 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.<br>Note 2: Void.<br>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 5 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 4-step RA type 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 | |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 24 | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern Note 1 | | | OCNG pattern 1 | OCNG pattern 1 | 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 |
| 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 +$\Delta_{UL}$ | +20 +$\Delta_{UL}$ | As defined in TS 38.331 [2]. $\Delta_{UL}$ is derived from the uplink calibration process Note 3 |
| Configured UE transmitted power ($P_{CMAX, f, c}$) | | 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 +$\Delta_{DL}$ | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ 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 $\Delta_{UL}$ value is calculated as -ROUND($P_{PRACH0}$ -1), where $P_{PRACH0}$ 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 $\Delta_{DL}$ 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 beams Note 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 | |
| | $Es/Iot_{BB}$ | 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 | |
| | $Es/Iot_{BB}$ | 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 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.5.3.2.2.2.2.2 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 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.5.3.2.2.2.2.3 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 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) 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 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.5.3.2.2.2.2.4 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 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.5.3.2.2.3 2-step RA type contention based random access test in FR2 for PSCell/SCell in EN-DC

###### A.5.3.2.2.3.1 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 MsgA power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.3 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.5.3.2.2.3.1-1. UE capable of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.3.1-2 and Table A.5.3.2.2.3.1-3.

**Table A.5.3.2.2.3.1-1: Supported test configurations for 2-step RA type 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.5.3.2.2.3.1-2: General test parameters for 2-step RA type 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 |
| Duplex Mode for Cell 2 | Config 1,2 | | TDD | |
| TDD Configuration | Config 1,2 | | TDDConf.3.1 | |
| $BW_{channel}$ | 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 |
| 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 ($P_{\mathrm{CMAX,\,f,\,c}}$) | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19] |
| MsgA Configuration | | | FR2 MsgA configuration 1 | As defined in A.3.20.3.1, with exceptions as defined below. |
| *msgA-RSRP-ThresholdSSB* | | dBm | RSRP_69 +ΔDL | RSRP_69 corresponds to -88dBm. ΔDL is derived from the downlink calibration process Note 4 |
| msgA-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 $\Delta_{UL}$ value is calculated as -ROUND(PMsgA0 -1), where PMsgA0 is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-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 MsgA.

Note 4: The $\Delta_{DL}$ 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.5.3.2.2.3.1-3: OTA-related test parameters for 2-step RA type 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 beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured *msgA-RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | 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 *msgA-RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | dB | 6.69 | |
| | Io | dBm/95.04 MHz | -70.41 | Io in symbols containing SSB index 1 |
| Propagation Condition | | - | AWGN | |
| Note 1: No artificial noise is applied in this test.<br>Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

### A.5.3.2.2.3.2 Test Requirements

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

#### A.5.3.2.2.3.2.1 MsgA Transmission

To test the UE behaviour specified in Clause 6.2.2.3.1.1 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 *msgA-RSRP-ThresholdSSB*.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA preamble transmission 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where $\mu$ indicates the MsgA PUSCH numerology. 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 MsgA PRACH and MsgA PUSCH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.3.2.2 MsgB Reception

To test the UE behaviour specified in Clause 6.2.2.3.1.2 the System Simulator shall transmit a MsgB with successRAR 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 2 preambles, the System Simulator shall transmit a MsgB *not* corresponding to the transmitted Random Access Preamble.

The UE may stop monitoring for MsgB(s) and shall transmit an ACK if the MsgB with a successRAR contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble and if the Contention Resolution is successful.

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

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA preamble transmission 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where $\mu$ indicates the MsgA PUSCH numerology. 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 MsgA transmissions shall be within the accuracy specified in Clause 7.1.2.

###### A.5.3.2.2.3.2.3 No MsgB Reception

To test the UE behaviour specified in clause 6.2.2.3.1.3 the System Simulator shall transmit a MsgB with successRAR 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 5.1.2a in TS38.321 [7], and transmit with the calculated MsgA PRACH and MsgA PUSCH transmission power when the backoff time expires if no MsgB is received within the RA Response window.

In addition, the power applied to all MsgA transmissions shall be in accordance with what is specified in Clause 6.2.2.3. The power of the first MsgA preamble transmission 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where $\mu$ indicates the MsgA PUSCH numerology. 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 MsgA PRACH and MsgA PUSCH transmissions shall be within the accuracy specified in Clause 7.1.2.

#### A.5.3.2.2.4 2-step RA type non-contention based random access test in FR2 for PSCell/SCell in EN-DC

##### A.5.3.2.2.4.1 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 MsgA power settings and timing are within specified limits. This test will verify the requirements in clause 6.2.2.3 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.5.3.2.2.4.1-1. UE capable of EN-DC with PSCell or SCell in FR2 needs to be tested by using the parameters in Table A.5.3.2.2.4.1-2 and Table A.5.3.2.2.4.1-3 for SSB-based non-contention based random access test.

**Table A.5.3.2.2.4.1-1: Supported test configurations for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Config | Description |
|---|---|
| 1 | 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.5.3.2.2.4.1-2: General test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| SSB Configuration | Config 1 | | SSB.1 FR2 | As defined in A.3.10 |
| Duplex Mode for Cell 2 | Config 1 | | TDD | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 24 | |
| OCNG Pattern [Note 1] | | | OCNG pattern 1 | As defined in A.3.2.1. |
| PDSCH Reference Channel [Note 2] | Config 1 | | SR3.1 TDD | As defined in A.3.1.1. |
| RMSI CORESET Reference Channel | Config 1 | | CR.3.1 TDD | As defined in A.3.1.2 |
| 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 +$\Delta_{UL}$ | As defined in TS 38.331 [2]. $\Delta_{UL}$ is derived from the uplink calibration process [Note 3] |
| Configured UE transmitted power ($P_{CMAX, f, c}$) | | dBm | maximum value configurable for certain power class | As defined in clause 6.2.4 in TS 38.101-2 [19] |
| MsgA Configuration | | | FR2 MsgA configuration 2 | As defined in A.3.20.3.2, with exceptions as defined below |
| msgA-*RSRP-ThresholdSSB* | | dBm | RSRP_69 +$\Delta_{DL}$ | RSRP_69 corresponds to -88dBm. $\Delta_{DL}$ 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 $\Delta_{UL}$ value is calculated as -ROUND($P_{MsgA0}$ -1), where $P_{MsgA0}$ is the measured first MsgA PRACH power with -80.6dBm/SCS applied, *msgA-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 MsgA.

Note 4: The $\Delta_{DL}$ 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.5.3.2.2.4.1-3: OTA-related test parameters for non-contention based random access test in FR2 for PSCell/SCell in EN-DC**

| Parameter | | Unit | Test-1 | Comments |
|---|---|---|---|---|
| AoA setup | | | Setup 1 | As defined in A.3.15.1 |
| Assumption for UE beams Note 2 | | | Rough | |
| SSB with index 0 | Es Note1 | dBm/SCS | -80.6 | Power of SSB with index 0 is set to be above configured msgA-*RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -80.6 | |
| | $Es/Iot_{BB}$ | 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 msgA-*RSRP-ThresholdSSB* |
| | SSB_RP | dBm/SCS | -95.0 | |
| | $Es/Iot_{BB}$ | 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.<br>Note 2: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

### A.5.3.2.2.4.2 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.5.3.2.2.4.2.1 MsgA Transmission

To test the UE behavior specified in Clause 6.2.2.3.2.1, with the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs configured, the System Simulator shall receive the MsgA with a preamble which belongs to one of the Random Access Preambles associated with the SSB with index 0.

In addition, the System Simulator shall receive the MsgA PRACH 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 occasions permitted by the restrictions given first by the *msgA-SSB-SharedRO-MaskIndex* if configured, or next by the *ra-ssb-OccasionMaskIndex* if configured.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.3. 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where $\mu$ indicates the MsgA PUSCH numerology. 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.5.3.2.2.4.2.3 MsgB Reception

To test the UE behavior specified in Clause 6.2.2.3.2.2 the System Simulator shall transmit a MsgB containing a fallbackRAR MAC subPDU.

The UE shall fallback to the 4-step RA type by transmitting the msg3 containing the payload of MsgA PUSCH and monitoring contention resolution as described in clause 8.2A in TS 38.213 [3].

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.3. 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where $\mu$ indicates the MsgA PUSCH numerology. 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 MsgA and msg3 transmissions shall be within the accuracy specified in Clause 7.1.2.

###### A.5.3.2.2.4.2.4 No MsgB Reception

To test the UE behavior specified in clause 6.2.2.3.2.3 the System Simulator shall transmit a MsgB containing a successRAR message and 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 5.1.2a in TS 38.321 [7], and transmit with the calculated MsgA transmission power when the backoff time expires if no MsgB is received within the MsgB Response window.

In addition, the power applied to all preambles shall be in accordance with what is specified in Clause 6.2.2.3. 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 power of the first MsgA PUSCH transmission shall be $0.6 + 3(\mu + 2)$ dBm with an accuracy specified in clause 6.3.4.2 of TS 38.101-2 [19], where $\mu$ indicates the MsgA PUSCH numerology. 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 | | |
| $BW_{channel}$ | MHz | 1,2 | 100: $N_{RB,c}$ = 66 | | |
| Data RBs allocated | | 1,2 | 66 | | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | | |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>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.8[Note5] | |
| 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 | O P. 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.1[Note6] | SRSConf.2[Note6] | |
| 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.<br>Note 2: Void<br>Note 3: VoidNote 4: Void<br>Note 5: DRx related parameters are given in Table A.3.3.8-1<br>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 beams Note 6 | | Fine | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -100 | |
| $\hat{E}_s/N_{oc}$ | dB | 4 | |
| SSB_RP Note2 | dBm/SCS Note4 | -99 | |
| $\hat{E}_s/I_{ot}$ | dB | 4 | |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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 $N_{RB,c}$ |
| | 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 $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$ of the first detected path of DL SSB.

   a. The $N_{TA}$ offset value (in $T_c$ units) is 13792

   b. The $T_e$ 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 | $+8*64T_c$ | $+4*64T_c$ |

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 ($N_{TA}$ + $N_{TA\_offset}$) $\times T_c \pm T_e$ 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 ($N_{TA}$ + $N_{TA\_offset}$) $\times T_c \pm T_e$ 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<br>Cell 2: 2 | 1 for E-UTRAN PCell<br>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 ($T_A$) value during T1 | | 31 | $N_{TA\_new} = N_{TA\_old}$ for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command ($T_A$) value during T2 | | 39 | *For 120 kHz SCS* $N_{TA\_new} = N_{TA\_old} + 1024*T_c$ (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 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | 100: $N_{RB,c}$ = 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 beams Note 6 | | Fine | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -103 | |
| $\hat{E}_s/N_{oc}$ | dB | 4 | |
| SS-RSRP Note2 | dBm/SCS Note4 | -99 | |
| $\hat{E}_s/I_{ot}$ | dB | 4 | |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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. 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 |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 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 |
| CORESET Reference Channel | Config 1, 2 | | CR.3.1 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.3.8.3.4 |
| 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 |
| 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 beams[Note 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 | 2[Note 6] | -6[Note 6] | -15 | | | |
| ssb-Index 1 SNR | Config 1, 2 | | Not sent | | | 2[Note 6] | -15 | -15 |
| $N_{oc}$ | 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.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>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.<br>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<br>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). | |

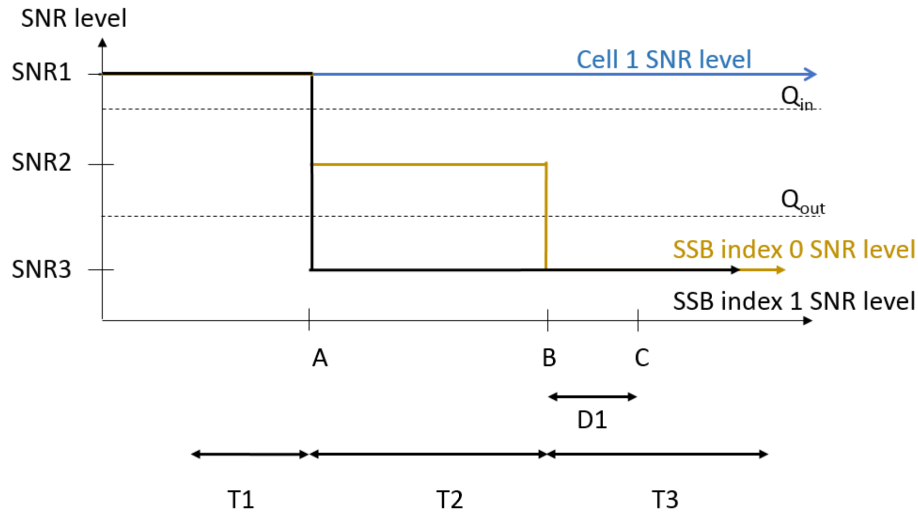


**Figure A.5.5.1.1.1-1: SNR variation for out-of-sync testing**

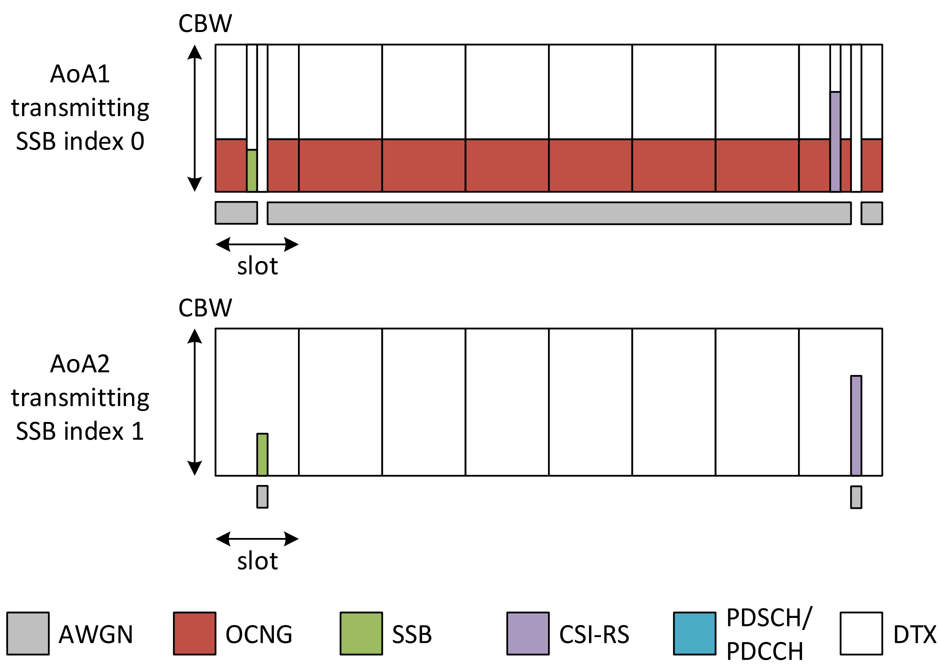


**Figure A.5.5.1.1.1-2: Time multiplexed downlink transmissions**

### 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 |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 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 |
| CORESET Reference Channel | Config 1, 2 | | CR.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.3.8.3.4 |

| | | | | |
|---|---|---|---|---|
| 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 |
| 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 beams Note 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 | 2 Note 6 | -6 Note 6 | -15 | -4.5 | 2 Note 6 | | | | | |
| ssb-Index 1 SNR | Config 1, 2 | | Not sent | | | | | 2 Note 6 | -15 | -15 | -15 | -15 |
| $N_{oc}$ | 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**

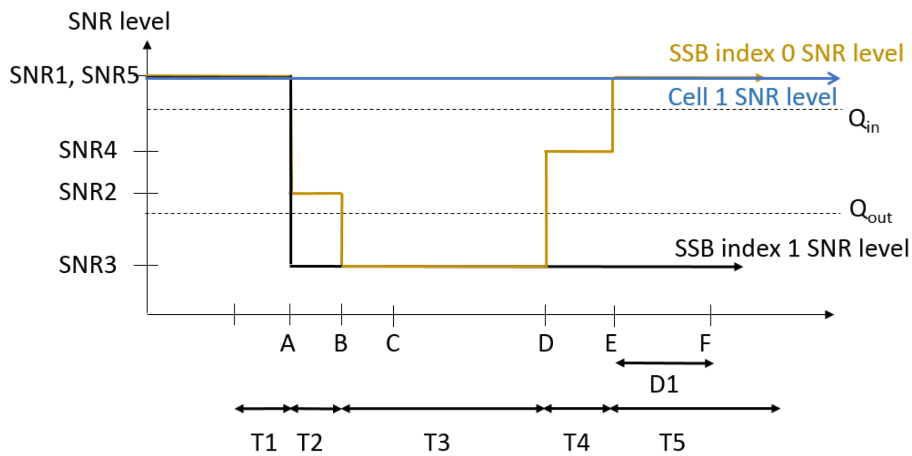


**Figure A.5.5.1.2.1-1: SNR variation for in-sync testing**

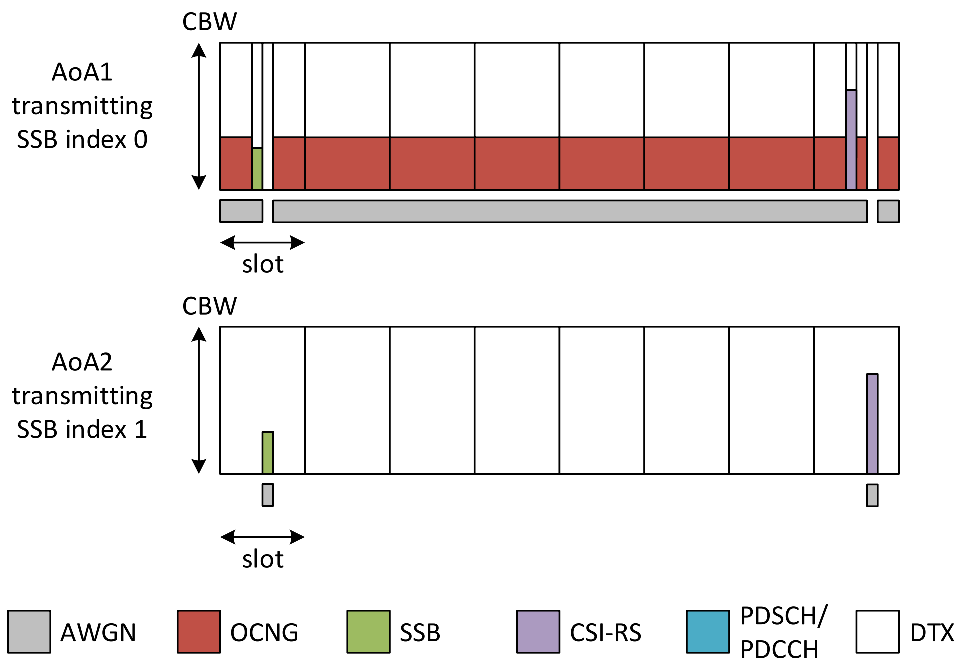


**Figure A.5.5.1.2.1-2: Time multiplexed downlink transmissions**

### 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 |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 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 |
| CORESET Reference Channel | Config 1, 2 | | CR.3.1 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.3.8.3.4 |
| 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 |
| 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 beams Note 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 | 2 Note 6 | -6 Note 6 | -15 |
| ssb-Index 1 SNR | Config 1, 2 | | 2 Note 6 | -15 | -15 |
| $N_{oc}$ | 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.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>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.<br>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<br>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**

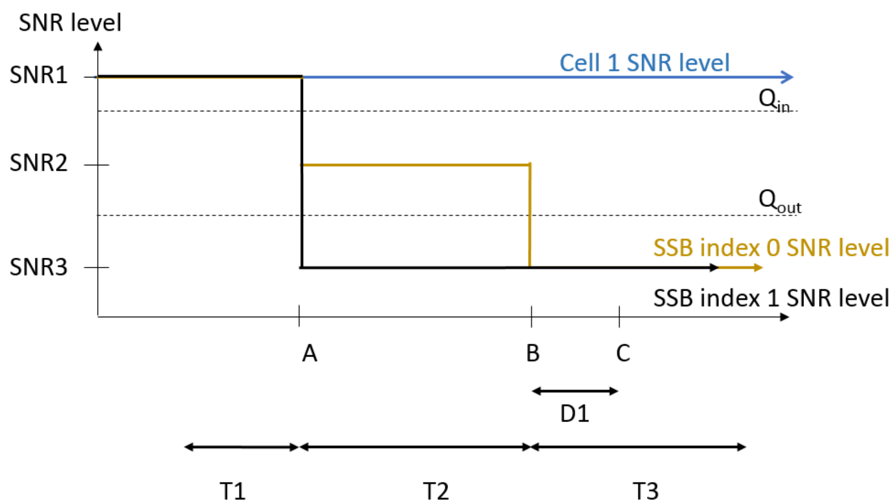


**Figure A.5.5.1.3.1-1: SNR variation for out-of-sync testing**

#### 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 |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 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 |
| CORESET Reference Channel | Config 1, 2 | | CR.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.3.8.3.4 |
| 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 |
| 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.<br>Note 2: UE-specific PDCCH is not transmitted after T1 starts.<br>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 beams[Note 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 | 2[Note 6] | -6[Note 6] | -15 | -4.5 | 2[Note 6] |
| ssb-Index 1 SNR | Config 1, 2 | | 2[Note 6] | -15 | -15 | -15 | -15 |
| $N_{oc}$ | 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.<br>Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.3<br>Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.<br>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.<br>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<br>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**

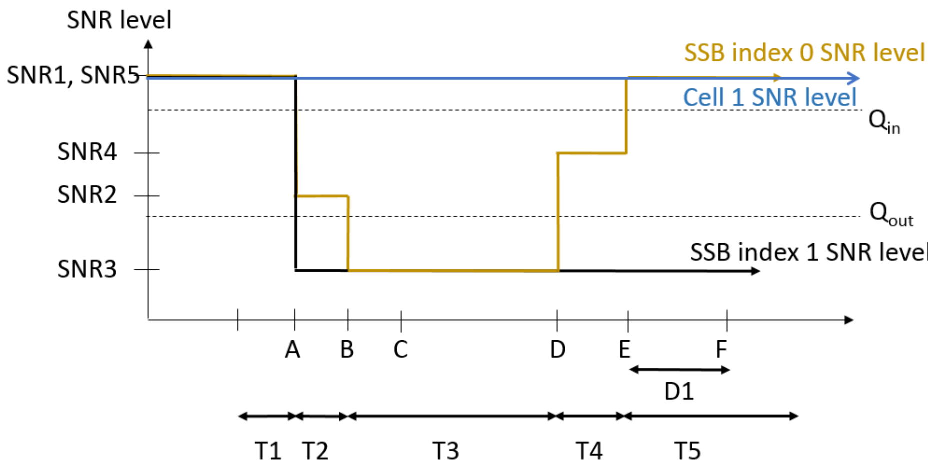


**Figure A.5.5.1.4.1-1: SNR variation for in-sync testing.**

#### 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 |
| 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 |
| RMC CORESET Reference Channel | Config 1 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| | Config 2 | | CCR.3.1 TDD<br>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<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | TCI.State.3 |
| OCNG parameters | | | OP.2 |
| 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 |
| 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.<br>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 beams[Note 10] | | | Rough | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | | dB | 4 | | | Not sent | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | |
| SNR on RLM-RS1 | Config 1, 2 | dB | 2[Note 11] | -6[Note 11] | -15 | | | |
| SNR on RLM-RS2 | Config 1, 2 | | Not sent | | | 2[Note 11] | -14 | -15 |
| $N_{oc}$ | 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**

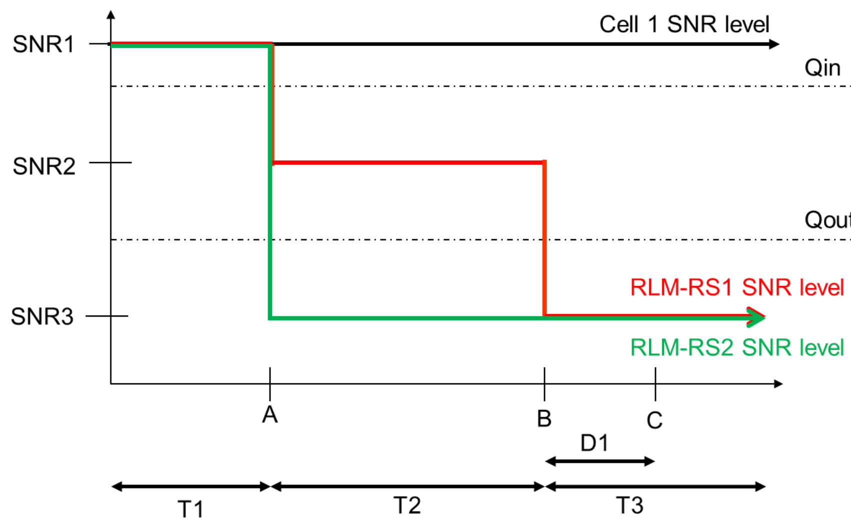


**Figure A.5.5.1.5.1-1: SNR variation for CSI-RS out-of-sync testing**

#### 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 ($D_1$ 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 |
| 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 |
| RMC CORESET Reference Channel | Config 1 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| | Config 2 | | CCR.3.1 TDD<br>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<br>Resource #4 in TRS.2.2 TDD |
| OCNG parameters | | | OP.2 |
| TRS configuration | | | TRS.2.1 TDD<br>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 |
| 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.<br>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 beams[Note 10] | | | Rough | | | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | | dB | 0 | | | | | Not sent | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | | | | | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | | | | | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | | | | | | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | | | | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | | | | | | |
| SNR on RLM-RS1 | Config 1, 2 | dB | 2[Note 11] | -6[Note 11] | -15 | -4.5 | 2[Note 11] | | | | | |
| SNR on RLM-RS2 | Config 1, 2 | | Not sent | | | | | 2[Note 11] | -14 | -15 | -15 | -14 |
| $N_{oc}$ | 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**

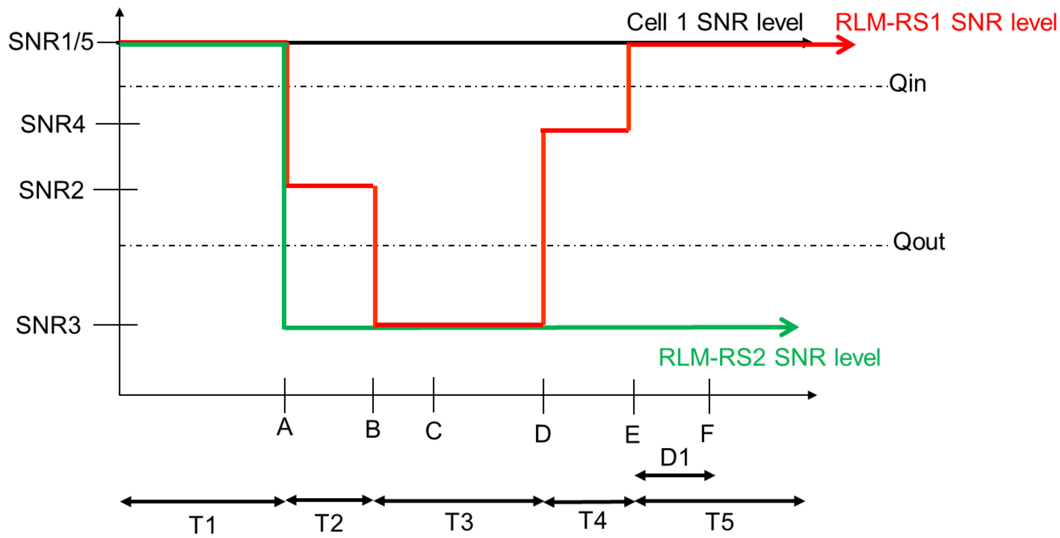


**Figure A.5.5.1.6.1-1: SNR variation for CSI-RS in-sync testing**

#### 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 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.5.5.1.7.1-1, 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.

**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 |
| RMC CORESET Reference Channel | Config 1 | | CCR. 3.1 TDD<br>CCR.3.3 TDD |
| | Config 2 | | CCR. 3.1 TDD<br>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<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>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 |
| 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.<br>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 beams[Note 10] | | | Rough | | |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | |
| SNR on RLM-RS1 | Config 1, 2 | dB | 2[Note 11] | -6[Note 11] | -15 |
| SNR on RLM-RS2 | Config 1, 2 | | 2[Note 11] | -14 | -15 |
| $N_{oc}$ | Config 1 | dBm/15KHz | -104.7 | | |
| | Config 2 | | -104.7 | | |
| Propagation condition | | | DL-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**

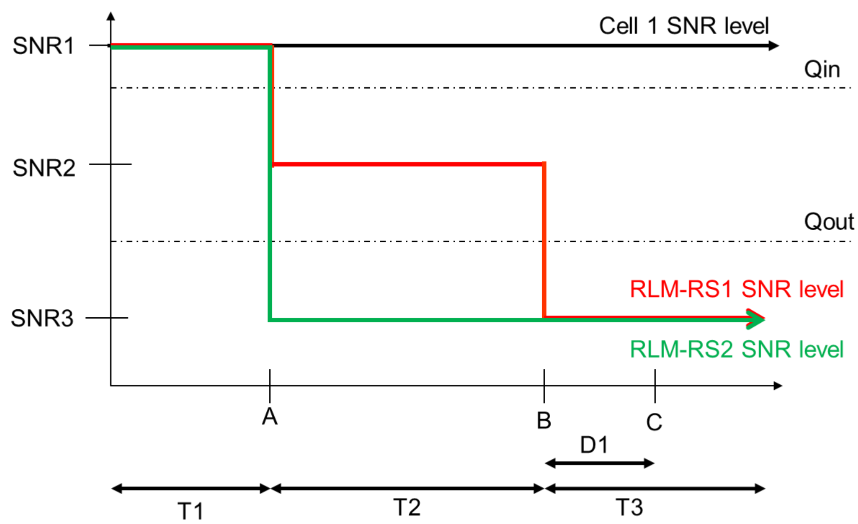


**Figure A.5.5.1.7.1-1: SNR variation for CSI-RS out-of-sync testing**

#### 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 ($D_1$ 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 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.5.5.1.8.1-1, 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 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.5.5.1.8.1-1: 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 |
| RMCCORESET Reference Channel | Config 1 | | CCR.3.1 TDD<br>CCR.3.3 TDD |
| | Config 2 | | CCR.3.1 TDD<br>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<br>Resource #4 in TRS.2.2 TDD |
| TRS configuration | | | TRS.2.1 TDD<br>TRS.2.2 TDD |
| TCI configuration for PDCCH#1/PDSCH | | | TCI.State.2 |
| TCI configuration for PDCCH#2 | | | CI.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 | DCI format | | 1-0 |

| | | | |
|---|---|---|---|
| parameters | 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* |
| v | | | |
| 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 |
| 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.<br>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 beams[Note 10] | | | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSSPDCCH_beta | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRSPDCCH_DMRS_beta | | dB | | | | | |
| EPRE ratio of PBCH DMRS to SSSPBCH_beta | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRSPSS_beta | | dB | | | | | |
| EPRE ratio of PSS to SSSSSS_beta | | dB | | | | | |
| EPRE ratio of PDSCH DMRS to SSS PDSCH_beta | | dB | | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB | | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB | | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB | | | | | |
| SNR on RLM-RS1 | Config 1, 2 | dB | 2[Note 11] | -6[Note 11] | -15 | -4.5 | 2[Note 11] |
| SNR on RLM-RS2 | Config 1, 2 | dB | 2[Note 11] | -14 | -15 | -15 | -14 |
| $N_{oc}$ | 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**

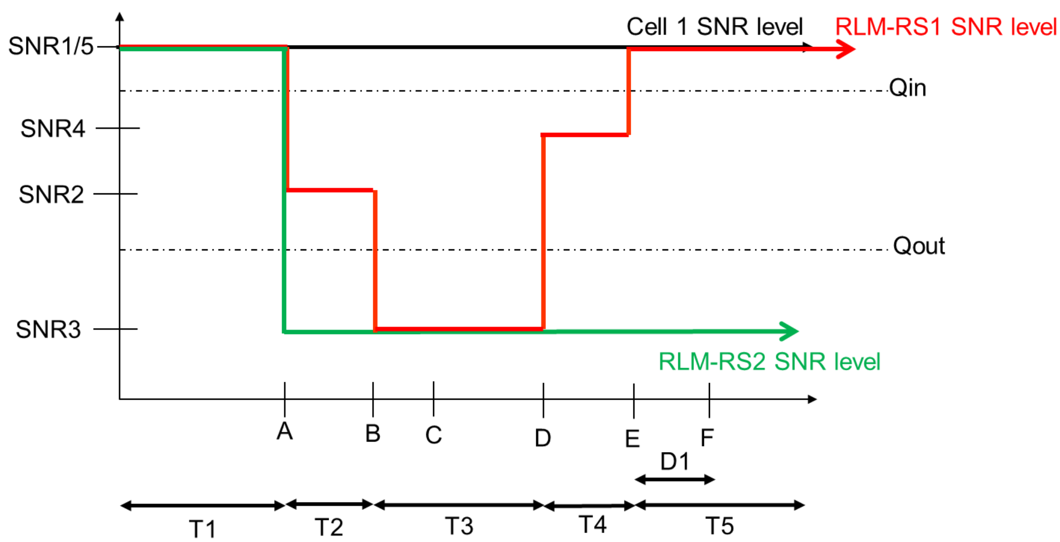


**Figure A.5.5.1.8.1-1: SNR variation for CSI-RS in-sync testing**

### 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 beams Note 1 | | | Rough | Rough |
| TDD configuration | | 1, 2 | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1, 2 | 100: $N_{RB,c}$ = 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 |
| $N_{oc}$ | dBm/15kHz | 1, 2 | -92.1 | -92.1 |
| $N_{oc}$ Note2 | dBm/SCS | 1, 2 | -84.9 | Not sent |
| $\hat{E}_s/N_{oc}$ | dB | 1, 2 | 3 | N/A |
| $\hat{E}_s/I_{ot_{BB}}$ 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 $N_{oc}$ 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 $Es/Iot_{BB}$ 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 $\Delta MB_S$ from TS 38.101-2 [19] Table 6.2.1.3-4.

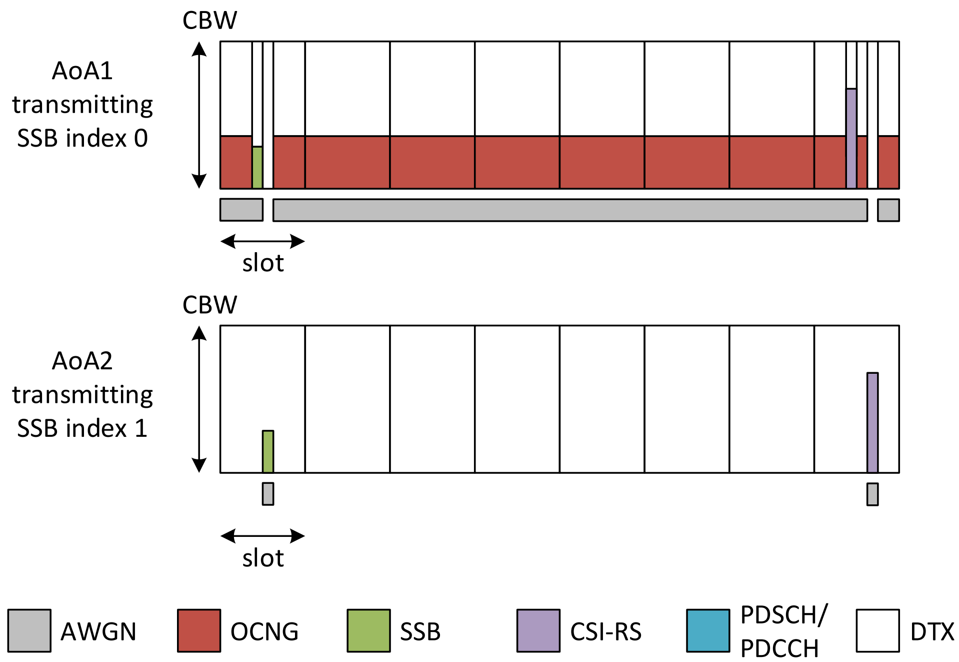


**Figure A.5.5.1.9.1-1: Time multiplexed downlink transmissions**

#### 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 | 10 | |

**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 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 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) | | | |
| $\hat{E}_s/N_{oc}$ | | 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 beams Note 6 | | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| SSB_RP Note2 | dBm/SCS Note4 | -85.97 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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 | 10 | |

**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 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 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) | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Propagation Condition | | | AWGN |
| Time offset to cell1 Note 2 | | ms | 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.<br>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 beams Note 6 | | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| SS B_RP Note2 | dBm/SCS Note4 | -85.97 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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 and 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 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| SCell measurement cycle (measCycleSCell) | Ms | 640 | |
| T1 | S | 10 | |

**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 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 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 cell1 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 beams Note 6 | | | Fine | Rough |
| $N_{oc}$ 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 | | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS Note3 | -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_RP Note2 | 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 | | | |
| $\hat{E}_s/I_{ot}$ | 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 | | | |
| $\hat{E}_s/N_{oc}$ | 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 | | | |
| Io Note2 | 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 $N_{oc}$ 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**

| $\mu$ | 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**

| $\mu$ | 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 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.5.5.2.4.1-1: 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, 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 | |
| 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 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 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 | | ms | 3 | 3 |
| Time offset to cell1 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 beams Note 6 | | | Fine | Rough |
| $N_{oc}$ 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 | | | |
| $N_{oc}$ Note1 | NR_TDD_FR2_A | dBm/SCS Note3 | -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_RP Note2 | 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 | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 12 | 5 |
| $\hat{E}_s/N_{oc}$ | | dB | 12 | 5 |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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**

| $\mu$ | 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**

| $\mu$ | 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 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 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 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.<br>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 beams Note 6 | | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| SSB_RP Note2 | dBm/SCS Note4 | -85.97 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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**

| $\mu$ | 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 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 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 | | ms | 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.<br>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 beams Note 6 | | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| SSB_RP Note2 | dBm/SCS Note4 | -85.97 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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.5.5.2.6.2 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**

| $\mu$ | 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.5.5.2.7 E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching

#### A.5.5.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS on a PUSCH-less carrier of SCell, the UE can perform carrier based switching to one PUSCH-less SCCs from a CC with PUSCH. The test will verify the interruption requirements on active serving cell in SCG in clause 8.2.1.2.13. Supported test configurations are shown in table A.5.5.2.7.1-1.

In the test there are three cells: cell1, cell2 and cell3. Cell1 is E-UTRAN PCell on the primary component carrier. Cell3 is E-UTRAN SCell on the TDD secondary component carrier which operates in downlink without PUCCH/PUSCH. Cell2 is NR FR2 PSCell. The UE is configured with the SRS switching between E-UTRAN PCell and E-UTRAN SCell. The general test parameters and NR cell specific test parameters are given in Table A.5.5.2.8.1-2, A.5.5.2.8.1-3. And the E-UTRAN cell specific test parameters (for cell1 and cell3) can refer to Table A.3.7.2.1-1. The test consists of two successive time periods, with duration of T1 and T2, respectively. During T1 LTE PCell and NR PSCell are continuously scheduled in DL. Immediately at the beginning of T2, a PDCCH with SRS-TPC-RNTI is sent to the UE to initiate SRS switching.

**Table A.5.5.2.7.1-1: E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching supported test configurations**

| Config | Description |
|---|---|
| 1 | LTE FDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth,TDD duplex mode |
| 2 | LTE TDD(cell1), LTE TDD (cell3), 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.5.5.2.7.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| 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. |
| Active PSCell | | Cell2 | PSCell on NR RF channel number 2. |
| Activated SCell | | Cell3 | SCell on E-UTRAN RF channel number 3. |
| CP length | | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 0.2 | |
| T2 | s | 0.2 | UE shall perform SRS switching during T2 |

**Table A.5.5.2.7.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | Config 1,2 | | TDD |
| TDD configuration | Config 1,2 | | TDDConf.3.1 |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 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.1 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) | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 |
| Propagation Condition | | | AWGN |
| Time offset to cell1 Note 2 | | ms | 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.<br>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.5.5.2.7.1-4: 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 beams Note 6 | | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -102.97 |
| $\hat{E}_s/N_{oc}$ | dB | 17 |
| SS-RSRP Note2 | dBm/SCS Note4 | -85.97 |
| $\hat{E}_s/I_{ot}$ | dB | 17 |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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.5.5.2.7.1-5: Sounding Reference Symbol Configuration for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

| Field | Value | Comment |
|---|---|---|
| srsBandwidthConfiguration | bw5 | |
| srsSubframeConfiguration | Sc8 | Once every 5 subframes |
| ackNackSrsSimultaneousTransmission | FALSE | |
| srsMaxUpPTS | N/A | Not applicable for E-UTRAN FDD |
| srsBandwidth | 0 | No hopping |
| srsHoppingBandwidth | hbw0 | |
| frequencyDomainPosition | 0 | |
| Duration | TRUE | Indefinite duration |
| Srs-ConfigurationIndex | 47 | SRS periodicity of 40ms. |
| transmissionComb | 0 | |
| cyclicShift | cs0 | No cyclic shift |
| SRS-AntennaPort | an1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 36.331. | | |

### A.5.5.2.7.2 Test Requirements

The UE shall be continuously scheduled in NR FR2 PSCell throughout the test. During T2 two interruption time periods are allowed on Cell2 and Cell1, each interruption due to SRS carrier based switching on Cell2 shall not exceed X defined in Table A.5.5.2.7.2-1.

**Table A.5.5.2.7.2-1: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching**

| $\mu$ | NR Slot length (ms) | Interruption length X (slots) |
|---|---|---|
| 2 | 0.25 | 5 |
| 3 | 0.125 | 9 |

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

## A.5.5.2.8 E-UTRAN – NR FR2 interruptions at NR SRS carrier based switching

### A.5.5.2.8.1 Test Purpose and Environment

The purpose of the test is to verify interruptions at NR SRS carrier based switching requirements defined in TS38.133 clause 8.2.1.2.12 and TS36.133 clause 7.32.2.13. The general test parameters are given in Table A.5.5.2.8.1-2, and NR cell specific test parameters are given in Table A.5.5.2.8.1-3. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1.

In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 is NR FR2 PSCell and Cell3 is NR FR2 SCell. Cell3 is not configured with PUCCH/PUSCH transmission. The test consists of two time periods, with duration of T1 and T2, respectively. During T1 and T2, Cell1, Cell2 and Cell3 are continuously scheduled in DL. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR SCell.

At the beginning of T2, TE shall trigger aperiodic SRS transmission on Cell3.

**Table A.5.5.2.8.1-1: 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.5.5.2.8.1-2: 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. |
| Configured SCell | | Cell3 | SCell on NR RF channel number 3. |
| CP length | | Normal | Applicable to cell1 and cell 2 |
| DRX | | OFF | |
| Measurement gap pattern Id | | OFF | |
| T1 | s | 5 | |
| T2 | s | 0.1 | |

**Table A.5.5.2.8.1-3: 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 | Cell 3 |
|---|---|---|---|---|
| Frequency Range | | | FR2 | |
| Duplex mode | Config 1,2 | | TDD | |
| TDD configuration | Config 1,2 | | TDDConf.3.1 | |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 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 | |
| SRS configuration | Config 1,2 | | SRS.3 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.1 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) | | | | |
| $\hat{E}_s/N_{oc}$ | | dB | 17 | |
| Propagation Condition | | | AWGN | |
| Time offset to cell1 Note 2 | | µs | 33 | |
| 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.<br>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.5.5.2.8.1-3A: 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 beams Note 6 | | Fine | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -103 | |
| $\hat{E}_s/N_{oc}$ | dB | 4 | |
| SS-RSRP Note2 | dBm/SCS Note4 | -99 | |
| $\hat{E}_s/I_{ot}$ | dB | 4 | |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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.5.5.2.8.1-4: Void**

#### A.5.5.2.8.3 Test Requirements

In T2 UE shall transmit SRS on Cell3 as requested. During T2 interruption on Cell2 due to SRS carrier based switching from Cell2 to Cell3 shall not exceed the requirements defined in TS38.133 clause 8.2.1.2.12. Interruption on Cell1 due to SRS carrier based switching from Cell2 to Cell3 shall not exceed the requirements defined in TS36.133 clause 7.32.2.13.
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.<br>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**

| Parameter[Note 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 |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 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 | |
| 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 SSS Note 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.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>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**

| Parameter[Note 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 beams[Note 7] | | Rough | | | Rough | | |
| $N_{oc}$ Note1 | dBm/15kHz[Note4] | -104.7 | | | -104.7 | | |
| $N_{oc}$ Note1 | dBm/SCS[Note 3] | -95.7 | | | -95.7 | | |
| $\hat{E}_s/N_{oc}$ | dB | 7 | | | 7 | | |
| SSB_RP[Note2] | dBm/SCS Note4 | -88.7 | | | -88.7 | | |
| $\hat{E}_s/I_{ot}$ | dB | 7 | | | 7 | | |
| Io[Note2] | 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 $N_{oc}$ 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, with the following exceptions:

- Placement of interruptions is only verified in NR PSCell.

### 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<br>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<br>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<br>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<br>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<br>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<br>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 | | |
| $BW_{channel}$ | Config 1,4 | MHz | 100: $N_{RB,c}$ = 66 | | | 10: $N_{RB,c}$ = 52 | | |
| | Config 2,5 | | | | | 10: $N_{RB,c}$ = 52 | | |
| | Config 3,6 | | | | | 40: $N_{RB,c}$ = 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 | | |
| CSI-RS configuration for CSI reporting | Config 1,4 | | CSI-RS.3.1 TDD | | | 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 | 120kHz | | | 15kHz | | |
| | Config 3,6 | | | | | 30kHz | | |
| reportConfigType | Config 1-6 | | periodic | | | N/A | | |
| reportQuantity | Config 1-6 | | cri-RI-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<br>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.<br>Note 2: Void<br>Note 3: Void<br>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<br>Link only, see clause A.3.7A | | |
| Assumption for UE beams[Note 7] | | | Rough | | | | | |
| $N_{oc}$ [Note1] | | dBm/15kHz | -104.7 | | | | | |
| $N_{oc}$ [Note1] | Config 1,2,4,5 | dBm/SCS | -95.7 | | | | | |
| | Config 3,6 | | | | | | | |
| SSB_RP[Note2] | Config 1,2,4,5 | dBm/SCS [Note3] | -88.7 | | | | | |
| | Config 3,6 | | | | | | | |
| $\hat{E}_s/N_{oc}$ | Config 1,2,3,4,5,6 | dB | 7 | | | | | |
| $\hat{E}_s/I_{ot}$ | | dB | 7 | | | | | |
| Io[Note2] | Config 1,2,4,5 | dBm/ChBw[Note4,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 $N_{oc}$ 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 94.04 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.

### 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+$T_{L1\text{-}RSRP}$. In the next DL slot after slot m+$T_{L1\text{-}RSRP}$, 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<br>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<br>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<br>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<br>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<br>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<br>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.<br>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 | | | | | |
| $BW_{channel}$ | Config 1,4 | MHz | 10: $N_{RB,c}$ = 52 | | | 100: $N_{RB,c}$ = 66 | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 106 | | | | | |
| Data RBs allocated | Config 1,4 | | 52 | | | 66 | | |
| | Config 2,5 | | 52 | | | | | |
| | Config 3,6 | | 106 | | | | | |
| BWP BW | Config 1,4 | | 10: $N_{RB,c}$ = 52 | | | 100: $N_{RB,c}$ = 66 | | |
| | Config 2,5 | | 10: $N_{RB,c}$ = 52 | | | | | |
| | Config 3,6 | | 40: $N_{RB,c}$ = 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 | | | | | |
| CSI-RS configuration | Config 1~6 | | NA | | | NA | CSI-RS.3.1 TDD Note 5 | |
| CSI reporting periodicity Note 6 | Config 1~6 | ms | NA | | | 5 | | |
| 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 | | | | | |
| 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+$T_{L1\text{-}RSRP}$ 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 beams Note 7 | | | NA | | | Rough | | |
| $N_{oc}$ Note1 | | dBm/15kHz | Link only, see clause A.3.7A | | | -104.7 | | |
| $N_{oc}$ Note1 | Config 1,2,4,5 | dBm/SCS | | | | -95.7 | | |
| | Config 3,6 | | | | | | | |
| SSB_RP Note2 | Config 1,2,4,5 | dBm/SCS Note3 | | | | -∞ | -88.7 | -88.7 |
| | Config 3,6 | | | | | | | |
| $\hat{E}_s/N_{oc}$ | Config 1,2,3,4,5,6 | dB | | | | -∞ | 7 | 7 |
| $\hat{E}_s/I_{ot}$ | | dB | | | | -∞ | 7 | 7 |
| Io Note2, 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 $N_{oc}$ 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+$T_{L1\text{-}RSRP}$), where $T_{L1\text{-}RSRP}$ is no larger than

$$3\text{ms} + T_{FirstSSB\_MAX} + 15*T_{SMTC\_MAX} + 8*T_{rs} + T_{L1\text{-}RSRP,\ measure} + T_{L1\text{-}RSRP,\ report}$$

as defined in clause 8.3.2. For this test case, $T_{FirstSSB\_MAX}$=$T_{SMTC\_MAX}$=$T_{rs}$=20ms; $T_{L1\text{-}RSRP,\ measure}$=480ms and $T_{L1\text{-}RSRP,\ measure}$=5ms, which allows $T_{L1\text{-}RSRP}$ 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 $m + \frac{T_{HARQ}+T_{activtion\_time}+T_{CSI\_Reporting}}{NR\ slot\ length}$, where

- $T_{HARQ}$ is defined in Table A.5.5.3.1.1-2

- $T_{activation\_time}$ = 3ms + $T_{FirstSSB\_MAX}$ + 15*$T_{SMTC\_MAX}$ + 8*$T_{rs}$ + $T_{L1\text{-}RSRP, measure}$ + $T_{L1\text{-}RSRP, report}$ + max {($T_{HARQ}$ + $T_{uncertainty\_MAC}$ + 5ms + $T_{FineTiming}$), ($T_{uncertainty\_RRC}$ + $T_{RRC\_delay}$)}, which allows 1030ms

- $T_{CSI\_Reporting}$ = 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 $\text{n} + \frac{\text{T}_{\text{HARQ}}+3\text{ms}}{NR\ slot\ length}$, as defined in clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$ to $m + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{NR slot length}}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m_1 + 1 + \frac{T_{\text{HARQ}}}{\text{EUTRA slot length}}$ to subframe $m_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}+T_{\text{X}}}{\text{EUTRA slot length}}$, as defined in clause 8.3, where $T_X$ =20ms, and $\text{m}_1$ and $\text{m}_2$ 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 $\text{n} + 1 + \frac{\text{T}_{\text{HARQ}}}{NR\ slot\ length}$ to $\text{n} + 1 + \frac{\text{T}_{\text{HARQ}}+3\text{ms}}{NR\ slot\ length}$, 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 $n_1 + 1 + \frac{T_{\text{HARQ}}}{EUTRA\ subframe\ length}$ to subframe $\text{n}_2 + 1 + \frac{T_{\text{HARQ}}+3\text{ms}}{EUTRA\ subframe\ length}$, where $\text{n}_1$ and $\text{n}_2$ 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.5.5.3.6 Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2

#### A.5.5.3.6.1 Test Purpose and Environment

The purpose of this test is to verify that the multiple SCell activation and deactivation delay and interruption are within the requirements stated in clause 8.3, when the two SCells to be activated are in FR2 and one SCell is known and the other SCell is unknown by the UE at the time of activation.

The supported test configurations are shown in Table A.5.5.3.6.1-1 below. The general test parameters are given in Table A.5.5.3.6.1-2 and cell-specific test parameters in Table A.5.5.3.6.1-3 below. OTA related test parameters are shown in table A.5.5.3.6.1-4.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are four carriers, one E-UTRA cell, and three NR cells. Before the test starts the UE is connected to Cell 1 (PCell) on the E-UTRA carrier and Cell 2 (PSCell) on the NR carrier in FR1, but is not aware of Cell 3 (SCell1) or Cell 4 (SCell2) on the NR carriers both in FR2. Cell 1, Cell 2 and Cell 3 have constant signal levels throughout the test. 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 Cell 3 (SCell1) and Cell 4 (SCell2) are configured on NR. The test equipment sends a single MAC message for activation of both SCells within 3s for UE power class 2/3/4 or 4s for UE power class 1 after RRM reports is sent for SCell1.

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. In the same MAC PDU, the test equipment activates the TCI state of RMC CORESET. In slot #m, the test equipment also sends an RRC message to configure the CSI-RS resources for SCell1 and SCell2.

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 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.5.5.3.6.1-1: 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 |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.5.5.3.6.1-2: General test parameters**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1,2,3,4 | One E-UTRAN radio channel (1) and three NR radio channels (2,3,4) are used for this test |
| Active PCell | | Cell 1 | Primary cell on E-UTRAN RF channel number 1. As specified in clause A.3.7.2.2 |
| Active PSCell | | Cell 2 | Primary secondary cell on NR RF channel number 2 in FR1. |
| Configured deactivated SCells | | Cell 3, Cell 4 | Configured deactivated secondary cell on NR RF channel number 3 and RF channel number 4, both in FR2 |
| CP length | | Normal | |
| DRX | | OFF | Continuous monitoring of primary cell |
| SCell measurement cycle (measCycleSCell) | ms | 160 | For both Cell 3 and Cell 4 |
| T1 | s | 7 | During this time the PSCell shall be known and the SCells configured, SCell1 detected but SCell2 not 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. |
| $T_{HARQ}$ | ms | $k_1$×NR slot length | $k_1$ 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] |
| k | slot | $k_1 + 3 \cdot N_{\text{slot}}^{\text{subframe},\mu} + 1$ | As specified in clause 4.3 of TS 38.213 [3] |

**Table A. 5.5.3.6.1-3: Cell specific test parameters**

| Parameter | | Unit | Cell 2 | | | Cell 3 | | | Cell 4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| **SSB ARFCN** | | | freq1 | | | freq2 | | | freq3 | | |
| Duplex mode | Config 1,2 | | TDD | | | | | | | | |
| TDD configuration | Config 1,2 | | TDDConf.3.1 | | | | | | | | |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 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 | | | | | | | | |
| Timing offset to Cell 2 | | ms | Not Applicable | | | 0 | | | 0 | | |
| PDSCH Reference measurement channel | Config 1,2 | | SR.3.1 TDD | | | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET Reference Channel | Config 1,2 | | CR.3.1 TDD | | | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC CORESET Reference Channel | Config 1,2 | | CCR.3.1 TDD | | | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| TRS configuration | Config 1,2 | | TRS.2.1 TDD | | | TRS.2.1 TDD | | | TRS.2.1 TDD | | |
| CSI-RS configuration | Config 1,2 | | CSI-RS.3.1 TDD | | | N/A | CSI-RS.3.1 TDD | | N/A | CSI-RS.3.1 TDD | |
| CSI reporting periodicity | Config 1,2 | ms | 5 | | | 5 | | | 5 | | |
| OCNG Patterns | | | OP.1 | | | | | | | | |
| SMTC configuration | | | SMTC.1 | | | | | | | | |
| SSB configuration | Config 1,2 | | SSB.1 FR2 | | | SSB.1 FR2 | | | N/A | SSB.1 FR2 | |
| 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.5.5.3.6.1-4: OTA related test parameters**

| Parameter Note 6 | Unit | Cell 3 | | | Cell 4 | | |
|---|---|---|---|---|---|---|---|
| | | T1 | T2 | T3 | T1 | T2 | T3 |
| Angle of arrival configuration | | Setup 1 according to A.3.15.1 | | | | | |
| Assumption for UE beams Note 7 | | Rough | | | Rough | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -112 | | | -112 | | |
| $N_{oc}$ Note1 | dBm/SCS Note 3 | -102.97 | | | -102.97 | | |
| $\hat{E}_s/N_{oc}$ | dB | 14 | | | N/A | 14 | 14 |
| SS-RSRP Note2 | dBm/SCS Note4 | -88.97 | | | N/A | -88.97 | -88.97 |
| $\hat{E}_s/I_{ot}$ | dB | 14 | | | N/A | 14 | 14 |
| Io Note2 | dBm/95.04 MHz Note4 | -59.81 | | | -73.98 | -59.81 | -59.81 |

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 $N_{oc}$ 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: 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.5.5.3.6.2 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 CSI reports for SCell1 and SCell2 with non-zero CQI index in the configured slots for CSI reporting no later than slot $\mathrm{m} + \frac{\mathrm{T_{HARQ}} + T_{\mathrm{activtion\_time}} + T_{\mathrm{CSI\_Reporting}}}{NR\ slot\ length}$, where

- $T_{HARQ}$ is defined in Table A.5.5.3.Y.1-2

- $T_{activation\_time}$ = 5ms + $T_{FineTiming}$ = 25ms,

- $T_{CSI\_Reporting}$ = 10ms

- NR slot length is 0.125ms.

During T3 the UE shall stop sending CSI reports for both SCells no later than slot $\mathrm{n} + \frac{\mathrm{T_{HARQ}} + 3\mathrm{ms}}{NR\ slot\ length}$, as defined in clause 8.3.

All of the above test requirements shall be fulfilled in order for the observed SCell activation 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 $m + \frac{T_{HARQ}+T_{activtion\_time}+T_{CSI\_Reporting}}{NR\ slot\ length}$ as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

### A.5.5.3.7 Direct SCell activation at SCell addition of known SCell in FR2

#### A.5.5.3.7.1 Test Purpose and Environment

The purpose of this test case is the same as for the test defined in clause A.4.5.3.5 except the SCell is in FR2 intra-band.

The supported test configurations are shown in table A.5.5.3.7.1-1 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.5.5.3.7.1-2 and A.5.5.3.7.1-3 will replace the values of corresponding parameters in Tables A.4.5.3.5.1-2 and A.4.5.3.5.1-3. In this case, OTA related test parameters are shown in table A.5.5.3.7.1-4 below.

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. There are three carriers, each with one cell. Cell 1 operates in either FDD or TDD duplex mode according to test configuration. Cell 2 and Cell 3 operate in TDD duplex mode. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on radio channel 1 (PCC) and Cell 2 (PSCell) on radio channel 2 (PSCC), but is not aware of Cell 3 (SCell1) on radio channel 3 (SCC). The UE is only monitoring the PCC/PSCC. The UE shall be continuously scheduled in the PCell/PSCell throughout the whole test.

At the beginning of T1, the UE is configured to measure radio channel 3 and starts detecting the Cell 3 (SCell) on radio channel 3 (SCC). During T1 Cell 3 is detected and measured and measurement report is sent by the UE to the test equipment.

Time period T2 starts when test equipment sends the RRCConnectionReconfiguration message for the activation of the SCell within time period specified in clause 8.3.2 for known cell definition to ensure the configured SCell is known.The NR shall be use an *RRCConnectionReconfigurationComplete* message with parameter *sCellState* set to *activated*for the SCell (Cell 3), which causes the SCell to become configured and activated on radio channel 3 (SCC). The message is sent from the test equipment to the UE and is received in a subframe # denoted m at the UE antenna connector. The UE shall accomplish the activation of the SCell no later than subframe (m+ $N_{direct}$).

Time period T3 starts at (m+ $N_{direct}$), at which point UE shall be reporting a valid CQI for PCell/PSCell and SCell.

During T3, the UE shall be continuously scheduled in the SCell.

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

The test equipment verifies the CSI report from the direct activated SCell after the activation procedure is completed contains CQI index other than 0.

**Table A.5.5.3.7.1-1: 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.5.5.3.7.1-2: General test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| RF Channel Number | | 1, 2, 3 | Two radio channels are used for this test. One for E-UTRA cell and two for NR Cell |
| Active PCell | | Cell1 | PCell on RF channel number 1. As specified in clause A.3.7.2.2 |
| Active PSCell | | Cell2 | PSCell on RF channel number 2. |
| Deconfigured deactivated SCell | | Cell3 | Deconfigured deactivated secondary cell on RF channel number 3 |
| DRX | | OFF | Continuous monitoring of PCell/PSCell |
| PRACH configuration on cell2 | | FR2 configuration 2 | Captured in A.3.8.3.2 |
| PSCell CQI/PMI periodicity and offset configuration index | | slot5 | CQI reporting for PSCell every uplink slot |
| Cell-individual offset for cells on RF channel number 1 | dB | 0 | Individual offset for cells on carrier frequency of cell1. |
| Cell-individual offset for cells on RF channel number 2 | dB | 0 | Individual offset for cells on carrier frequency of cell2. |
| Cell-individual offset for cells on RF channel number 3 | dB | 0 | Individual offset for cells on carrier frequency of cell3. |
| T1 | s | 7 | During this time the PCell/PSCell shall be known and cell3 is detected, and UE shall report a valid CQI for PCell/PSCell. |
| T2 | s | $N_{direct}$ | During this time the UE shall be configured with directly activated SCell1. |
| T3 | s | 1 | During this time the UE shall report a valid CQI for PCell/PSCell and SCell. |

**Table A.5.5.3.7.1-3: Cell specific test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter[Note 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 | | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | | 100: $N_{RB,c}$ = 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 | | | | | |
| 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 SSS[Note 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: 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 $N_{oc}$ 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: All parameters apply for configuration 1 and 2.

**Table A.5.5.3.7.1-4: OTA related test parameters for FR2 SCell activation case with FR2 PSCell**

| Parameter Note 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 beams Note 7 | | Rough | | | Rough | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -104.7 | | | -104.7 | | |
| $N_{oc}$ Note1 | dBm/SCS Note 3 | -95.7 | | | -95.7 | | |
| $\hat{E}_s/N_{oc}$ | dB | 7 | | | 7 | | |
| SS-RSRP Note2 | dBm/SCS Note4 | -88.7 | | | -88.7 | | |
| $\hat{E}_s/I_{ot}$ | dB | 7 | | | 7 | | |
| Io Note2 | 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 $N_{oc}$ 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: 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.5.5.3.7.2 Test Requirements

The UE shall accomplish the activation of the SCell no later than subframe m+$N_{direct}$ as defined in clause 8.3.4.

Time period T3 starts at (m+ $N_{direct}$), at which point UE shall be reporting a valid CQI for both PCell/PSCell and SCell.

During T3 the UE shall send CSI reports for SCell with non-zero CQI index and continue to send CSI reports for SCell 1 with non-zero CQI index until the end of T3. All of the above test requirements shall be fulfilled in order for the observed SCell1 direct activation delay to be counted as correct. The rate of correct observed SCell1 direct activation delay during repeated tests shall be at least 90%.

## 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 $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candicate set $q_1$. 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 $q_0$ 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 $q_1$ 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 |
| 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 | | | Unit | Value | Comment |
|---|---|---|---|---|---|
| | | | | **Test 1** | |
| Active E-UTRA PCell | | | | Cell 1 | |
| E-UTRA RF Channel Number | | | | 1 | |
| Active PCell | | | | Cell 2 | |
| RF Channel Number | | | | 2 | |
| Duplex mode | | Config 1, 2 | | TDD | |
| $BW_{channel}$ | | Config 1, 2 | | 100: $N_{RB,c}$ = 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 | |
| CORESET Reference Channel | | Config 1, 2 | | CR.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 | | FR2 PRACH configuration 2 | A.3.8.3 |
| SSB index assigned as BFD RS ($q_0$) | | | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | | | 1 | |
| TCI Configuration | | Config 1, 2 | | TCI.State.0 | |
| OCNG parameters | | | | OP.1 | |
| CP length | | | | Normal | |
| Beam failure detection 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 | 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 | | | dBm/SCS kHz | -94.5 | Threshold used for $Q_{in\_LR\_SSB}$ |

| | | | | |
|---|---|---|---|---|
| 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 for CSI reporting | Config 1, 2 | | CSI-RS.3.1 TDD | |
| TCI states | | | TCI.State.0 | |
| CSI-RS for tracking | Config 1, 2 | | TRS.2.1 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 | 2.61 | |
| T3 | | s | 1.64 | |
| T4 | | S | 0 | |
| T5 | | s | 1.01 | |
| D1 | | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>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 beams Note 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 $q_0$ | Config 1 | dB | 5 Note 11 | -3 Note 11 | -12 | -12 | -12 |
| | Config 2 | | 5 Note 11 | -3 Note 11 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| | Config 2 | | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/ SCS kHz | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| | Config 2 | | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$ | Config 1 | dBm/120 KHz | -104.7 | | | | |
| | Config 2 | | -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**

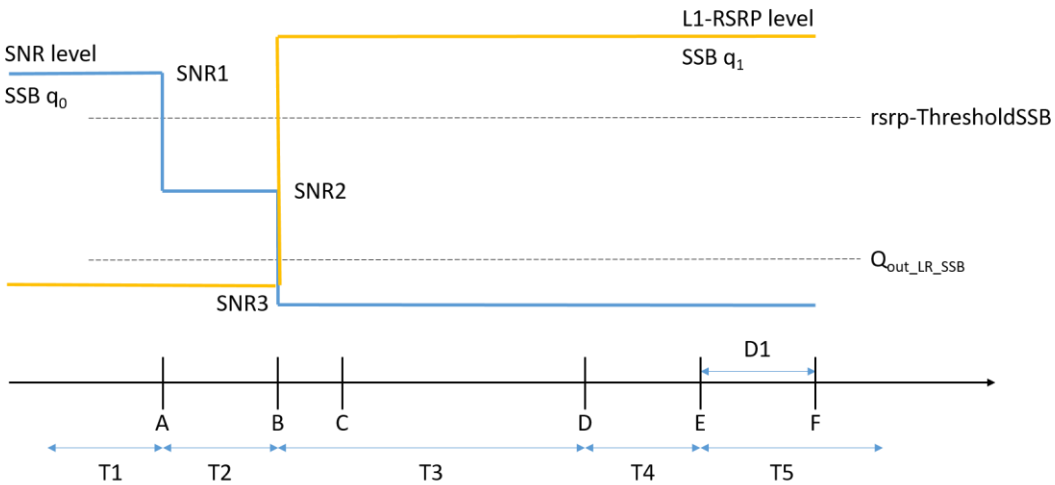


**Figure A.5.5.5.1.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### 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 $q_1$.

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 $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ 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 $q_0$ configured for a serving PSCell and that the UE performs correct SSB-based link recovery based on beam candidate set $q_1$. 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 $q_0$ 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 $q_1$ 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 |
| 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 | | Unit | Value | Comment |
|---|---|---|---|---|
| | | | Test 1 | |
| Active E-UTRA PCell | | | Cell 1 | |
| E-UTRA RF Channel Number | | | 1 | |
| Active PCell | | | Cell 2 | |
| RF Channel Number | | | 2 | |
| Duplex mode | Config 1, 2 | | TDD | |
| $BW_{channel}$ | Config 1, 2 | | 100: $N_{RB,c}$ = 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 | | CR. 3.1 TDD | |
| | Config 2 | | CR.3.2 TDD | |
| SSB Configuration | Config 1 | | SSB.1 FR2 | |
| | Config 2 | | SSB.2 FR2 | |
| SMTC Configuration | Config 1, 2 | | SMTC.3 | |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | | 120 KHz | |
| PRACH Configuration | Config 1, 2 | | FR2 PRACH configuration 2 | A.3.8.3 |
| SSB index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | | 1 | |
| TCI Configuration | Config 1, 2 | | TBD | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Beam failure detection 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 | 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.3 | A.3.3.3 |
| 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 | | dBm/SCS kHz | TBD | Threshold used for $Q_{in\_LR\_SSB}$ |
| rsrp-ThresholdSSB | Config 1 | dBm/SSB SCS | -94.5 | Threshold used for $Q_{in\_LR\_SSB}$ |
| | Config 2 | | -91.5 | |

| | | | | |
|---|---|---|---|---|
| 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, 2 | | CSI-RS.3.1 TDD | A.3.14.2 |
| TCI states | | | TCI.State.0 | |
| CSI-RS for tracking | Config 1, 2 | | TRS.2.1 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 | 3.37 | |
| T3 | | s | 2.8 | |
| T4 | | s | 0 | |
| T5 | | s | 0.61 | |
| D1 | | 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 beams Note 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 $q_0$ | Config 1 | dB | 5 Note 11 | -3 Note 11 | -12 | -12 | -12 |
| | Config 2 | | 5 Note 11 | -3 Note 11 | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| | Config 2 | | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SSB SCS | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| | Config 2 | | -101.5 | -101.5 | -81.5 | -81.5 | -81.5 |
| $N_{oc}$ | Config 1 | dBm/120 KHz | -104.7 | | | | |
| | Config 2 | | -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**

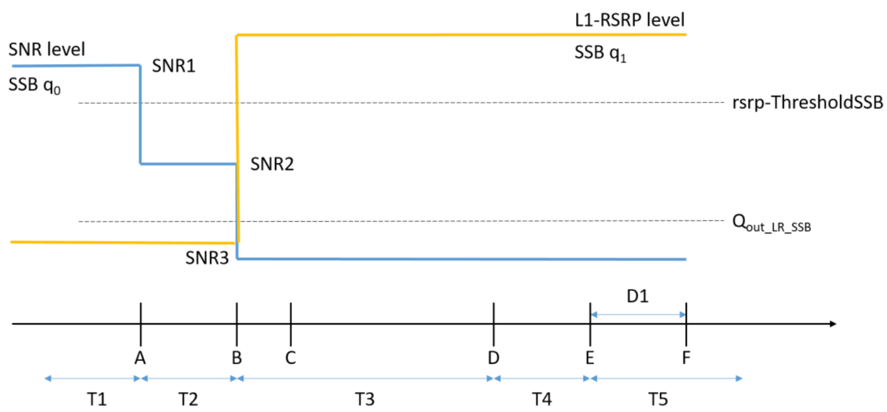


**Figure A.5.5.5.2.1-1: SNR and L1-RSRP variation for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### 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 $q_1$.

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 $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ 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 $q_0$ configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set $q_1$. 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 $q_0$ 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 $q_1$ 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 |

**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 | | 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 | | TDD | |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | Config 1 | | 66 | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | |
| CORESET Reference Channel | Config 1 | | CR.3.1 TDD | A.3.1.2 |
| SSB Configuration | Config 1 | | SSB. 1 FR2 | A.3.10 |
| SMTC Configuration | Config 1 | | SMTC.3 | A.3.11 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz | |
| PRACH Configuration | Config 1 | | FR2 PRACH configuration 4 | A.3.8.3 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | 0 | |
| TRS configuration | | | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Beam failure detection 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 | 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 $q_1$ | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | dBm/SCS kHz | -94.5 | Threshold used for $Q_{in\_LR\_SSB}$ |
| 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 for $q_0$ and $q_1$ | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.3.1 TDD | A.3.14.2 |
| csi-RS-Index assigned as RLM RS | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | s | 1.17 | |
| T3 | | s | 0.9 | |
| T4 | | s | 0 | |
| T5 | | s | 0.31 | |
| D1 | | 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 beams[Note 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 $q_0$ | Config 1 | dB | 5 [Note 11] | -3 [Note 11] | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$ | Config 1 | dBm/15 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**

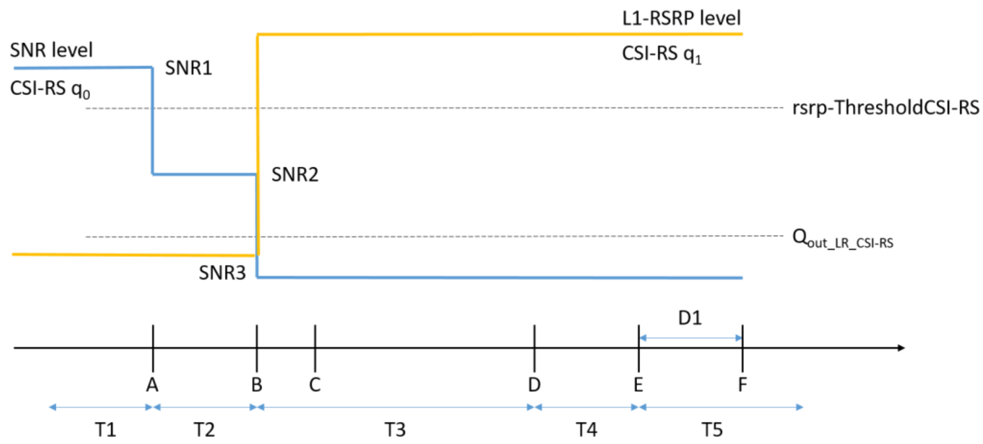


**Figure A.5.5.5.3.1-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing in non-DRX mode**

### 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 $q_1$.

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 $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ 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 $q_0$ configured for a serving PSCell and that the UE performs correct CSI-RS-based link recovery based on beam candicate set $q_1$. 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 $q_0$ 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 $q_1$ 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 |

**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 | | 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 | | TDD | |
| $BW_{channel}$ | Config 1 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | Config 1 | | 66 | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | |
| CORESET Reference Channel | Config 1 | | CR.3.1 TDD | A.3.1.2 |
| SSB Configuration | Config 1 | | SSB. 1 FR2 | A.3.10 |
| SMTC Configuration | Config 1 | | SMTC.3 | A.3.11 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz | |
| PRACH Configuration | Config 1 | | FR2 PRACH configuration 4 | A.3.8.3 |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ | | | 0 | |
| TRS configuration | | | TRS.2.1 TDD | |
| PDSCH/PDCCH TCI state | | | TCI.State.2 | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Beam failure detection 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 | 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 | A.3.3.3 |
| Gap pattern ID | | | N.A. | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | dBm/SCS kHz | -94.5 | Threshold used for $Q_{in\_LR\_SSB}$ |

| | | | | |
|---|---|---|---|---|
| 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 for $q_0$ and $q_1$ | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.3.1 TDD | A.3.14.2 |
| csi-RS-Index assigned as RLM RS | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | s | 5.43 | |
| T3 | | s | 5.16 | |
| T4 | | s | 0 | |
| T5 | | s | 0.31 | |
| D1 | | 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.3.155 | | | | |
| Assumption for UE beams Note 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 $q_0$ | Config 1 | dB | 5 Note 11 | -3 Note 11 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$ | Config 1 | dBm/15 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.5.5.5.4.1-1.
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**

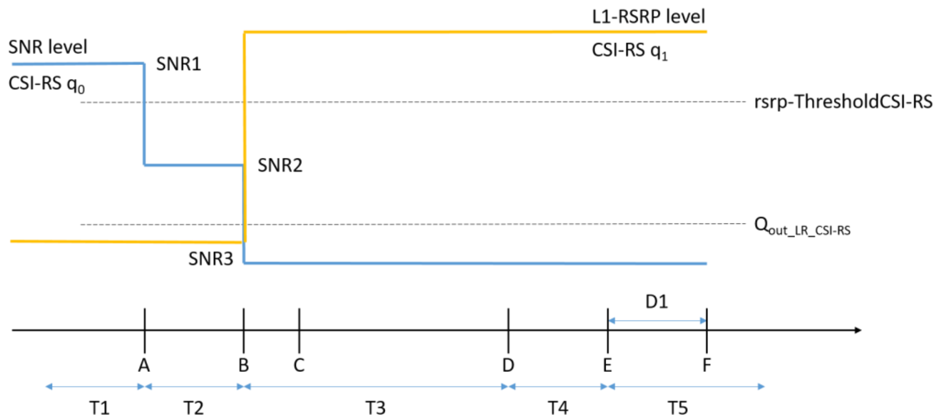


**Figure A.5.5.5.4.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing in DRX mode**

### 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 $q_1$.

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 $q_1$. The UE shall not transmit preamble on a beam associated with the candidate beam set $q_1$ 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 $q_0$ 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 $q_1$ 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 |
| 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 | | 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 1,2 | | TDD | |
| $BW_{channel}$ | Config 1,2 | MHz | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | Config 1,2 | | 66 | |
| TDD Configuration | Config 1,2 | | 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 | |
| CORESET Reference Channel | Config 1,2 | | CR.3.1 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 | | FR2 PRACH configuration 2 | A.3.8.3 |
| SSB index assigned as BFD RS ($q_0$) | | | 0 | |
| SSB index assigned as CBD RS ($q_1$) | | | 1 | |
| TRS configuration | | | TRS.2.1 TDD | |
| TCI configuration | | | TCI.State.0 | |
| OCNG parameters | | | OP.1 | |
| CP length | | | Normal | |
| Beam failure detection 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 | 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 | DRX is not in use |
| Gap pattern ID | | | N.A. | No measurement gap pattern is configured |
| ssb-Index | | | 2 | Number of SSB indexes used for beam failure detection |

| | | | | |
|---|---|---|---|---|
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | dBm/SCS kHz | -94.5 | Threshold used for $Q_{in\_LR\_SSB}$ |
| 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 for reporting | Config 1, 2 | | CSI-RS.3.1 TDD | A.3.14.2 |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the UE shall be fully synchronized to cell 1 |
| T2 | | s | 2.6 | |
| T3 | | s | 1.64 | |
| T4 | | s | 0 | |
| T5 | | s | 1.01 | |
| D1 | | s | 0.97 | |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.<br>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 beams[Note 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 $q_0$ | Config 1 | dB | 5 [Note 11] | -3 [Note 11] | -12 | -12 | -12 |
| | Config 2 | | 5 [Note 11] | -3 [Note 11] | -12 | -12 | -12 |
| SNR_SSB of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| | Config 2 | | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| SSB_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| | Config 2 | | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$ | 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 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

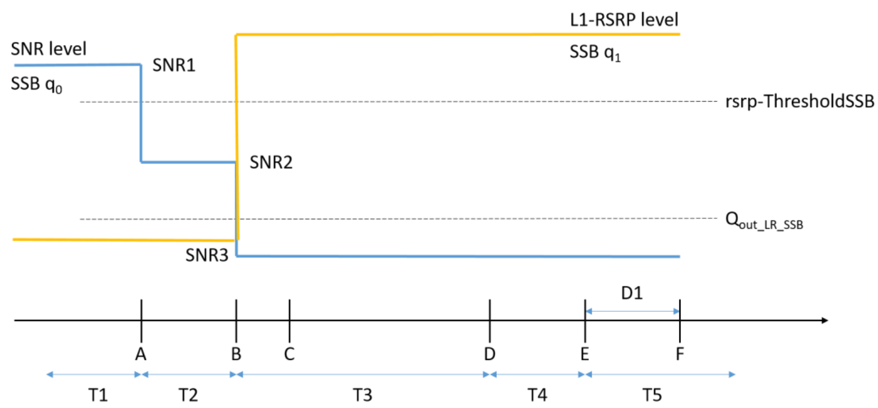


**Figure A.5.5.5.5.1-1: SNR and L1-RSRP variation SSB for SSB-based beam failure detection and link recovery testing in non-DRX mode**

#### 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.5.5.5.6 EN-DC Beam Failure Detection and Link Recovery Test for FR2 SCell configured with CSI-RS-based BFD and LR in non-DRX mode

#### A.5.5.5.6.1 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 $q_0$ configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, 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 SCell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.6.1-1, A.5.5.5.6.1-2 and A.5.5.5.6.1-3. There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PSCell, and cell 3 is the SCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.6.1-1 shows the variation of the downlink SNR of the active SCell and the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate CSI-RS based beam failure. Figure A.5.5.5.6.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set $q_1$ 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, cell 2, and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 ms. In the test, DRX configuration is not enabled.

**Table A.5.5.5.6.1-1: Supported test configurations for FR2 PSCell and SCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.5.5.5.6.1-2: General test parameters for FR2 SCell for 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 | |
| Active SCell | | | Cell 3 | |
| RF Channel Number | | | 3 | |
| Duplex mode | Config 1 | | TDD | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | |
| CORESET Reference Channel | Config 1 | | CR.3.1 TDD | A.3.1.2 |
| SSB Configuration | Config 1 | | SSB.3 FR2 | A.3.10 |
| SMTC Configuration | Config 1 | | SMTC.3 | A.3.11 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz | |
| PRACH Configuration | Config 1 | | Table A.3.8.3.1-1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell | | | 0 | |
| TRS configuration | | | TRS.2.1 TDD | |
| TCI configuration | | | CSI-RS.Config.0 | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Beam failure detection 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 | 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. | |
| schedulingRequestID-BFR-SCell-r16 | | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | slots | 40 | 5ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | slots | 5 | |
| PUCCH parameters for SR configuration for BFR on SCell | | | Table 8.3.3.1.2-1 in [13] | |
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ in activated SCell | | | 1 | |

| | | | | |
|---|---|---|---|---|
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | dBm/SCS kHz | -94.5 | Threshold used for $Q_{in\_LR\_SSB}$ |
| 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 for $q_0$ and $q_1$ | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.3.1 TDD | A.3.14.2 |
| csi-RS-Index assigned as RLM RS | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | s | 1.17 | |
| T3 | | s | 0.9 | |
| T4 | | s | 0 | |
| T5 | | s | 0.31 | |
| D1 | | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

**Table A.5.5.5.6.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in non-DRX mode**

| Parameter | | Unit | Cell2 | Test 1 Cell3 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | T1 to T5 | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.3.15 | Setup 1 defined in A.3.15 | | | | |
| Assumption for UE beams Note 10 | | | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 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 $q_0$ | Config 1 | dB | 5 | 5 | -3 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -104.7 | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | 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.5.5.5.6.1-1.
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 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

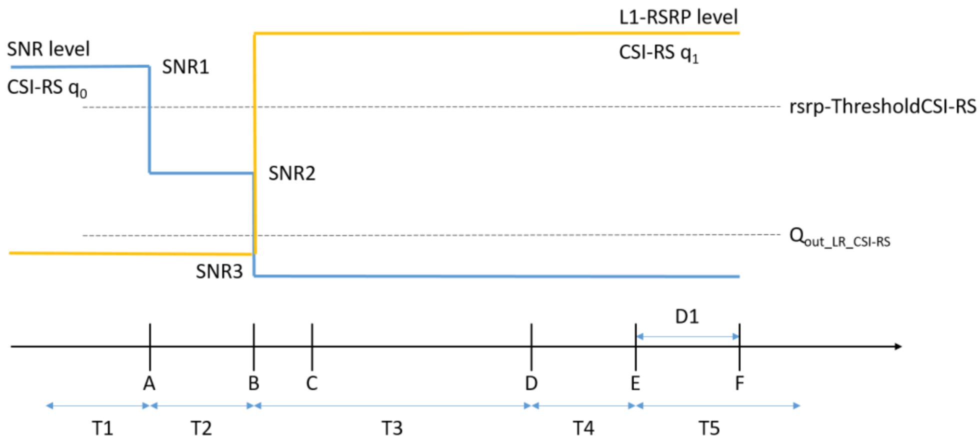


**Figure A.5.5.5.6.1-1: SNR and L1-RSRP variation for CSI-RS based beam failure detection and link recovery testing for SCell in non-DRX mode**

#### A.5.5.5.6.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 in A.5.5.5.6.1 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 2.

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

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_1$ 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.5.5.5.7 EN-DC Beam Failure Detection and Link Recovery Test for FR2 SCell configured with CSI-RS-based BFD and LR in DRX mode

#### A.5.5.5.7.1 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 $q_0$ configured for an active SCell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set $q_1$. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP of the SCell with *schedulingRequestID-BFR-SCell-r16* configuration, 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 SCell requirements in clause 8.5.

The test parameters are given in Tables A.5.5.5.7.1-1, A.5.5.5.7.1-2 and A.5.5.5.7.1-3. There are three cells, cell 1 is the E-UTRAN PCell, cell 2 is the PSCell, and cell 3 is the SCell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.5.5.5.7.1-1 shows the variation of the downlink SNR of the active SCell and the SNR of the CSI-RS in set $q_0$ in the active SCell to emulate CSI-RS based beam failure. Figure A.5.5.5.7.1-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set

$q_1$ 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, cell 2, and cell 3. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 2 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.5.5.5.7.1-1: Supported test configurations for FR2 PSCell and SCell**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, TDD duplex mode, 120 kHz SSB SCS, 100 MHz bandwidth |

**Table A.5.5.5.7.1-2: General test parameters for FR2 SCell for 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 | |
| Active SCell | | | Cell 3 | |
| RF Channel Number | | | 3 | |
| Duplex mode | Config 1 | | TDD | |
| TDD Configuration | Config 1 | | TDDConf.3.1 | |
| CORESET Reference Channel | Config 1 | | CR.3.1 TDD | A.3.1.2 |
| SSB Configuration | Config 1 | | SSB.3 FR2 | A.3.10 |
| SMTC Configuration | Config 1 | | SMTC.3 | A.3.11 |
| PDSCH/PDCCH subcarrier spacing | Config 1 | | 120 KHz | |
| PRACH Configuration | Config 1 | | Table A.3.8.3.1-1 | |
| csi-RS-Index assigned as beam failure detection RS in set $q_0$ in activated SCell | | | 0 | |
| TRS configuration | | | TRS.2.1 TDD | |
| TCI configuration | | | CSI-RS.Config.0 | |
| OCNG parameters | | | OP.1 | A.3.2.1 |
| CP length | | | Normal | |
| Beam failure detection 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 | 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 | A.3.3.3 |
| Gap pattern ID | | | N.A. | |
| schedulingRequestID-BFR-SCell-r16 | | | Configured | |
| Periodicity of PUCCH for SR configuration for BFR on SCell | | slots | 40 | 5ms |
| Offset of PUCCH for SR configuration for BFR on SCell | | slots | 5 | |
| PUCCH parameters for SR configuration for BFR on SCell | | | Table 8.3.3.1.2-1 in [13] | |

| | | | | |
|---|---|---|---|---|
| csi-RS-Index assigned as candidate beam detection RS in set $q_1$ in activated SCell | | | 1 | |
| rlmInSyncOutOfSyncThreshold | | | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdSSB | | dBm/SCS kHz | -94.5 | Threshold used for $Q_{in\_LR\_SSB}$ |
| 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 for $q_0$ and $q_1$ | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| CSI-RS configuration for CSI reporting | Config 1 | | CSI-RS.3.1 TDD | A.3.14.2 |
| csi-RS-Index assigned as RLM RS | Config 1 | | CSI-RS.3.2 TDD | A.3.14.2 |
| T310 Timer | | ms | 1000 | |
| N310 | | | 2 | |
| T1 | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | s | 5.43 | |
| T3 | | s | 5.16 | |
| T4 | | s | 0 | |
| T5 | | s | 0.31 | |
| D1 | | s | 0.27 | |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

**Table A.5.5.5.7.1-3: Cell specific test parameters for FR2 SCell for beam failure detection and link recovery testing in DRX mode**

| Parameter | | Unit | Cell2 | Test 1 Cell3 | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | T1 | T2 | T3 | T4 | T5 |
| AoA setup | | | Setup 1 defined in A.3.155 | Setup 1 defined in A.3.155 | | | | |
| Assumption for UE beams[Note 10] | | | Rough | Rough | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | 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 $q_0$ | Config 1 | dB | 5 | 5 | -3 | -12 | -12 | -12 |
| SNR_CSI-RS of set $q_1$ | Config 1 | dB | 0.2 | 0.2 | 0.2 | 20.2 | 20.2 | 20.2 |
| CSI-RS_RP of set $q_1$ | Config 1 | dBm/SCS kHz | -104.5 | -104.5 | -104.5 | -84.5 | -84.5 | -84.5 |
| $N_{oc}$ | Config 1 | dBm/15 kHz | -104.7 | -104.7 | | | | |
| Propagation condition | | | TDL-A 30ns 75Hz | 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.5.5.5.7.1-1.
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 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

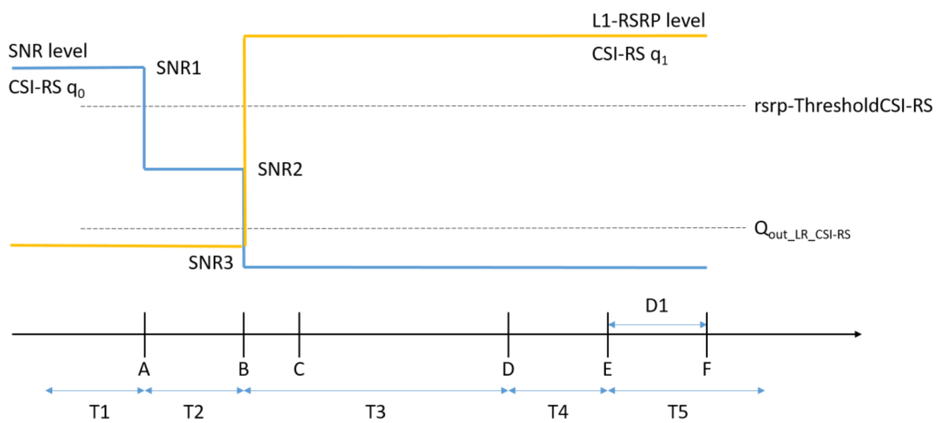


**Figure A.5.5.5.7.1-1: SNR and L1-RSRP variation for CSI-RS-based beam failure detection and link recovery testing for SCell in DRX mode**

#### A.5.5.5.7.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 in A.5.5.5.7.1 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 2.

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 2.

During T3 the UE shall detect beam failure and initial link recovery. During T4 and T5 the UE measures and evaluates beam candidate from beam candidate set $q_1$.

No later than time point F occurring no later than D1 = 260+10 ms after the start of T5, the UE shall transmit PUCCH with LRR, followed by BFR MAC CE containing a beam associated with the candidate beam set $q_1$. The UE shall not transmit PUCCH with an LRR with the candidate beam set $q_1$ 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.5.5.6 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 NR 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 NR 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 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 (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 BWP is 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 at the beginning of the DL slot right after PSCell's DL slot ($i+T_{BWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot ($i+T_{BWPswitchDelay}$).

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 beginning slot of the DL 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 at the beginning of the DL slot right after PSCell's DL slot ($j+T_{BWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot ($j+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ($j+T_{BWPswitchDelay}$).

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 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<br>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 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 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.<br>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 beams Note 6 | | Fine |
| $N_{oc}$ Note 1 | dBm/15 kHz | -112 |
| $N_{oc}$ Note 1 | dBm/SCS | -103 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.<br>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 for PSCell in the DL slot right after DL slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for PSCell in the DL slot right after DL slot ($j+T_{BWPswitchDelay}+k1$).

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 $T_{BWPswitchDelay}$ 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 in the DL slot right after DL slot ($i+Y1$), ($j+Y2$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

#### 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 NR PSCell (Cell 2) and one NR 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 NR 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 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 (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 BWP is BWP-1 in SCell.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is 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 at the beginning of the DL slot right after PSCell's DL slot ($i+T_{BWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot ($i+T_{BWPswitchDelay}$).

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 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 slot wherein *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 SCell's DL slot ($j+T_{BWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell on PSCell at latest at the beginning of the DL slot right after slot ($j+T_{BWPswitchDelay}+k1$). The UE shall be continuously scheduled on SCell's BWP-1 starting from the beginning of the DL slot right after slot ($j+T_{BWPswitchDelay}$).

PCell(Cell 1) interruption due to BWP switch of PSCell 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 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<br>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.<br>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 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. |
| 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 | |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 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 | ULBWP.0.2 |
| Active UL BWP-0 Configuration | | ULBWP.0.2 | N.A. |
| Active UL BWP-1 Configuration | | N.A. | ULBWP.1.3 |
| Active UL BWP-2 Configuration | | N.A. | 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 | | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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 beams Note 6 | | Fine | Fine |
| $N_{oc}$ Note 1 | dBm/15 kHz | -112 | -112 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 | -56 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.<br>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 for SCell in the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for SCell in the DL slot right after slot ($j+T_{BWPswitchDelay}+k1$).

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 PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start of the interruption of PCell during PSCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS36.133 Clause 7.32.2.7.

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 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 in the DL slot right after slot ($i+T_{BWPswitchDelay}+k1$), ($j+T_{BWPswitchDelay}+k1$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

*Editor's note: FFS value of k1 for type 1 and type 2 UE.*

### 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 NR 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 NR PSCell are specified in Table A.5.5.6.2.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) 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 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 BWP is 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 on SRB3, is 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 completely receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ($i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$) as defined in clause 8.6.3 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ($i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ($i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$).

$T_{RRCprocessingDelay}$ and $T_{BWPswitchDelayRRC}$ 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 RRC Reconfiguration message including updated BWP configurationis sent till the time when RRC Reconfiguration Complete message 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 |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | | 1 |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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 table A.3.15 |
| Assumption for UE beams Note 5 | | | Fine |
| $N_{oc}$ 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 | | |
| $N_{oc}$ 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-RSRP Note2 | 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 | | |
| $\hat{E}_s/I_{ot}$ | | dB | 18 |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -56 |
| | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>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 in the beginning of the DL slot right after slot ($i+T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}$).

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.5.5.6.3 Simultaneous DCI-based and Timer-based Active BWP Switch on multiple CCs

#### A.5.5.6.3.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs in synchronous EN-DC

##### A.5.5.6.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch on multiple CCs 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.5.5.6.3.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.5.5.6.3.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and NR SCell is specified in Table A.5.5.6.3.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.6.3.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on 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 2 and Cell 3 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 (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 PSCell and SCell, BWP-1 and BWP-2, in Cell 2 and Cell 3 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 BWP is BWP-1 in PSCell and SCell.
- UE is configured with a *bwp-InactivityTimer* timer value for PSCell and 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 PSCell DL BWP switch and a DCI format 1_1 command for SCell DL BWP switch, sent from the test equipment to the UE simultaneously, are received at the UE side in PSCell and SCell slot # denoted *i*. The UE should switch its bandwidth part from BWP-1 to BWP-2 in PSCell and SCell.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot $(i+T_{MultipleBWPswitchDelay})$ as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot $(i+T_{MultipleBWPswitchDelay}+k1)$. The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot $(i+T_{MultipleBWPswitchDelay})$.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after SCell's DL slot $(i+T_{BWPswitchDelay})$ as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell no later than at the beginning of the DL slot right after slot $(i+T_{MultipleBWPswitchDelay}+k1)$. The UE shall be continuously scheduled on PSCell's BWP-2 starting from the beginning of the DL slot right after slot $(i+T_{MultipleBWPswitchDelay})$.

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

During T2, the test equipment won't transmit DCI format for PDSCH reception on PSCell (Cell 2) and SCell (Cell 3).

During T3,

The time period T3 starts from the slot #*j*, where j is the beginning slot of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires in PSCell and SCell. The UE should switch its bandwidth part from BWP-2 back to the default bandwidth part – BWP-1 in both PSCell and SCell.

The UE shall be able to receive PDSCH on PSCell at the beginning of the DL slot right after PSCell's DL slot ($j+ T_{MultipleBWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the PSCell at latest at the beginning of the DL slot right after slot ($j+ T_{MultipleBWPswitchDelay} +k1$). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ($j+ T_{MultipleBWPswitchDelay}$).

The UE shall be able to receive PDSCH on SCell at the beginning of the DL slot right after SCell's DL slot ($j+ T_{MultipleBWPswitchDelay}$) as defined in clause 8.6 and starts to report valid ACK/NACK for the SCell at latest at the beginning of the DL slot right after slot ($j+ T_{MultipleBWPswitchDelay} +k1$). The UE shall be continuously scheduled on SCell's BWP-1 starting from the beginning of the DL slot right after slot ($j+ T_{MultipleBWPswitchDelay}$).

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

The test equipment verifies the DL BWP switch time in PSCell and SCell 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 PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of PSCell and SCell, respectively.

**Table A.5.5.6.3.1.1-1: 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.5.5.6.3.1.1-2: 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, 3 | Two NR radio channel is used for this test for PSCell and SCell |
| 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 | For both PCell, PSCell and SCell |
| *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.5.5.6.3.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | Unit | Cell 2 | Cell 3 |
|---|---|---|---|
| Frequency Range | | FR2 | FR2 |
| Duplex mode | | TDD | TDD |
| TDD configuration | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | 1, 2 | 1, 2 |
| Initial DL BWP Configuration | | DLBWP.0.2 Note 2 | DLBWP.0.2 Note 2 |
| Active DL BWP-1 Configuration | | DLBWP.1.1 Note 2 | DLBWP.1.1 Note 2 |
| Active DL BWP-2 Configuration | | DLBWP.1.3 Note 2 | DLBWP.1.3 Note 2 |
| Initial UL BWP Configuration | | ULBWP.0.2 Note 2 | ULBWP.0.2 Note 2 |
| Active UL BWP-1 Configuration | | ULBWP.1.1 Note 2 | ULBWP.1.1 Note 2 |
| Active UL BWP-2 Configuration | | ULBWP.1.3 Note 2 | ULBWP.1.3 Note 2 |
| PDSCH Reference measurement channel | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET parameters | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET parameters | | CCR.3.1 TDD | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 | OP.1 |
| SSB Configuration | | SSB.1 FR2 | SSB.1 FR2 |
| SMTC Configuration | | SMTC.1 | SMTC.1 |
| TCI State | | TCI.State.0 | TCI.State.0 |
| TRS Configuration | | TRS.2.1 TDD | TRS.2.1 TDD |
| Correlation Matrix and Antenna Configuration | | 1x2 Low | 1x2 Low |
| 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 |
| 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.<br>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.5.5.6.3.1.1-4: 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.3.15.1 | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beams Note 6 | | Fine | Fine |
| $N_{oc}$ Note 1 | dBm/15 kHz | -112 | -112 |
| $N_{oc}$ Note 1 | dBm/SCS | -103 | -103 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 | -56 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone.<br>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.5.5.6.3.1.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell and SCell in the DL slot right after DL slot ($i+T_{MultipleBWPswitchDelay}+k1$).

During T3, the UE shall start to send the ACK for PSCell and SCell in the DL slot right after DL slot ($j+T_{MultipleBWPswitchDelay}+k1$).

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [7].

Depending on UE capability *bwp-SwitchingDelay* and *bwp-SwitchingMultiCCs-r16* [2], UE shall finish BWP switch within the time duration $T_{MultipleBWPswitchDelay}$ defined in TS 38.133 caluse 8.6.2A and 8.6.2B

All of the above test requirements shall be fulfilled in order for the observed PSCell and 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 time of PCell interruption during PSCell and SCell active BWP switch shall not happen outside the BWP switch delay.

During T3, the start time of PCell interruption during PSCell and SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of 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 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 in the DL slot right after DL slot ($i+Y1$), ($j+Y2$), then the UE shall use the next available uplink resource for reporting the corresponding ACK.

Editor's note: whether E-UTRA PCell's interruption test requirement is needed or not depends on whether E-UTRA Pcell's interruption could be tested when PSCell is FR2 cell.

### A.5.5.6.4 SCell dormancy switch

#### A.5.5.6.4.1 E-UTRAN – NR FR2 PSCell SCell dormancy switch of single FR2 SCell inside active time

##### A.5.5.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify

1) the interruption due to RRM and CSI measurement during SCell dormancy on spCell is within the limits specified in clause 7.32.2.14.2 of 36.133 [15] for E-UTRA victim cell, and clause 8.2.1.2.15.2 and 8.2.1.2.15.3 for NR victim cell, and

2) the SCell dormancy switch delay is within the requirement defined in clause 8.6.2, and the SCell dormancy switch interruption is within the limits defined in clause 8.2.1.2.15.1 for NR victim cell, and clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell.

Supported test configurations are shown in Table A.5.5.6.4.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.5.5.6.4.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.5.5.6.4.1.1-3 below.

The tests consist of three consecutive time periods T1, T2, and T3, respectively. All cells have constant signal levels throughout the test. The UE is continuously scheduled in PCell and PSCell throughout the test

Before the test starts,

- UE is connected to Cell 1 (PCell), Cell 2 (PSCell) and Cell 3 (SCell).
- UE is configured with a single UE-specific downlink bandwidth part, BWP-0, for Cell 2. BWP-0 includes the bandwidth of the initial DL BWP and SSB.
- UE is configured with one non-dormant and one dormant UE-specific downlink bandwidth part, BWP-0 and BWP-1, respectively, for Cell 3. BWP-0 includes the bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP in Cell 3 is BWP-0.
- UE is indicated that firstOutsideActiveTimeBWP-Id that the active DL BWP after when switching from dormant BWP in Cell 3 is BWP-0

T1 starts at the point in time at which the UE receives a DCI with dormancy indication on PDCCH in PSCell at the antenna connector, in a slot # denoted *m*, pertaining to dormancy indication for switching SCell from non-dormancy to dormancy. The UE shall complete switching of the SCells to dormancy by the end of slot $m$ + ceil($T_{BWPswitchDelay}$/NR slot length) + 1 in Test1, and slot $m$ + ceil($T_{BWPswitchDelay}$/NR slot length) + 2 in Test2, as specified in clause 8.6.2. Any PCell interruptions due to the switching between non-dormant and dormant BWPs shall fulfill requirements in clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell. Any PSCell interruptions due to the switching between non-dormant and dormant BWPs shall fulfill requirements in clause 8.2.1.2.15.1 for NR victim cell. The test equipment verifies that interruptions due to switching from non-dormancy to dormancy are within the requirements by analysing HARQ feedback transmitted in PCell for PCell and in PSCell for PSCell.

During T2, the UE is carrying out CSI and RRM measurements on dormant SCell. Any PCell interruptions due to CSI and RRM measurements shall fulfill requirements in clause 7.32.2.14.2 of 36.133 [15] for E-UTRA victim cell, and clause 8.2.1.2.15.2 and 8.2.1.2.15.3 for NR victim cell. The test equipment verifies that the interruptions are within the allowed percentages by counting ACK/NACKs in PCell and PSCell. At the end of T2, the test equipment transmits a DCI with dormancy indication on PDCCH in PCell carrying a dormany indication for switching SCell from dormancy to non-dormancy.

T3 starts at the point in time at which the UE receives a DCI with dormancy indication on PDCCH in PSCell at the antenna connector, in a slot # denoted *n*, pertaining to dormancy indication for switching SCell from dormancy to non-dormancy. The UE shall complete switching of the SCell to non-dormancy by the end of slot $n$ + ceil($T_{BWPswitchDelay}$/NR slot length) + 1 in Test1, and slot $n$ + ceil($T_{BWPswitchDelay}$/NR slot length) + 2 in Test2, as specified in clause 8.6.2. Any PCell interruptions due to the switching between non-dormant and dormant BWPs shall fulfill requirements in clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell. Any PSCell interruptions due to the switching between non-dormant and dormant BWPs shall fulfill requirements in clause 8.2.1.2.15.1 for NR victim cell. The test equipment verifies that interruptions due to switching from dormancy to non-dormancy are within the requirements by analysing HARQ feedback transmitted in PCell for PCell, and in PSCell for PSCell. PDCCHs indicating new transmissions shall be sent continuously on SCell from the slot right after $n$ + ceil($T_{BWPswitchDelay}$/NR slot length) + 1 in Test1, and slot $n$ + ceil($T_{BWPswitchDelay}$/NR slot length) + 2 in Test2. The test equipment verifies the SCell dormancy switch delay by counting the slots from slot n till an ACK/NACK for SCell is received.

There are two subtests in this test. In Subtest 1 the DCI format 1_1 command for SCell dormancy switch is transmitted within the first 3 OFDM symbols in a slot, and in Subtest 2 the DCI format 1_1 command for SCell dormancy switch is transmitted after the first 3 OFDM symbols in a slot. A UE that only supports triggering during within the first three OFDM symbols of a slot shall only undergo Test1, whereas a UE that supports triggering also in remaining OFDM symbols of a slot shall undergo Test1 and Test2.

**Table A.5.5.6.4.1.1-1: Dormancy 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<br>Note 2: A UE which fulfils the requirements in test case in clause A.5.5.6.4.2 can skip the test cases in current clause A.5.5.6.4.1.<br>Note 3: NR configuration is the same for PSCell and SCells. | |

**Table A.5.5.6.4.1.1-2: General test parameters for Dormancy switch in synchronous EN-DC**

| Parameter | Unit | Value | | Comment |
|---|---|---|---|---|
| | | Subtest 1 | Subtest 2 | |
| 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 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. |
| Active SCell | | Cell 3 | | SCell on RF channel number 3. |
| CP length | | Normal | | |
| DRX | | OFF | | |
| Measurement gap pattern Id | | OFF | | |
| *bwp-InactivityTimer* | ms | 500 | | |
| 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 | 0 | | Synchronous cells |
| Triggering DCI format | | DCI 1_1 | | Triggering DCI format for triggering during active time |
| OFDM symbol range in slot for transmission of DCI with dormancy indication | | 0 – 2 | 3 – 11 | Test1 is based on that triggering DCI is received within the first three OFDM symbols of a slot. Test2 is based on that the triggering DCI is received later than within the first three OFDM symbols of a slot. |
| T1 | s | 0.2 | | |
| T2 | s | 5 | | |
| T3 | s | 0.2 | | |

**Table A.5.5.6.4.1.1-3: NR Cell specific test parameters for Dormancy switch in synchronous EN-DC**

| Parameter | Unit | Subtest 1 | | Subtest 2 | |
|---|---|---|---|---|---|
| | | **Cell 2** | **Cell 3** | **Cell 2** | **Cell 3** |
| Frequency Range | | FR2 | | FR2 | |
| Duplex mode | | TDD | | TDD | |
| TDD configuration | | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 66 | | 100 MHz: $N_{RB,c}$ = 66 | |
| Active BWP ID | | 0 | 0 | 0 | 0 |
| Initial DL BWP Configuration | | DLBWP.0.2 | DLBWP.0.2 | DLBWP.0.2 | DLBWP.0.2 |
| Active DL BWP-0 Configuration | | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 | DLBWP.1.1 |
| Active DL BWP-1 Configuration | | NA | DLBWP.1.2 | NA | DLBWP.1.2 |
| Initial UL BWP Configuration | | ULBWP.0.2 | ULBWP.0.2 | ULBWP.0.2 | ULBWP.0.2 |
| Active UL BWP-0 Configuration | | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 | ULBWP.1.1 |
| Active UL BWP-1 Configuration | | NA | ULBWP.1.2 | NA | ULBWP.1.2 |
| PDSCH Reference measurement channel | | SR.3.1 TDD | | SR.3.1 TDD | |
| RMSI CORESET parameters | | CR.3.1 TDD | | CR.3.1 TDD | |
| Dedicated CORESET parameters | | CCR.3.1 TDD | | CCR.3.2 TDD | CCR.3.1 TDD |
| OCNG Patterns | | OP.1 | | OP.1 | |
| SSB Configuration | | SSB.1 FR2 | | SSB.1 FR2 | |
| SMTC Configuration | | SMTC.1 | | SMTC.1 | |
| TCI State | | TCI.State.0 | | TCI.State.0 | |
| TRS Configuration | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| CSI-RS for CSI reporting | | CSI-RS.3.1 TDD | | CSI-RS.3.1 TDD | |
| CSI reporting periodicity | slots | 640 | | 640 | |
| SCell measurement cycle (measCycleSCell) | ms | 640 | | 640 | |
| Antenna Configuration | | 1x2 | | 1x2 | |
| Propagation Condition | | AWGN | | AWGN | |
| 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) | | | | | |

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 $N_{oc}$ 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.5.5.6.4.1.1-4: OTA related test parameters for Dormancy switch in synchronous EN-DC**

| Parameter | Unit | Cell 2 | Cell 3 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 according to clause A.3.15 | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -112 | -112 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -85 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 | -56 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone. | | | |

#### A.5.5.6.4.1.2 Test Requirements

During T1, any interruption on PCell and PSCell due to dormancy switching of SCell shall be within the requirement specified in in clause 8.2.1.2.15.1 for NR victim cell, and clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell.

During T2, interruptions on PCell and PSCell due to CSI and RRM measurements on dormant SCell shall be within the interruption rate requirements specified in 8.2.1.2.15.1 for NR victim cell, and clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell.

During T3, any interruption on PCell and PSCell due to dormancy switching of SCell shall be within the requirement specified in in clause 8.2.1.2.15.1 for NR victim cell, and clause 7.32.2.14.1 of 36.133 [15] for E-UTRA victim cell. Monitoring of PDCCH for SCell in PSCell shall be resumed within the dormancy switching time specified in clause 8.6.2A.

For an event to be considered to be correct, all requirements above have to be fulfilled.

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

### A.5.5.6.4.2 E-UTRAN – NR FR1 PSCell SCell dormancy switch of two FR2 SCells outside active time

#### A.5.5.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify the NR SCell dormant BWP switch delay requirement defined in clause 8.6.2A.1, interruption requirements due to the NR SCell dormant BWP switch defined in clause 8.2.1.2.15.1 for NR victim cells and in clause 7.32.2.14.1 of TS36.133 for E-UTRA victim cell, respectively, and interruption requirements due to CSI and RRM measurements on the NR dormant SCells defined in clauses 8.2.1.2.15.2 and 8.2.1.2.15.3 for NR victim cells and in clause 7.32.2.14.2 of TS36.133 for E-UTRA victim cell, respectively. Supported test configurations are shown in Table Table A.5.5.6.4.2.1-1.

The general test parameters are given in Table A.5.5.6.4.2.1-2, and NR cell specific test parameters are given in Table A.5.5.6.4.2.1-3 and Table A.5.5.6.4.2.1-4 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), one NR FR1 PSCell (Cell 2), and three NR FR2 SCells (Cell 3-5) as given in Table A.5.5.6.4.2.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table

A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and SCell are specified in Table A.5.5.6.4.2.1-3 and Table A.5.5.6.4.2.1-4 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1), PSCell (Cell 2), and SCell (Cell 5) to ensure that the UE will have ACK/NACK sending except the time before T1 and during T3. PDCCHs indicating new transmissions shall be sent continuously on SCells (Cell 3,4) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on the cells and the time duration of when active BWP of the cell is dormant.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), Cell 2 (PSCell) on radio channel 2 (PSCC), and Cell 3-5 (SCells) on radio channels 3-5 (SCCs), respectively.
- UE is configured with 2 different UE-specific downlink BWPs for Cell 3 and Cell 4, BWP-1 and BWP-2. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB. Here, BWP-2 on Cell 3 and Cell 4 is configured as dormant BWP.
- UE is configured with 1 UE-specific downlink BWP the same as initial BWP for Cell 3 and Cell 4.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in Cell 3 and Cell 4.
- UE is configured with DRX.
- UE is configured to monitor PDCCH for DCI format 2_6 from Cell 2 at *ps-Offset* before the start of *onDuration*. *ps-Offset* is selected to correspond to the dormancy switching time specified in clause 8.6.2A.

All cells have constant signal levels throughout the test.

The test consists of 3 successive time periods, with durations of T1, T2, T3, and T4, respectively.

During T1,

Time period T1 starts when a DCI format 2_6 command for Cell 3 and Cell 4 DL BWP switch to BWP-2, 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 at the beginning of the DL slot right after PSCell's DL slot ($i$+ $T_{MultipleBWPswitchDelay}$+X) as defined in clause 8.6.2A.2. The UE shall be continuously scheduled on the cell starting from the beginning of the DL slot right after slot ($i$+ $T_{MultipleBWPswitchDelay}$+X).

The UE shall be able to receive PDSCH at the beginning of the DL slot right after SCell(Cell 5)'s DL slot ($i$+ $T_{MultipleBWPswitchDelay}$+X) as defined in clause 8.6.2A.2. The UE shall be continuously scheduled on the cell starting from the beginning of the DL slot right after slot ($i$+ $T_{MultipleBWPswitchDelay}$+X).

PCell(Cell 1) interruption due to dormant BWP switch on PSCell shall occur within the dormant BWP switch delay.

SCell(Cell 5) interruption due to dormant BWP switch on SCell(Cell 5) shall occur within the dormant BWP switch delay.

During T2,

Time period T2 starts when dormant BWP switch latency requirement test is completed. The test equipement shall schedule PDSCH every slot.

The UE shall be able to report ACK/NACK corresponding to the scheduled PDSCH to PSCell except for the allowed times as defined in clauses 8.2.1.2.15.2 and 8.2.1.2.15.3.

The UE shall be able to report ACK/NACK corresponding to the scheduled PDSCH to PCell except for the allowed times as defined in clause 7.32.2.14.2 of TS36.133.

During T3,

Time period T3 starts when interruption due to SSB based RRM measurement and CSI measurement requirements test is completed. Test equipment shall not transmit PDCCH, hence, the UE doesn't monitor PDCCH except DCI format 2_6 based PDCCH.

During T4,

Time period T4 starts when a DCI format 2_6 command for Cell 3 and Cell 4 DL BWP switch to BWP-1, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted $j$. The UE shall switch its bandwidth part from BWP-2 to BWP-1.

The UE shall be able to receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ($j$+ $T_{MultipleBWPswitchDelay}$+X) as defined in clause 8.6.2A.2. The UE shall be continuously scheduled on the cell starting from the beginning of the DL slot right after slot ($j$+ $T_{MultipleBWPswitchDelay}$+X).

The UE shall be able to receive PDSCH at the beginning of the DL slot right after all SCell's (Cell 3,4,5) DL slot ($j$+ $T_{MultipleBWPswitchDelay}$+X) as defined in clause 8.6.2A.2. The UE shall be continuously scheduled on the cells starting from the beginning of the DL slot right after slot ($j$+ $T_{MultipleBWPswitchDelay}$+X).

PCell(Cell 1) interruption due to dormant BWP switch on PSCell shall occur within the dormant BWP switch delay.

SCell(Cell 5) interruption due to dormant BWP switch on SCell(Cell 5) shall occur within the dormant BWP switch delay.

**Table A.5.5.6.4.2.1-1: Supported test configurations for EN-DC DCI 2_6 based Domant BWP Switch on Multiple NR FR2 SCells**

| Config | Cell 1 | Cell 2 | Cell 3, Cell 4, Cell 5 | DCI 2_6 of Cell 2 |
|---|---|---|---|---|
| 1 | LTE FDD | 15kHz SSB SCS, FDD | 120kHz SSB SCS, TDD | within 3 OFDM symbols |
| 2 | LTE FDD | 15kHz SSB SCS, TDD | 120kHz SSB SCS, TDD | within 3 OFDM symbols |
| 3 | LTE FDD | 30kHz SSB SCS, TDD | 120kHz SSB SCS, TDD | within 3 OFDM symbols |
| 4 | LTE TDD | 15kHz SSB SCS, FDD | 120kHz SSB SCS, TDD | within 3 OFDM symbols |
| 5 | LTE TDD | 15kHz SSB SCS, TDD | 120kHz SSB SCS, TDD | within 3 OFDM symbols |
| 6 | LTE TDD | 30kHz SSB SCS, TDD | 120kHz SSB SCS, TDD | within 3 OFDM symbols |
| 7 | LTE FDD | 15kHz SSB SCS, FDD | 120kHz SSB SCS, TDD | after 3 OFDM symbols |
| 8 | LTE FDD | 15kHz SSB SCS, TDD | 120kHz SSB SCS, TDD | after 3 OFDM symbols |
| 9 | LTE FDD | 30kHz SSB SCS, TDD | 120kHz SSB SCS, TDD | after 3 OFDM symbols |
| 10 | LTE TDD | 15kHz SSB SCS, FDD | 120kHz SSB SCS, TDD | after 3 OFDM symbols |
| 11 | LTE TDD | 15kHz SSB SCS, TDD | 120kHz SSB SCS, TDD | after 3 OFDM symbols |
| 12 | LTE TDD | 30kHz SSB SCS, TDD | 120kHz SSB SCS, TDD | after 3 OFDM symbols |
| Note 1: 10 MHz bandwidth for Cell 2 with 15kHz SSB SCS.<br>Note 2: 40 MHz bandwidth for Cell 2 with 30kHz SSB SCS.<br>Note 3: 100 MHz bandwidth for Cell 3,4,5.<br>Note 4: The UE is only required to be tested in one of the supported test configurations. | | | | |

**Table A.5.5.6.4.2.1-2: General test parameters for EN-DC DCI 2_6 based Domant BWP Switch on Multiple NR FR2 SCells**

| Parameter | Unit | Value | Comment |
|---|---|---|---|
| E-UTRA RF Channel Number | | 1 | One E-UTRAN carrier frequenciy is used. |
| NR RF Channel Number | | 2,3,4,5 | Four NR radio channels are used for this test. RF channel number 2 is in FR 1 and RF channel numbers 3,4,5 are in a band where intra-band FR2 CA is allowed. |
| Active PCell | | Cell 1 | Primary cell on NR RF channel number 1. |
| Active PSCell | | Cell 2 | Primary SCG cell on NR RF channel number 2. |
| Configured activated SCell | | Cell 3,4,5 | Configured activated secondary cell on NR RF channel numbers 3,4,5. |
| CP length | | Normal | |
| DRX | | DRX.3 | As specified in clause A.3.3 |
| ps-Offset | | Depending on UE capability | Monitoring of DCI 2_6 ahead of start of drx-onDurationTimer. Value of ps-Offset shall correspond to SCell dormancy switching time for switching of two SCells, as specified in clause 8.6.2A. Actual value depends on reported UE capabilities. |
| ps-WakeUp | | true | Wake up for onDuration in case DCI format 2_6 is not detected. |
| SCell measurement cycle (measCycleSCell) | ms | 160 | |
| Cell2 timing offset to cell1 | μs | 3 | |
| Cell3,4,5 timing offset to cell1 | μs | 3 | |
| Timing offset among cell3,4,5 | μs | 0 | |
| T1 | s | 0.2 | During this time cell 3,4 switch to dormancy from non-dormancy. |
| T2 | s | 10 | During this time cell 3,4 are dormant. |
| T3 | S | 0.1 | During this time PDCCH is not transmitted from all cells. |
| T4 | s | 0.2 | During this time cell 3,4 switch to non-dormancy from dormancy. |

**Table A.5.5.6.4.2.1-3: Cell specific test parameters for EN-DC DCI 2_6 based Domant BWP Switch on Multiple NR FR2 SCells**

| Parameter | | Unit | Cell 2 | Cell 3,4 | Cell 5 |
|---|---|---|---|---|---|
| Frequency range | | | FR1 | FR2 | FR2 |
| Duplex mode | | | FDD | TDD | TDD |
| TDD configuration | Config 1,4,7,10 | | NA | TDDConf.3.1 | TDDConf.3.1 |
| | Config 2,5, 8,11 | | TDDConf.1.1 | TDDConf.3.1 | TDDConf.3.1 |
| | Config 3,6,9,12 | | TDDConf.2.1 | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | Config 1,2,4,5,7,8,10,11 | MHz | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| | Config 3,6,9,12 | MHz | 40: $N_{RB,c}$ = 106 | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 66 |
| SSB Configuration | Config 1,2,4,5,7,8,10,11 | | SSB.1 FR1 | SSB.1 FR2 | SSB.1 FR2 |
| | Config 3,6,9,12 | | SSB.2 FR1 | SSB.1 FR2 | SSB.1 FR2 |
| Downlink initial BWP Configuration | | | DLBWP.0.2 | DLBWP.0.2 | DLBWP.0.2 |
| Active (non-dormant) DL BWP-1 Configuration | | | NA | DLBWP.1.1 | NA |
| Active (dormant) DL BWP-2 Configuration | | | NA | DLBWP.1.1 | NS |
| Uplink initial BWP Configuration | | | ULBWP.0.2 | ULBWP.0.2 | ULBWP.0.2 |
| Active Uplink BWP-1 Configuration | | | NA | ULBWP.1.1 | NA |
| Active Uplink BWP-2 Configuration | | | NA | ULBWP.1.1 | NA |
| SMTC Configuration | | | SMTC.1 | SMTC.1 | SMTC.1 |
| TRS configuration | Config 1,4,7,10 | | TRS.1.1 FDD | TRS.2.1 TDD | TRS.2.1 TDD |
| | Config 2,5, 8,11 | | TRS.1.1 TDD | TRS.2.1 TDD | TRS.2.1 TDD |
| | Config 3,6,9,12 | | TRS.1.2 TDD | TRS.2.1 TDD | TRS.2.1 TDD |
| TCI state | | | TCI.State.0 | TCI.State.0 | TCI.State.0 |
| PDSCH Reference measurement channel | Config 1,4,7,10 | | SR.1.1 FDD | SR.3.1 TDD | SR.3.1 TDD |
| | Config 2,5, 8,11 | | SR.1.1 TDD | SR.3.1 TDD | SR.3.1 TDD |
| | Config 3,6,9,12 | | SR.2.1 TDD | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET Parameters | Config 1,4,7,10 | | CR.1.1 FDD | CR.3.1 TDD | CR.3.1 TDD |
| | Config 2,5, 8,11 | | CR.1.1 TDD | CR.3.1 TDD | CR.3.1 TDD |
| | Config 3,6,9,12 | | CR.2.1 TDD | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET Parameters for scheduling PDCCH | Config 1,4 | | CCR.1.1 FDD | CCR.3.1 TDD | CCR.3.1 TDD |
| | Config 7,10 | | CCR.1.5 FDD | CCR.3.1 TDD | CCR.3.1 TDD<br>CCR.3.1 TDD |
| | Config 2,5 | | CCR.1.1 TDD | CCR.3.1 TDD | CCR.3.1 TDD |
| | Config 8,11 | | CCR.1.5 TDD | CCR.3.1 TDD | CCR.3.1 TDD |
| | Config 3,6 | | CCR.2.1 TDD | CCR.3.1 TDD | CCR.3.1 TDD |
| | Config 9,12 | | CCR.2.3 TDD | CCR.3.1 TDD | CCR.3.1 TDD |
| Dedicated CORESET Parameters for DCI 2_6 | Config 1,4 | | CCR.1.1 FDD | NA | NA |
| | Config 7,10 | | CCR.1.5 FDD | NA | NA |

| | | | | | |
|---|---|---|---|---|---|
| | Config 2,5 | | CCR.1.1 TDD | NA | NA |
| | Config 8,11 | | CCR.1.5 TDD | NA | NA |
| | Config 3,6 | | CCR.2.1 TDD | NA | NA |
| | Config 9,12 | | CCR.2.3 TDD | NA | NA |
| CSI-RS configuration | | | NA | CSI-RS.3.1 TDD | NA |
| OCNG Patterns | | | OP.1 | | |
| EPRE ratio of PSS to SSS | | dB | 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 SSS[Note 1] | | | | | |
| EPRE ratio of OCNG to OCNG DMRS [Note 1] | | | | | |
| Propagation conditions | | | 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. | | | | | |

**Table A.5.5.6.4.2.1-4: OTA related test parameters for EN-DC DCI 2_6 based Domant BWP Switch on Multiple NR FR2 SCells**

| Parameter[Note 6] | Unit | Cell 2 | Cell 3,4 | Cell 5 |
|---|---|---|---|---|
| Angle of arrival configuration | | N/A Link only, see clause A.3.7A | Setup 1 defined in clause A.3.15.1 | |
| Assumption for UE beams [Note 7] | | | Fine | Fine |
| $N_{oc}$ [Note1] | dBm/15kHz[Note4] | | -111.7 | -111.7 |
| $N_{oc}$ [Note1] | dBm/SCS[Note3] | | -102.7 | -102.7 |
| $\hat{E}_s/N_{oc}$ | dB | | 7 | 7 |
| SS-RSRP[Note2] | dBm/SCS [Note4] | | -95.7 | -95.7 |
| $\hat{E}_s/I_{ot}$ | dB | | 7 | 7 |
| Io[Note2] | dBm/95.04 MHz [Note4] | | -65.9 | -65.9 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone<br>Note 6: All parameters apply for configuration 1 and 2<br>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.5.5.6.4.2.2 Test Requirements

During T1, the UE shall start to send the ACK for PSCell in the DL slot right after PSCell's DL slot ($i$+ $T_{MultipleBWPswitchDelay}$+X) as defined in clause 8.6.2A.2.

During T2, the UE shall transmit at least 98.5% of ACK/NACK on NR PCell.

During T4, the UE shall start to send the ACK for PSCell in the DL slot right after PSCell's DL slot ($j$+ $T_{MultipleBWPswitchDelay}$+X) as defined in clause 8.6.2A.2.

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

During T1, the start of the interruption of PCell and SCell (Cell 5) during dormant BWP switch on SCells (Cell 3,4) shall not happen outside the dormant BWP switch delay.

During T1, the start of the interruption of PCell and SCells (Cell 3,4,5) during dormant BWP switch on SCells (Cell 3,4) shall not happen outside the dormant BWP switch delay.

#### A.5.5.6.5 Simultaneous RRC-based Active BWP Switch on multiple CCs

##### A.5.5.6.5.1 E-UTRAN – NR PSCell FR2 and NR SCell FR2 DL active BWP switch on multiple CCs with non-DRX in synchronous EN-DC

###### A.5.5.6.5.1.1 Test Purpose and Environment

The purpose of this test is to verify the DL BWP switch delay requirement for simultaneous RRC-based BWP switch on multiple CCs defined in clause 8.6.3A. Supported test configurations are shown in Table A.5.5.6.5.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) and one NR SCell (Cell 3) as given in Table A.5.5.6.5.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell and NR SCell are specified in Table A.5.5.6.5.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) 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), to Cell 2 (PSCell) on radio channel 2 (PSCC) and to Cell 3 (SCell) on radio channel 3.
- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 2 (PSCell) and Cell 3 (SCell).
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 of initial condition in Cell 2 (PSCell) and Cell 3 (SCell).

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 in Cell 2 and Cell3, sent from the test equipment to the UE, is 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 in Cell 2 and Cell 3.

The UE shall be able to completely receive PDSCH on Cell 2 and Cell 3 at the beginning of the DL slot right after PSCell's DL slot ($i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length}$) as defined in clause 8.6.3A and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length}$). The UE shall be continuously scheduled on Cell 2's BWP-1and Cell 3's BWP-1 starting from the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length}$).

$T_{RRCprocessingDelay}$ , $T_{BWPswitchDelayRRC}$ and $D_{RRC}$ are defined in clause 8.6.3A.

The test equipment verifies the DL BWP switch time in Cell 2 and Cell 3 by counting the time from the time when the RRC Reconfiguration message including updated BWP configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.5.5.6.5.1.1-1: 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.5.5.6.5.1.1-2: 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, 3 | Two 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 |
| Active SCell | | Cell 3 | SCell on RF channel number 3 |
| 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. |
| 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] | |

**Table A.5.5.6.5.1.1-3: NR Cell specific test parameters for DL BWP switch in synchronous EN-DC**

| Parameter | | Unit | Cell 2 | Cell 3 |
|---|---|---|---|---|
| Frequency Range | | | FR2 | FR2 |
| Duplex mode | | | TDD | TDD |
| TDD configuration | | | TDDConf.3.1 | TDDConf.3.1 |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | | 1 | 1 |
| Initial DL BWP Configuration | | | DLBWP.0.2 | DLBWP.0.2 |
| Initial UL BWP Configuration | | | ULBWP.0.2 | ULBWP.0.2 |
| Initial Condition | Active DL BWP-1 Configuration | | DLBWP.1.3 | DLBWP.1.3 |
| | Active UL BWP-1 Configuration | | ULBWP.1.3 | ULBWP.1.3 |
| Final Condition | Active DL BWP-1 Configuration | | DLBWP.1.1 | DLBWP.1.1 |
| | Active UL BWP-1 Configuration | | ULBWP.1.1 | ULBWP.1.1 |
| PDSCH Reference measurement channel | | | SR.3.1 TDD | SR.3.1 TDD |
| RMSI CORESET parameters | | | CR.3.1 TDD | CR.3.1 TDD |
| Dedicated CORESET parameters | | | CCR.3.1 TDD | CCR.3.1 TDD |
| OCNG Patterns | | | OP.1 | OP.1 |
| SSB Configuration | | | SSB.1 FR2 | SSB.1 FR2 |
| SMTC Configuration | | | SMTC.1 | SMTC.1 |
| TCI State | | | TCI.State.0 | TCI.State.0 |
| TRS Configuration | | | TRS.2.1 TDD | TRS.2.1 TDD |
| Antenna Configuration | | | 1x2 | 1x2 |
| Propagation Condition | | | AWGN | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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.5.5.6.5.1.1-4: OTA related test parameters for BWP switching test case**

| Parameter | Unit | Cell 2 | Cell 3 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 according to table A.3.15 | Setup 1 according to table A.3.15 |
| Assumption for UE beams Note 5 | | Fine | Fine |
| $N_{oc}$ Note1 | dBm/15kHz | -112 | -112 |
| $N_{oc}$ Note1 | dBm/SCS | -103 | -103 |
| SS-RSRP Note2 | dBm/SCS Note3 | -85 | -85 |
| $\hat{E}_s/I_{ot}$ | dB | 18 | 18 |
| Io Note2 | dBm/95.04 MHz Note4 | -56 | -56 |

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 $N_{oc}$ 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.5.5.6.5.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell and SCell in the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}+D_{RRC}}{NR\ slot\ length}$).

All of the above test requirements shall be fulfilled in order for the observed PSCell and SCell 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 | | | |
| $BW_{channel}$ | MHz | 1,2 | 100: NRB,c = 66 | | | |
| Data RBs allocated | | 1,2 | 48 | | | |
| Initial BWP Configuration | | 1,2 | DLBWP.0.1<br>ULBWP.0.1 | | | |
| Dedicated BWP Configuration | | 1,2 | DLBWP.1.1<br>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-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 beams Note 6 | | Rough | | | |
| $\hat{E}_s/N_{oc}$ Ês Note2 | dBm/SCS | -∞ | -81 | | |
| SSB_RP Note2, Note 4 | dBm/SCS | -∞ | -81 | | |
| $\hat{E}_s/I_{ot\ BB}$ Note 2, Note 7 | dB | -∞ | 4.88 | | |
| Io Note 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 $Es/Iot_{BB}$ 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 $\Delta MB_S$ 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 ms[Note1] 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]:

$$T_{config\_PSCell} = T_{RRC\_delay} + T_{processing} + T_{search} + T_{\Delta} + T_{PSCell\_DU} + 2ms$$

Where:

$T_{RRC\_delay}$ = 20ms

$T_{processing}$ = 40ms

$T_{search}$ = 8*3*20 = 480 ms

$T_{\Delta}$ = 20ms

$T_{PSCell\_DU}$ = 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. 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+ $T_{HARQ}$ +3 ms.The test equipment also verifies the TCI state switch time in PSCell by scheduling the UE on TCI state 1 after n+ $T_{HARQ}$ +3 ms + ($T_{first-SSB}$ + $T_{SSB-proc}$) .

**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 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 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.0 |
| TCI State 1 | | TCI.State.1 |
| 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 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 | |
| $\hat{E}_s$ | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SS B_RP Note 2 | dBm/ SCS | -80.6 | -80.6 | - Infinity | -80.6 |
| $\hat{E}_s/I_{ot}$ BB Note 7 | dB | 8.3 | 8.3 | -Infinity | 8.3 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | -50.0 |

Note 1: Void
Note 2: SS B_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 $Es/Iot_{BB}$ 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 $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

##### 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+ $T_{HARQ}$ +3 ms
- be able to start receiving on TCI state 1 after n+ $T_{HARQ}$ +5 ms + $T_{first\text{-}SSB}$

### 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. 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+ $T_{RRC\_processing}$ + $T_{first\text{-}SSB}$ + 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 | 0.2 | |

**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 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 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.0 |
| TCI State 1 | | TCI.State.1 |
| TRS Configuration | | TRS.2.1 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 beams Note 6 | | Rough | | Rough | |
| $\hat{E}_s$ | dBm/SCS | -80.6 | -80.6 | -Infinity | -80.6 |
| SSB_RP Note 2 | dBm/ SCS | -80.6 | -80.6 | - Infinity | -80.6 |
| Io Note2 | dBm/95.04 MHz Note4 | -56.0 | -56.0 | - Infinity | -56.0 |
| Note 1: Void<br>Note 2: SS B_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.<br>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<br>Note 7: Calculation of $Es/Iot_{BB}$ 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 $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | |

##### 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+ $T_{RRC\_processing}$ + $T_{first\text{-}SSB}$ + 2ms.

### A.5.5.9 Uplink spatial relation switch delay

#### A.5.5.9.1 MAC-CE based uplink spatial relation switch

##### A.5.5.9.1.1 E-UTRAN – NR PSCell FR2 uplink spatial relation switch for a known spatial relation

###### A.5.5.9.1.1.1 Test Purpose and Environment

The purpose of this test is to verify the uplink spatial relation switch delay requirement defined in clause 8.12.3 by a UE capable of beam correspondence without the need for UL beam sweeping. Supported test configurations are shown in Table A.5.5.9.1.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.9.1.1.1-2. 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.5.5.9.1.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.9.1.1.1-4.

PDCCHs indicating new transmissions shall be sent continuously on PSCell (Cell 2) to ensure that the UE would have continuous ACK/NACK sending by PUCCH.

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 spatial relations for PSCell, PUCCH spatial relation 0 (QCL'd to SSB0) and spatial relation 1 (QCL'd to SSB1), in Cell 2 before starting the test.
- UE is indicated in spatial relation 0 as the active PUCCH spatial relation

The test consists of two time periods, T1 and T2. During T1 only SSB to which PUCCH spatial relation 0 QCLed is transmitted. At the beginning of T2, the SSB corresponding to spatial relation 1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured. 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 transmit PUCCH with spatial relation 1.

The test equipment verifies that UE can be scheduled on PSCell on spatial relation 0 till $n$ + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$. The test equipment also verifies the spatial relation switch time in PSCell by scheduling the UE on spatial relation 1 from slot $n$ + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$ + 1 and onwards.

**Table A.5.5.9.1.1.1-1: 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.5.5.9.1.1.1-2: General test parameters for spatial relation 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 |
| L1-RSRP reporting period | slot | 160 | Periodic L1-RSRP reporting configured |
| L1-RSRP measured RS | | SSB0, SSB1 | L1-RSRP measurements of SSB0 and SSB1. |
| Number of reported RS | | 2 | L1-RSRP reporting of measurements on SSB0 and SSB1. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

**Table A.5.5.9.1.1.1-3: NR Cell specific test parameters for spatial relation switch**

| Parameter | Unit | Cell 2 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 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.3.1 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 |
| Spatial Relation 0 | | PUCCH.<br>SRI.0 |
| Spatial Relation 1 | | PUCCH.<br>SRI.1 |
| TRS Configuration | | TRS.2.1 TDD |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| 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 both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table A.5.5.9.1.1.1-4: OTA related test parameters for uplink spatial relation 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 | | | |
| Noc Note 1 | dBm/15 kHz | -92.1 | | | |
| Noc Note 1 | dBm/SCS | -83.1 | | | |
| Ês/Noc | dB | 1 | 1 | -Infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | -82.1 | -Infinity | -82.1 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -50.6 | -50.6 | -54.1 | -50.6 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.<br>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.5.5.9.1.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with results for SSB1.

After receiving MAC-CE command in slot n, UE shall:

- be able to continue to transmit PUCCH on spatial relation 0 till $n$ + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$;
- be able to start transmitting PUCCH on spatial relation 1 from slot $n$ + $T_{HARQ}$/NR slot length + $3N_{slot}^{subframe,\mu}$ + 1.

### A.5.5.9.2 RRC based spatial relation switch

#### A.5.5.9.2.1 E-UTRAN – NR PSCell FR2 spatial relation switch associated with a known DL-RS

##### A.5.5.9.2.1.1 Test Purpose and Environment

The purpose of this test is to verify the RRC based spatial relation switch delay requirement defined in clause 8.12.5 by a UE capable of beam correspondence without the need for UL beam sweeping. Supported test configurations are shown in Table A.5.5.9.2.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1), and one NR PSCell (Cell 2) as given in Table A.5.5.9.2.1.1-2. 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.5.5.9.2.1.1-3 below. The OTA related test parameters for FR2 is shown in Table A.5.5.9.2.1.1-4.

Periodic SRS is transmitted on NR PSCell (Cell2), and the SRS configuration is SRSConf.1 given in Table A.5.4.1.1.1-3.

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 SRS-SpatialRelation0 associated with SSB0.
- UE is indicated SRS-SpatialRelation0 as the active SRS spatial relation.

The test consists of two time periods, T1 and T2. During T1 only SSB0 to which SRS-SpatialRelation0 associated is transmitted. UE shall transmit periodic SRS with SRS-SpatialRelation0 of PSCell. At the beginning of T2, the SSB1 corresponding to SRS-SpatialRelation1 starts transmitting. The UE is configured to provide periodic L1-RSRP reports. The test has higher layer parameter *timeRestrictionForChannelMeasurements* configured. 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 transmit periodic SRS with target SRS-SpatialRelation1. The test equipment verifies that UE shall be able to transmit periodic SRS with target spatial relation (SRS-SpatialRelation1) on PSCell in the slot n + $T_{RRC\_processing}$/NR slot length + 1.

**Table A.5.5.9.2.1.1-1: 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.5.5.9.2.1.1-2: General test parameters for spatial relation switch associated with a known DL-RS**

| 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. |
| T1 | s | 0.2 | |
| T2 | s | 2 | |

**Table A.5.5.9.2.1.1-3: NR Cell specific test parameters for spatial relation switch associated with a known DL-RS**

| Parameter | Unit | Cell 2 |
|---|---|---|
| Frequency Range | | FR2 |
| Duplex mode | | TDD |
| TDD configuration | | TDDConf.3.1 |
| $BW_{channel}$ | | 100 MHz: $N_{RB,c}$ = 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.3.1 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 |
| SRS-SpatialRelation0 | | SRS.SRI0 |
| SRS-SpatialRelation1 | | SRS.SRI1 |
| TRS Configuration | | TRS.2.1 TDD |
| reportConfigType | | ssb-Index-RSRP |
| reportConfigType | | periodic |
| Number of reported RS | | 2 |
| L1-RSRP reporting period | slot | 160 |
| 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 both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | |

**Table A.5.5.9.2.1.1-4: OTA related test parameters for spatial relation switch associated with a known DL-RS**

| 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 | |
| $N_{oc}$ Note 1 | dBm/15 kHz | -92.1 | | | |
| $N_{oc}$ Note 1 | dBm/SCS | -83.1 | | | |
| $\hat{E}_s/N_{oc}$ | dB | 1 | 1 | -Infinity | 1 |
| SS-RSRP Note 2 | dBm/120 kHz Note3 | -82.1 | -82.1 | -Infinity | -82.1 |
| Io Note2,Note6 | dBm/95.04 MHz Note4 | -50.6 | -50.6 | -54.1 | -50.6 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: As observed with 0dBi gain antenna at the center of the quiet zone.<br>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.5.5.9.2.1.2 Test Requirements

During T2, UE shall send L1-RSRP report with SSB1 to which SRS-SpatialRelation1 is associated.

After receiving RRC command in slot n, UE shall be able to transmit target periodic SRS with SRS-SpatialRelation1 on PSCell in the slot n + $T_{RRC\_processing}$/*NR slot length* + 1.

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

## A.5.5.10 UE specific CBW change

### A.5.5.10.1 UE specific CBW change on FR2 NR PSCell

#### A.5.5.10.1.1 Test Purpose and Environment

The purpose of this test is to verify the UE specific CBW change delay requirement defined in clause 8.13. Supported test configurations are shown in Table A.5.5.10.1.1-1.

The test scenario comprises of one E-UTRA PCell (Cell 1) and one NR PSCell (Cell 2) as given in Table A.5.5.10.1.1-2. Cell-specific parameters of E-UTRA PCell are specified in Table A.3.7.2.1-1 and Cell-specific parameters of NR PSCell are specified in Table A.5.5.10.1.1-3 below.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) 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 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 BWP is BWP-1 of initial condition in PSCell.
- UE is indicated in *SCS-SpecificCarrier* that the active CBW is CBW-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* which reconfigure the UE specific CBW parameter, sent from the test equipment to the UE, is received at the UE side in PSCell's slot # denoted *i*. The UE shall reconfigure its UE specific CBW with the updated UE specific CBW of final condition.

The UE shall be able to completely receive PDSCH at the beginning of the DL slot right after PSCell's DL slot ($i+\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$) as defined in clause 8.13 and be ready for the reception of uplink grant for the PSCell no later than at the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$). The UE shall be continuously scheduled on PSCell's BWP-1 starting from the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$).

$T_{RRCprocessingDelay}$ and $T_{CBWchangeDelayRRC}$ are defined in clause 8.13.

The test equipment verifies the UE specific CBW change switch time in PSCell by counting the time from the time when the RRC Reconfiguration message including updated UE specific CBW configuration is sent till the time when RRC Reconfiguration Complete message is received.

**Table A.5.5.10.1.1-1: UE specific CBW change 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.5.5.10.1.1-2: General test parameters for UE specific CBW change 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.5.5.10.1.1-3: NR Cell specific test parameters for UE specific CBW change in synchronous EN-DC**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Frequency Range | | | FR2 |
| Duplex mode | | | TDD |
| TDD configuration | | | TDDConf.3.1 |
| $BW_{channel}$ | | | 100 MHz: $N_{RB,c}$ = 66 |
| Active BWP ID | | | 1 |
| Initial DL BWP Configuration | | | DLBWP.0.2 |
| Initial UL BWP Configuration | | | ULBWP.0.2 |
| Active DL BWP Configuration | | | DLBWP.1.3 |
| Active UL BWP Configuration | | | DLBWP.1.3 |
| Initial Condition | Active DL CBW-1 Configuration | | DLCBW.1.1 |
| | Active UL CBW-1 Configuration | | ULCBW.1.1 |
| Final Condition | Active DL CBW-1 Configuration | | DLCBW.1.2 |
| | Active UL CBW-1 Configuration | | ULCBW.1.2 |
| 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 |
| 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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.5.5.10.1.1-4: OTA related test parameters for UE specific CBW change test case**

| Parameter | | Unit | Cell 2 |
|---|---|---|---|
| Angle of arrival configuration | | | Setup 1 according to table A.3.15 |
| Assumption for UE beams Note 5 | | | Fine |
| $N_{oc}$ 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 | | |
| $N_{oc}$ 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-RSRP Note2 | 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 | | |
| $\hat{E}_s/I_{ot}$ | | dB | 18 |
| Io Note2 | NR_TDD_FR2_A | dBm/95.04 MHz Note4 | -56 |
| | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>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.5.5.10.1.2 Test Requirements

During T1, the UE shall be ready for the reception of uplink grant for PSCell in the beginning of the DL slot right after slot ($i+\frac{T_{RRCprocessingDelay}+T_{CBWchangeDelayRRC}}{NR\ Slot\ length}$).

All of the above test requirements shall be fulfilled in order for the observed PSCell UE specific CBW change switch delay to be counted as correct.

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

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

# 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<br>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 | |
| offsetMO | dB | 1~4 | 16 | Applied to NR Cell 3 measurement object |
| 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 | |
| $BW_{channel}$ | MHz | 1~4 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1,2 | 24 | | 24 | |
| | | 3,4 | 48 | | 48 | |
| Intial BWP configuration | | 1~4 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>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 | | CR.3.1 TDD | |
| | | 3,4 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 3,4 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| 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 | |
| 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 beams Note 4 | | 1~4 | Rough | | Rough | |
| | dBm/SCS | 1, 2 | -89 | -89 | -Infinity | -89 |
| | | 3, 4 | -86 | -86 | -Infinity | -86 |
| $\hat{E}_s/I_{ot\_BB}$ 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 |
| $Io$ | dBm/95.04MHz | 1,2 | -64.41 | -64.41 | See Cell 2 columns | |
| | | 3,4 | -61.41 | -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 $Es/Iot_{BB}$ 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 $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | |

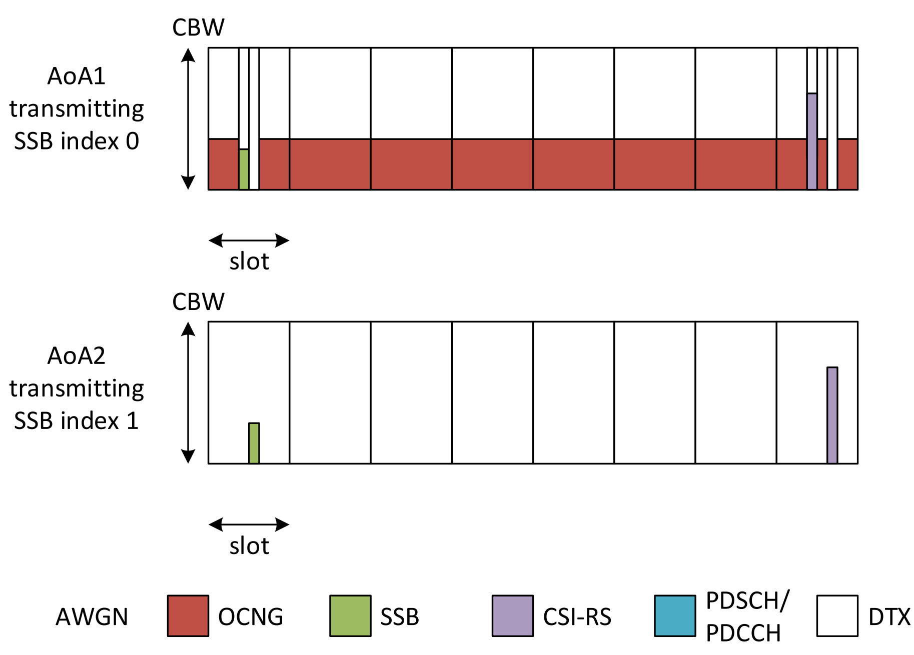


**Figure A.5.6.1.1.1-1: Time multiplexed downlink transmissions (Config 1,2 example)**

#### 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)<br>PSCell (Cell 2) | | |
| Neighbour cell | | 1~4 | Cell 3 | | Cell to be identified. |
| RF Channel Number | | 1~4 | 1: Cell 1<br>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 | |
| $BW_{channel}$ | MHz | 1~4 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1~4 | 66 | | 66 | |
| Intial BWP configuration | | 1~4 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>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 | | CR.3.1 TDD | |
| | | 3,4 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 3,4 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| 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 | | TRS.2.1 TDD | |
| | | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| 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 beams Note 4 | | 1~4 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1~4 | 3.77 | -1.52 | -Infinity | -1.52 |
| $N_{oc}$ Note 2 | dBm/15 KHz | 1~4 | -98 | | | |
| $N_{oc}$ 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 |
| $\hat{E}_s/N_{oc}$ | dB | 1~4 | 4 | 4 | -Infinity | 4 |
| $Io$ | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: Es/Iot, SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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.<br>Note 5: Calculation of $Es/Iot_{BB}$ 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 $\Delta MB_P$ 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 $2xTTI_{DCCH}$ 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<br>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 | |
| offsetMO | dB | 1~4 | 16 | Applied to NR Cell 3 measurement object |
| 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 $\mu$s | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 | | 1~4 | 3 $\mu$s | 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 | |
| $BW_{channel}$ | MHz | 1~4 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 | | CR.3.1 TDD | |
| | | 3,4 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 3,4 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| 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 | |
| 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 beams Note 4 | | 1~4 | Rough | | Rough | |
| $E_s$ | dBm/SCS | 1, 2 | -89 | -89 | -Infinity | -89 |
| | | 3, 4 | -86 | -86 | -Infinity | -86 |
| $\hat{E}_s/I_{ot\ BB}$ 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 |
| $Io$ | dBm/95.04MHz | 1,2 | -64.41 | -64.41 | See Cell 2 columns | |
| | | 3, 4 | -61.41 | -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 $Es/Iot_{BB}$ 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 $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.

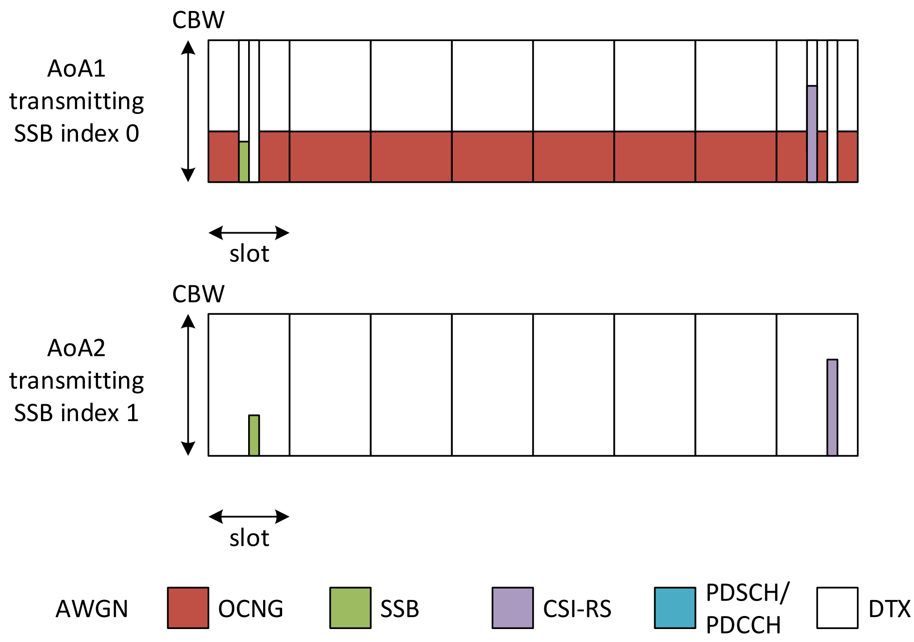


**Figure A.5.6.1.3.1-1: Time multiplexed downlink transmissions (Config 1,2 example)**

#### 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 $2xTTI_{DCCH}$ 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)<br>PSCell (Cell 2) | | |
| Neighbour cell | | 1~4 | Cell 3 | | Cell to be identified. |
| RF Channel Number | | 1~4 | 1: Cell 1<br>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 | | |
| 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 | |
| $BW_{channel}$ | MHz | 1~4 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | 1~4 | 66 | | 66 | |
| Intial BWP configuration | | 1~4 | DLBWP.0.1<br>ULBWP.0.1 | | DLBWP.0.1<br>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 | | CR.3.1 TDD | |
| | | 3,4 | CR.3.2 TDD | | CR.3.2 TDD | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| | | 3,4 | CCR.3.7 TDD | | CCR.3.7 TDD | |
| 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 beams Note 4 | | 1~4 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ BB Note 5 | dB | 1~4 | 3.77 | -1.52 | -Infinity | -1.52 |
| $N_{oc}$ Note 2 | dBm/15 KHz | 1~4 | -98 | | | |
| $N_{oc}$ 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 |
| $\hat{E}_s/N_{oc}$ | dB | 1~4 | 4 | 4 | -Infinity | 4 |
| $Io$ | 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 $N_{oc}$ 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 $Es/Iot_{BB}$ 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 $\Delta MB_P$ 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 $2xTTI_{DCCH}$ 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<br>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.<br>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 beams[Note 7] | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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) | | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1,2 | -87 | -87 | -Infinity | -87 |
| SSBRP Note 3 | dBm/SCS Note5 | Config 1,2 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s/I_{ot}$ 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: | VoidNote 3: SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | VoidNote 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 $Es/Iot_{BB}$ 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 $\Delta MB_S$ 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 $2xTTI_{DCCH}$ 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<br>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.<br>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 beams[Note 7] | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 | |
| 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) | | | | | | |
| $N_{oc}$ Note2 | dBm/15kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1,2 | -95.7 | | -95.7 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| SS-RSRP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| Io Note3 | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: Void<br>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone<br>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 $2xTTI_{DCCH}$ 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<br>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.<br>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 beams[Note 7] | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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) | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| $\hat{E}_s$ | dBm/SCS | Config 1 | -87 | -87 | -Infinity | -87 |
| SSBRP Note 3 | dBm/SCS Note5 | Config 1,2 | -87 | -87 | -Infinity | -87 |
| $\hat{E}_s/I_{ot}$ 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.<br>Note 2: Void<br>Note 3: SSBRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: VoidNote 5: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone<br>Note 6: As observed with 0dBi gain antenna at the centre of the quiet zone<br>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<br>Note 8: Calculation of $Es/Iot_{BB}$ 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 $\Delta MB_S$ 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 $2xTTI_{DCCH}$ 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<br>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.<br>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 beams Note 7 | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | Config 1,2 | 66 | | 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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) | | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| Io Note3 | 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 $N_{oc}$ 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 $2xTTI_{DCCH}$ 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,<br>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.<br>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 $\mu$s | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | | Config 1,4 | 3ms | | Asynchronous cells.<br>The timing of Cell 3 is 3ms later than the timing of Cell 2. |
| | | Config 2,3,5,6 | 3$\mu$s | | 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 | NA | | Setup 1 as specified in clause A.3.15 | |
| Assumption for UE beams Note 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 | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 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 | 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 | | | |
| 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) | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1,2,3,4,5,6 | Link only, see clause A.3.7A | -Infinity | -87 |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2,3,4,5,6 | | -Infinity | -87 |
| $\hat{E}_s/I_{ot}$ BB Note 8 | dB | Config 1,2,3,4,5,6 | | -Infinity | 14.69 |
| Io Note3 | 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 $Es/Iot_{BB}$ 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 $\Delta MB_S$ 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 $2xTTI_{DCCH}$ 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,<br>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.<br>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 | | 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 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel 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.<br>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 | NA | | Setup 1 as specified in clause A.3.15 | |
| Assumption for UE beams[Note 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 | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |

| | | | | | |
|---|---|---|---|---|---|
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | 100: $N_{RB,c}$ = 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 | 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 | | |
| 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) | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | NA Link only, see clause A.3.7A | -104.7 | |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | | -Infinity | 9 |

| | | | | |
|---|---|---|---|---|
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | -Infinity | 9 |
| Io[Note3] | 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.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SSB_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 4: SSB_RP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone<br>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 $2xTTI_{DCCH}$ 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 Test 1 | Value Test 2 | Comment |
|---|---|---|---|---|---|
| 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.<br>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.<br>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 | NA | Setup 1 as specified in clause A.3.15 |
| Assumption for UE beams[Note 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 |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | 100: $N_{RB,c}$ = 66 |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | 100: $N_{RB,c}$ = 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 | 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 | |
| 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) | | | | | |
| $\hat{E}_s$ | dBm/SCS | Config 1,2,3,4,5,6 | Link only, see clause A.3.7A | -Infinity | -87 |
| SSB_RP Note 3 | dBm/SCS Note5 | Config 1,2,3,4,5,6 | | -Infinity | -87 |
| $\hat{E}_s/I_{ot}$ BB Note 8 | dB | Config 1,2,3,4,5,6 | | -Infinity | 14.69 |
| Io Note3 | 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-B_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 $Es/Iot_{BB}$ 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 $\Delta MB_S$ 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 $2xTTI_{DCCH}$ 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 frequenciy 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.<br>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.<br>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 T1 | Cell 2 T2 | Cell 3 T1 | Cell 3 T2 |
|---|---|---|---|---|---|---|
| AoA setup | | Config 1,2,3,4,5,6 | NA | | Setup 1 as specified in clause A.3.15 | |
| Assumption for UE beams Note 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 | |
| $BW_{channel}$ | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,4 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 2,5 | 10: $N_{RB,c}$ = 52 | | 100: $N_{RB,c}$ = 66 | |
| | | Config 3,6 | 40: $N_{RB,c}$ = 106 | | 100: $N_{RB,c}$ = 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 | 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 | | | |
| 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) | | | | | |
| $N_{oc}$ Note2 | dBm/15 kHz Note5 | | NA Link only, see clause A.3.7A | -104.7 | |
| $N_{oc}$ 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 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2,3,4,5,6 | | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2,3,4,5,6 | | -Infinity | 9 |
| Io Note3 | 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 $N_{oc}$ 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 $2xTTI_{DCCH}$ 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 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.5.6.3.1.2-1 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 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>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 SSS Note 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 beams Note 4 | 1~4 | | Rough | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -96 | | | |
| | 3,4 | | -93 | | | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ 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

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 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.5.6.3.2.2-1 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 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>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 SSS Note 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 beams Note 4 | 1~4 | | Rough | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -96 | | | |
| | 3,4 | | -93 | | | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ 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 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 | |

### 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 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~2 | | 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>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 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. | | | |

**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 beams Note 4 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ to be fulfilled.<br>Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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 + $G_{min}$ ≤ Reported RSRP(dBm) ≤CSI-RS _RP0 +δ + $G_{max}$ |
| CSI-RS1 | CSI-RS _RP1 -δ + $G_{min}$ ≤ Reported RSRP(dBm) ≤CSI-RS _RP1 +δ + $G_{max}$ |
| 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<br>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<br>Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

## A.5.6.3.4 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 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 | |

### 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 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| Data RBs allocated | 1~2 | | 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>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 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. | | | |

**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 beams Note 4 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ to be fulfilled.<br>Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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

After 1440ms 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 ~ +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.5.6.3.4.3-1.

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 + $G_{min}$ ≤ Reported RSRP(dBm) ≤CSI-RS _RP0 +δ + $G_{max}$ |
| CSI-RS1 | CSI-RS _RP1 -δ + $G_{min}$ ≤ Reported RSRP(dBm) ≤CSI-RS _RP1 +δ + $G_{max}$ |
| 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<br>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<br>Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

# A.5.6.4 CLI measurements

## A.5.6.4.1 SRS-RSRP measurement with DRX

### A.5.6.4.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of SRS-RSRP measurement. This test will verify the SRS-RSRP measurement requirements in clause 9.7.2.5 with the testing configurations for NR cells in Table A.5.6.4.1.1-1.

**Table A.5.6.4.1.1-1: Applicable NR configurations for FR2 SRS-RSRP test**

| Configuration | Description |
|---|---|
| 1 | NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |

### A.5.6.4.1.2 Test Parameters

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters for PSCell is given in Table A.5.6.4.1.2-1 ~ A.5.6.4.1.2-3 below 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 I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system transmits SRS resource for measurement in the DL slot according to the SRS configuration in Table A.5.6.4.1.2-4 and the test parameters for the (virtual) neighbour cell UE in Table A.5.6.4.1.2-3. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

**Table A.5.6.4.1.2-1: General test parameters for SRS-RSRP event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | E-UTRAN Cell 1 and NR Cell 2 | |
| RF Channel Number | | 1 | 1: Cell 1<br>2: Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR2 | |
| SMTC configuration | | 1 | SMTC.1 | |
| SRS configuration | | 1 | SRSConf.1 | Table A.5.6.4.1.2-4 |
| CP length | | 1 | Normal | |
| i1-Threshold | dBm | 1 | -103 | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | ms | 1 | DRX.11 | |
| Time offset between DL from serving cell and SRS from test system | μs | 1,2 | 10.67 | |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 1 | |

**Table A.5.6.4.1.2-2: NR Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | |
| OCNG Patterns | | 1 | OP.1 | |
| TRS configuration | | | TRS.2.1. TDD | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | |
| Propagation Condition | | 1 | AWGN | |

**Table A.5.6.4.1.2-3: NR OTA Cell specific test parameters for SRS-RSRP event triggered reporting for PSCell and Neighbour cell UE in FR2**

| Parameter | Unit | Test configuration | Cell 2 | | Neighbour cell UE | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1 | Setup 1 defined A.3.15.1 | | | |
| Beam assumption Note 4 | | 1 | Fine | | | |
| $N_{oc}$ Note 2 | dBm/15 kHz | 1 | -98 | | -98 | |
| $N_{oc}$ Note 2 | dBm/SCS | 1 | -89 | | -89 | |
| $\hat{E}_s/I_{ot}$ | dB | 1 | - | - | -infinity | 4 |
| $\hat{E}_s/N_{oc}$ | dB | 1 | - | - | -infinity | 4 |
| SRS-RSRP Note 3 | dBm/SCS kHz | 1 | - | - | -infinity | -94 |
| Io | dBm/95.04 MHz | 1 | -70.01 | -68.82 | -70.01 | -68.82 |

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 $N_{oc}$ to be fulfilled.
Note 3: SRS-RSRP 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

**Table A.5.6.4.1.2-4: SRS configuration for measurement reporting**

| | Field | SRSConf.1 | Comments |
|---|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 | |
| | srs-ResourceIdList | 0 | |
| | resourceType | Periodic | |
| | Usage | Codebook | |
| SRS-Resource | SRS-ResourceId | 0 | |
| | nrofSRS-Ports | Port1 | |
| | transmissionComb | n2 | |
| | combOffset-n2 | 0 | |
| | cyclicShift-n2 | 0 | |
| | resourceMapping startPosition | 0 | |
| | resourceMapping nrofSymbols | n1 | |
| | resourceMapping repetitionFactor | n1 | |
| | freqDomainPosition | 0 | |
| | freqDomainShift | 0 | |
| | freqHopping c-SRS | 12 | |
| | freqHopping b-SRS | 0 | |
| | freqHopping b-hop | 0 | |
| | groupOrSequenceHopping | Neither | |
| | resourceType | Periodic | |
| | periodicityAndOffset | sl160, 25 | |
| | sequenceId | 0 | Any 10 bit number |

#### A.5.6.4.1.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 60 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%.

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

### A.5.6.4.2 CLI-RSSI measurement with DRX

#### A.5.6.4.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of CLI-RSSI measurement. This test will verify the CLI-RSSI measurement requirements in clause 9.7.3.5 with the testing configurations for NR cells in Table A.5.6.4.2.1-1.

**Table A.5.6.4.2.1-1: Applicable NR configurations for FR2 CLI-RSSI test**

| Configuration | Description |
|---|---|
| 1 | NR 120 kHz SCS, 100 MHz bandwidth, TDD duplex mode |

### A.5.6.4.2.2 Test Parameters

Two cells are deployed in the test, which are E-UTRAN PCell (Cell 1) and FR2 PSCell (Cell 2). The test parameters for PSCell is given in Table A.5.6.4.2.2-1 ~ A.5.6.4.2.2-3 below 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 I1 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively.

During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI measurement resource and on 2 data symbols before. The CLI-RSSI measurement resource configuration is in Table A.5.6.4.2.2-4.

**Table A.5.6.4.2.2-1: General test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1 | E-UTRAN Cell 1 and NR Cell 2 | |
| RF Channel Number | | 1 | 1: Cell 1<br>2: Cell 2 | |
| SSB configuration | | 1 | SSB.1 FR2 | |
| SMTC configuration | | 1 | SMTC.1 | |
| CLI-RSSI configuration | | 1 | CLI-RSSIConf.1 | Table A.5.6.4.2.2-4 |
| CP length | | 1 | Normal | |
| i1-Threshold | dBm | 1 | -94.5 | |
| Hysteresis | dB | 1 | 0 | |
| Time To Trigger | s | 1 | 0 | |
| Filter coefficient | | 1 | 0 | L3 filtering is not used |
| DRX | | 1 | DRX.11 | |
| Time offset between DL from serving cell and OCNG from test system | μs | 1 | 10.67 | |
| T1 | s | 1 | 5 | |
| T2 | s | 1 | 1 | |

**Table A.5.6.4.2.2-2: NR Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| TDD configuration | | 1 | TDDConf.3.1 | |
| PDSCH RMC configuration | | 1 | SR.3.1 TDD | |
| PUSCH parameters | | 1 | N/A | |
| RMSI CORESET RMC configuration | | 1 | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1 | CCR.3.1 TDD | |
| OCNG Patterns Note 1 | | 1 | OP.1 | |
| TRS configuration | | | TRS.2.1. TDD | |
| PDSCH/PDCCH TCI state | | 1 | TCI.State.2 | |
| Initial BWP configuration | | 1 | DLBWP.0.1 ULBWP.0.1 | |
| Active DL BWP configuration | | 1 | DLBWP.1.1 | |
| Active UL BWP configuration | | 1 | ULBWP.1.1 | |
| Propagation Condition | | 1 | AWGN | |
| Note 1: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

**Table A.5.6.4.2.2-3: NR OTA Cell specific test parameters for CLI-RSSI event triggered reporting for PSCell in FR2**

| Parameter | Unit | Test configuration | Cell 2 | |
|---|---|---|---|---|
| | | | T1 | T2 |
| AoA setup | | 1 | Setup 1 defined in A.3.15.1 | |
| Beam assumption Note 3 | | 1 | Fine | |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/15 kHz | 1 | -119 | -108 |
| $N_{oc}$ on CLI-RSSI measurement resource Note 2 | dBm/SCS | 1 | -110 | -99 |
| Io on CLI-RSSI measurement resource | dBm/95.04 MHz | 1 | -81.01 | -70.01 |
| Io on CLI-RSSI measurement resource | dBm/1.08 MHz | 1 | -100.46 | -89.46 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>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 $N_{oc}$ to be fulfilled.<br>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. | | | | |

**Table A.5.6.4.2.2-4: CLI-RSSI measurement resource configuration for measurement reporting**

| | Field | CLI-RSSIConf.1 |
|---|---|---|
| RSSI-Resource | rssi-ResourceId | 0 |
| | rssi-SCS | 120 |
| | startPRB | 0 |
| | nrofPRBs | 66 |
| | startPosition | 3 |
| | nrofSymbols | 11 |
| | rssi-PeriodicityAndOffset | sl160, 25 |

#### A.5.6.4.2.3 Test Requirements

The UE shall send one Event I1 triggered measurement report, with a measurement reporting delay less than 20 ms from the beginning of time period T2. The nominal RSSI used to evaluate the requirement shall be based on Io.

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 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.5.6.5 Measurements with autonomous gaps

### A.5.6.5.1 EN-DC inter-frequency CGI identification of NR neighbor cell in FR2

#### A.5.6.5.1.1 Test Purpose and Environment

This test is to verify the requirement for identification of a new CGI of NR cell with autonomous gaps in clause 9.11.

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.5.6.5.1.1-1, A.5.6.5.1.1-2, and A.5.6.5.1.1-3.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE does not have any timing information of cell 3 Starting T2, cell 3 becomes detectable and the UE is expected to detect and send a measurement report with SSB index. In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. Gap pattern configuration with id #0 is configured before T2 begins to enable inter-frequency monitoring.

A RRC message implying SI reading with autonomous gap shall be sent to the UE during period T2, within 3s after the UE has reported Event A3. The RRC message shall create a measurement report configuration with *reportCGI* and *useAutonomousGaps-r16* setup. The start of T3 is the instant when the last TTI containing the RRC message implying SI reading is sent to the UE. Measurement gaps shall be deconfigured before the start of T3.

PDCCHs indicating new transmissions shall be sent continuously to ensure that the UE would have ACK/NACK sending during identifying a new CGI of NR cell.

The configuration of LTE cell 1 is defined in table A.3.7.2.2-1. Supported test configurations are shown in table A.5.6.5.1.1-1.

**Table A.5.6.5.1.1-1 Supported test configurations for EN-DC inter-frequency CGI identification of NR neighbor cell in 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<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

**Table A.5.6.5.1.1-2: General test parameters for EN-DC inter-frequency CGI identification of NR neighbor cell in FR2**

| Parameter | Unit | Test configuration | Value | Comment |
|---|---|---|---|---|
| E-UTRA RF Channel Number | | Config 1,2 | 1 | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | Two FR1 NR carrier frequencies is 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.<br>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 | As specified in clause 9.1.2-1. |
| Measurement gap offset | | Config 1,2 | 39 | |
| SMTC-SSB parameters | | Config 1,2 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1,2 | [-30] | |
| 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 | |
| T3 | s | Config 1,2 | 5 | |

**Table A.5.6.5.1.1-3: Cell specific test parameters for EN-DC inter-frequency CGI identification of NR neighbor cell in FR2**

| Parameter | Unit | Test configuration | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2, T3 | T1 | T2, T3 |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 | | | |
| 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 | |
| PDSCH Reference measurement channel | | Config 1,2 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | | Config 1,2 | CR.3.1 TDD | | - | |
| RMSI scheduling periodicity | ms | Config 1,2 | NA | | 40 | |
| TRS configuration | | Config 1,2 | TRS.2.1 TDD | | NA | |
| TCI configuration | | Config 1,2 | CSI-RS.Config.0 | | 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) | | | | | | |
| Propagation Condition | | Config 1,2 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |

**Table A.5.6.5.1.1-4: OTA cell specific test parameters for EN-DC inter-frequency CGI identification of NR neighbor cell in FR2**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2, T3 | T1 | T2, T3 |
| AoA setup | | Config 1,2 | Setup 1 defined in A.3.15.1 | | | |
| Assumption for UE beams Note 4 | | Config 1,2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 4 | 4 | -Infinity | -3 |
| $N_{oc}$ Note 2 | dBm/15 KHz | Config 1,2 | -102 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1, 2 | -93 | | | |
| SS-RSRP | dBm/SCS | 1, 2 | -89 | -89 | -Infinity | -96 |
| $\hat{E}_s/N_{oc}$ | dB | 1~4 | 4 | 4 | -Infinity | -3 |
| $Io$ | dBm/95.04MHz | 1~4 | -58.56 | | -62.25 | |

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 $N_{oc}$ to be fulfilled.
Note 3: SS-RSRP 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: As observed with 0dBi gain antenna at the centre of the quiet zone

### A.5.6.5.1.2 Test Requirements

The UE shall transmit a measurement report containing the cell global identifier of cell 3 within 775 milliseconds from the start of T3.

Test requirement = RRC Procedure delay + $T_{identify\_CGI}$ + processing time for FR2 + reporting delay

= 10 + (25*20 + 6*40) + 20 + 2ms from the start of T3

= 772 ms, allow 775 ms.

The UE shall be scheduled continuously throughout the test, and from the start of T3 until 775 ms the number of interrupted slots shall not exceed the allowed number as defined in clause 8.2.1.2.16.

The maximum number of interrupted slots allowed is 6*48 + 12*49 = 876.

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 $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.6 L1-SINR measurement for beam reporting

#### A.5.6.6.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured when DRX is used

##### A.5.6.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.1, with the testing configurations for NR cells in Table A.5.6.6.1.1-1.

**Table A.5.6.6.1.1-1: Applicable NR configurations for FR2 CSI-RS based L1-SINR 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 | |

##### A.5.6.6.1.2 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.5.6.6.1.2-1 and Table A.5.6.6.1.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR 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-SINR on aperiodic CSI-RS resources. After 480ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.6.1.2-1.

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.5.6.6.1.2-1: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 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<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| 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-r16 | 1~2 | | cri-SINR-r16 |
| Number of reported RS | 1~2 | | 2 |
| qcl-Info | 1~2 | | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList | 1~2 | | 26 |
| 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 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. | | | |

**Table A.5.6.6.1.2-1: 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 | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 0 | 9 |
| CSI-RS RSRP Note3 | 1~2 | dBm/SSB SCS | -95.97 | -86.97 |
| Io Note2 | 1~2 | dBm/95.04MHz | -63.97 | -57.47 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ to be fulfilled.<br>Note 3: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

#### A.5.6.6.1.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 and CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.28.1.

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 2xTTI$_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.6.2 L1-SINR measurement with SSB based CMR and dedicated IMR when DRX is not used

#### A.5.6.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements in clause 9.8.4.2, with the testing configurations for NR cells in Table A.5.6.6.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15

**Table A.5.6.6.2.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| 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.5.6.6.2.2 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.5.6.6.2.2-1 and Table A.5.6.6.2.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the SSBs and the associated CSI-RS resources, 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 and BFD measurements based on the SSBs, and UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

**Table A.5.6.6.2.2-1: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1~4 | | TDD |
| TDD Configuration | 1~4 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~4 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~4 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~4 | | CCR.3.1 TDD |
| SSB configuration | 1,2 | | SSB.1 FR2 |
| | 3,4 | | SSB.2 FR2 |
| CSI-RS configuration | 1~4 | | CSI-RS.3.1A TDD |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>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-r16 | 1~4 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~4 | | 2 |
| L1-SINR reporting period | 1~4 | slot | 640 |
| 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 SSS Note 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.5.6.6.2.2-2: 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 | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1,2 | dBm/SSB SCS | -96 | | | |
| | 3,4 | | -93 | | | |
| $\hat{E}_s/I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| SSB RSRP Note3 | 1,2 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
| | 3,4 | | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1,2 | dBm/95.04MHz | -67.5 | -67.5 | -71.1 | -60.7 |
| | 3,4 | | -67.5 | -67.5 | -71.1 | -60.7 |
| $\hat{E}_s/N_{oc}$ | 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 $N_{oc}$ to be fulfilled.
Note 3: SSB RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

**Table A.5.6.6.2.2-3: CSI-RS specific test parameters**

| Parameter | Config | Unit | CSI-RS#0 | | CSI-RS#1 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| Angle of arrival configuration | | | Setup 1 according to A.3.15.1 | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/15kHz | -105 | | | |
| $N_{oc}$ Note2 | 1~4 | dBm/CSI-RS SCS | -96 | | | |
| $\hat{E}_s/I_{ot}$ | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | 1~4 | dB | 0 | 0 | -Infinity | 9 |
| CSI-RS RSRP Note3 | 1,2 | dBm/ CSI-RS SCS | -96 | -96 | -Infinity | -87 |
| Io Note3 | 1,2 | dBm/95.04MHz | -67.5 | -67.5 | -71.1 | -60.7 |

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 $N_{oc}$ 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.5.6.6.2.3 Test Requirements

The UE shall send L1-SINR report every 640 slots. No later than X ms plus 640 slots from the beginning of time period T2, UE shall send L1-SINR report including the results for both SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 while meeting the accuracy requirements defined in clause 10.1.28.2, where X is

- 2880 for UE supporting power class 1
- 1920 for UE supporting power class 2, 3 or 4.

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 $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

### A.5.6.6.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR configured when DRX is not used

#### A.5.6.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of L1-SINR measurement. This test will partly verify the L1-SINR measurement requirements with CSI-RS based CMR and dedicated IMR cofigured in clause 9.8.4.3, with the testing configurations for NR cells in Table A.5.6.6.3.1-1.

**Table A.5.6.6.3.1-1: Applicable NR configurations for FR2 L1-SINR test with CMR and dedicated IMR**

| 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.5.6.6.3.2 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.5.6.6.3.2-1 and Table A.5.6.6.3.2-2 below.

In CSI measurement configuration, UE is indicated to perform L1-SINR measurement on the configured CSI-RS as CMR and an associated CSI-IM as IMR, and report aperiodically. The test consists of a single time period T1, during which the UE is triggered via DCI to report L1-SINR on aperiodic CSI-RS resources and the associated IMR. UE is also configured to measure L1-SINR based on SSB. After 480ms from the beginning of the test, the DCI trigger comes in slot 8 of a frame and UE provides the report back based on the reporting configuration as defined in Table A.5.6.6.3.2-1.

There is no measurement gap configured in the test. Before the test, UE is configured to perform RLM and BFD based on the SSBs, and UE is configured to perform L1-SINR measurement based on the CSI-RS as CMR and the CSI-IM as IMR.

**Table A.5.6.6.3.2-1: General test parameters**

| Parameter | Config | Unit | Value |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| CSI-RS configuration | 1~2 | | CSI-RS.3.3 TDD |
| CSI-IM configuration | 1~2 | | CSI-IM.3.2 TDD |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 |
| 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-r16 | 1~2 | | cri-SINR-r16 |
| Number of reported RS | 1~2 | | 2 |
| qcl-Info | 1~2 | | SSB#0 for resource#0<br>SSB#1 for resource#1 |
| reportSlotOffsetList | 1~2 | | 26 |
| T1 | 1~2 | s | 5 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | 1~2 | dB | 0 |
| Propagation condition | 1~2 | | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

**Table A.5.6.6.3.2-2: 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 beams Note 3 | 1~2 | | Rough | |
| $N_{oc}$ Note1 | 1~2 | dBm/15kHz | -105 | |
| $N_{oc}$ Note1 | 1~2 | dBm/SSB SCS | -95.97 | |
| $\hat{E}_s/I_{ot}$ | 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 |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 0 | 9 |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: CSI-RS RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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.5.6.6.3.3 Test Requirements

After 480ms from the beginning of the test, the UE shall send L1-SINR report at slot 26 from the reception of DCI triggering the L1-SINR measurement. The L1-SINR report shall include the results for both CSI-RS#0 as CMR + CSI-IM#0 as IMR and CSI-RS#1 as CMR + CSI-IM#1 as IMR while meeting the accuracy requirements defined in clause 10.1.28.3. The reported L1-SINR value shall consider the Rx antenna gain in the range of [-10 ~ +20] dB when calculated.

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 2x$TTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## A.5.6.7 CSI-RS based Intra-frequency Measurements

### A.5.6.7.1 EN-DC event triggered reporting test without gap under non-DRX

#### A.5.6.7.1.1 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 identification requirements in clause e. Supported test configurations are shown in table A.5.6.7.1.1-1.

**Table A.5.6.7.1.1-1: supported test configurations**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, 120 kHz SSB SCS, 120Khz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 120Khz 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. | |

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.5.6.7.1.1-2, A.5.6.7.1.1-3 and A.5.6.7.1.1-4 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.5.6.7.1.1-2: General test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Value | Comment |
|---|---|---|---|---|
| Active cell | | 1,2 | E-UTRAN PCell (Cell 1)<br>PSCell (Cell 2) | |
| Neighbour cell | | 1,2 | Cell 3 | Cell to be identified. |
| RF Channel Number | | 1,2 | 1: Cell 1<br>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 | | 1,2 | SMTC.1 | |
| A3-Offset | dB | 1,2 | -6 | |
| 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 | OFF | |
| Time offset between Cell 1 and Cell 2 | μs | 1,2 | 3 | Synchronous EN-DC |
| Time offset between Cell 2 and Cell 3 | μs | 1,2 | 0.58 | Synchronous cells |
| T1 | s | 1,2 | 5 | |
| T2 | s | 1,2 | 5 | |

**Table A.5.6.7.1.1-3: NR Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| TDD configuration | | 1,2 | TDDConf.3.1 | | TDDConf.3.1 | |
| $BW_{channel}$ | MHz | 1,2 | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Intial 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 | |
| PDSCH RMC configuration | | 1,2 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration | | 1,2 | CR.3.1 TDD | | CR.3.1 TDD | |
| Dedicated CORESET RMC configuration | | 1,2 | CCR.3.1 TDD | | CCR.3.1 TDD | |
| OCNG Patterns | | 1,2 | OP.1 | | OP.1 | |
| TRS configuration | | 1,2 | TRS.2.1 TDD | | N/A | |
| PDSCH/PDCCH TCI state | | 1,2 | TCI.State.2 | | N/A | |
| SMTC configuration | | 1, 2 | SMTC.1 | | SMTC.1 | |
| SSB configuration | | 1,2 | SSB.3 FR2 | | SSB.3 FR2 | |
| CSI-RS RRM configuration | | 1,2 | CSI-RS.RRM.FR2.1 TDD | | CSI-RS.RRM.FR2.1 TDD | |
| Propagation Condition | | 1,2 | AWGN | | | |

**Table A.5.6.7.1.1-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for EN-DC with PSCell in FR2 without gap without DRX**

| Parameter | Unit | Config | Cell 2 | | Cell 3 | |
|---|---|---|---|---|---|---|
| | | | T1 | T2 | T1 | T2 |
| AoA setup | | 1,2 | Setup 3 defined in A.3.15.3 | | | |
| | | | AoA1 | | AoA2 | |
| Assumption for UE beams Note 4 | | 1,2 | Rough | | Rough | |
| $\hat{E}_s/I_{ot}$ | dB | 1,2 | 4 | 4 | -Infinity | 8 |
| $N_{oc}$ Note 2 | dBm/15 KHz | 1,2 | -102 | | | |
| $N_{oc}$ Note 2 | dBm/SCS | 1,2 | -93 | | | |
| SS-RSRP | dBm/SCS | 1,2 | -89 | -89 | -Infinity | -85 |
| CSI-RSRP | dBm/SCS | 1,2 | -89 | -89 | -Infinity | -85 |
| $\hat{E}_s/N_{oc}$ | dB | 1,2 | 4 | 4 | -Infinity | 8 |
| $Io$ | dBm/95.04MHz | 1,2 | -58.56 | | -55.38 | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.<br>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 $N_{oc}$ to be fulfilled.<br>Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>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.5.6.7.1.2 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

- 3.2s for a UE supporting power class 1,
- 2.16s 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 in order to detect associated SSB for the CSI-RS resource of Cell 3.

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.5.6.8 CSI-RS based Inter-frequency Measurements

### A.5.6.8.1 EN-DC event triggered reporting tests for NR FR2 cell when DRX is used

#### A.5.6.8.1.1 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 9.10.3.

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.5.6.8.1.1-1, A.5.6.8.1.1-2, and A.5.6.8.1.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.5.6.8.1.1-2 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. 5.6.7.1.1-2 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 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.3.7.2.2-1. Supported test configurations are shown in table A.5.6.8.1.1-1.

**Table A.5.6.8.1.1-1 EN-DC event triggered reporting tests for FR2-FR2**

| Config | Description |
|---|---|
| 1 | LTE FDD, 120 kHz SSB SCS, 120 kHz CSI-RS SCS,100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, 120 kHz SSB SCS, 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurations<br>Note 2: target NR cell has the same SCS, BW and duplex mode as NR serving cell | |

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

**Table A.5.6.8.1.1-2: General test parameters for EN-DC inter-frequency event triggered reporting with SSB time index detection with DRX**

| Parameter | Unit | Test configuration | Value | | Comment |
|---|---|---|---|---|---|
| | | | Test 1 | Test 3 | |
| E-UTRA RF Channel Number | | Config 1,2 | 1 | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number | | Config 1,2 | 1, 2 | | Two FR2 NR carrier frequencies is 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.<br>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 | | As specified in clause A.3.3.3 |
| Time offset between PCell and PSCell | µs | Config 1,2 | 3 | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | µs | Config 1,2 | 0.58 | | Synchronous cells |
| T1 | s | Config 1,2 | 5 | | |
| T2 | s | Config 1,2 | 11 for PC1; 6.5 for other PC | 11 for PC1; 6.5 for other PC | |

**Table A.5.6.8.1.1-3: 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 beams Note 7 | | Config 1,2 | Rough | | Rough | |
| NR RF Channel Number | | Config 1,2 | 1 | | 2 | |
| Duplex mode | | Config 1,2 | TDD | | TDD | |
| $BW_{channel}$ | MHz | Config 1,2 | 10: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| BWP BW | MHz | Config 1,2 | 10: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 | |
| PDSCH Reference measurement channel | | Config 1,2 | SR.3.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2 | 120 | | 120 | |
| CORESET Reference Channel | | Config 1,2 | CR.3.1 TDD | | - | |
| TRS configuration | | Config 1,2 | TRS.2.1 TDD | | NA | |
| TCI configuration | | Config 1,2 | CSI-RS.Config.0 | | NA | |
| SMTC configuration defined in A.3.11 | | Config 1,2 | SMTC.1 | | SMTC.1 | |
| CSI-RS RRM configuration | | Config 1,2 | CSI-RS.RRM.FR2.1 TDD | | CSI-RS.RRM.FR2.1 TDD | |
| firstOFDMSymbolInTimeDomain | | Config 1,2 | 7 | | 12 | |
| $N_{oc}$ Note2 | dBm/15kHz Note5 | | -104.7 | | -104.7 | |
| $N_{oc}$ Note2 | dBm/SCS Note4 | Config 1,2 | -95.7 | | -95.7 | |
| CSI-RSRP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
| SS-RSRP Note 3 | dBm/SCS Note5 | Config 1,2 | -89.7 | -89.7 | -Infinity | -86.7 |
| $\hat{E}_s/I_{ot}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| $\hat{E}_s/N_{oc}$ | dB | Config 1,2 | 6 | 6 | -Infinity | 9 |
| Io Note3 | dBm/95.04 MHz Note5 | Config 1,2 | -59.7 | -59.7 | -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 $N_{oc}$ to be fulfilled. |
| Note 3: | SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |
| Note 4: | SS-RSRP and CSI-RSRP 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.5.6.8.1.2 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 ms for UE supporting power class 1, or

6240 ms for UE supporting other power class.

In test 1, and 2 UE is required to report SSB time index. The UE is required to read the neighbour cell SSB index in this test in order to detect associated SSB for the CSI-RS resource of Cell 3.

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 $2xTTI_{DCCH}$ higher than the measurement reporting delays above because of TTI insertion uncertainty of the measurement report in DCCH.

## 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**

| Parameter Note 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 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Data RBs allocated | | | 24 | | 24 | |
| 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. 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 SSS Note 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.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>Note 5: All parameters apply for configuration 1 and 2<br>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 beams Note 8 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -91.6 | | N/A | |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -82.6 | | N/A | |
| $\hat{E}_s/N_{oc}$ | dB | 6.0 | 1.0 | N/A | N/A |
| $E_s$ | dBm/SCS Note4 | | | (Table B.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| SSB_RP Note2 | 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) |
| $\hat{E}_s/I_{ot\ BB}$ Note6 | dB | 2.44 | -5.98 | -5.98 | -5.98 |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.<br>Note 2: SSB_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Void<br>Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 5: Void<br>Note 6: Calculation of $Es/Iot_{BB}$ 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 $\Delta MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.<br>Note 7: All parameters apply for configurations 1 and 2<br>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 +$G_{min}$ ≤ Reported RSRP(dBm) ≤ SSB_RP2 +δ +$G_{max}$ |
| Cell 3 | SSB_RP3 -δ +$G_{min}$ ≤ Reported RSRP(dBm) ≤ SSB_RP3 +δ +$G_{max}$ |
| 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<br>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<br>Note 3: $G_{min}$ and $G_{max}$ 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 |
| $BW_{channel}$ | 1~4 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 SSS Note 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 beams Note 7 | 1~4 | | Rough | | Rough | |
| $N_{oc}$ Note1 | 1, 2 | dBm/15kHz Note4 | -90.6 | -90.6 | (Table B.2.3-2 Rx Beam Peak Note 8 +1.97dB) | (Table B.2.3-2 Rx Beam Peak Note 8 -3.03dB) |
| | 3, 4 | | -93.7 | -93.7 | | |
| $N_{oc}$ Note1 | 1, 2 | dBm/SCS Note4 | -81.6 | -81.6 | (Table B.2.3-2 Rx Beam Peak Note 8 +11.0dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +6.0dB) |
| | 3, 4 | | -81.7 | -81.7 | (Table B.2.3-2 Rx Beam Peak Note 8 +14.0dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +9.0dB) |
| $\hat{E}_s/N_{oc}$ | 1~4 | dB | 6.0 | 6.0 | 17.0 | -1.0 |
| SSB_RP Note2 | 1, 2 | dBm/SCS | -75.6 | -75.6 | (Table B.2.3-2 Rx Beam Peak Note 8 +28.0dB) | (Table B.2. 3-2 Rx Beam Peak Note 8 +5.0dB) |
| | 3, 4 | | -75.7 | -75.7 | (Table B.2.3-2 Rx Beam Peak Note 8 +31.0dB) | (Table B.2. 3-2 Rx Beam Peak Note 8 +8.0dB) |
| ($SSB\_RP_{Cell 2}$ – $SSB\_RP_{Cell 3}$) | 1~4 | dB | 0 | | 23.00 | |
| $\hat{E}_s/I_{ot\ BB}$ Note6 | 1, 2 | dB | 5.26 | 5.96 | 9.53 | -3.46 |
| | 3, 4 | | 4. 61 | 5.91 | | |
| Io Note2 | 1, 2 | dBm/95.04 MHz Note4 | -50.00 | -50.00 | (Table B.2.3-2 Rx Beam Peak Note 8 +52.68dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +33.13dB) |
| | 3, 4 | | -50.09 | -50.09 | (Table B.2.3-2 Rx Beam Peak Note 8 +55.69dB) | (Table B.2.3-2 Rx Beam Peak Note 8 +36.14dB) |
| ($Io_{freq 1}$ – $Io_{freq 2}$) | 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 $N_{oc}$ to be fulfilled. |
| Note 2: | SSB_RP, Es/Iot, Io, ($SSB\_RP_{Cell\ 3}$ – $SSB\_RP_{Cell\ 2}$) and ($Io_{freq\ 2}$ – $Io_{freq\ 1}$) 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 $Es/Iot_{BB}$ 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 $\Delta MB_P$ or $\Delta MB_S$ 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 $SCS_{SSB}$ = 120 kHz, selected according to the operating band of Cell 3 and UE power class, without $\Delta MB_{P,n}$ 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.

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 $-\delta + G_{min} + X \le$ Reported RSRP(dBm) $\le$ SSB_RP2 $+\delta + G_{max}$ |
| Cell 3 | SSB_RP3 $-\delta + G_{min} \le$ Reported RSRP(dBm) $\le$ SSB_RP3 $+\delta + G_{max}$ |
| 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<br>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<br>Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class<br>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 |
|---|---|
| Cell 3 – Cell 2 | SSB_RP3 - SSB_RP2 -δ ≤ Reported RSRP(dB) ≤ SSB_RP3 - SSB_RP2 +δ –(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<br>Note 2: δ is the RSRP relative accuracy requirement from Table 10.1.5.1.2-1<br>Note 3: Void<br>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.5.7.1.3 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 |
| $BW_{channel}$ | 1,4 | MHz | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 | 10: $N_{RB,c}$ = 52 | 100: $N_{RB,c}$ = 66 |
| | 2,5 | | 10: $N_{RB,c}$ = 52 | | 10: $N_{RB,c}$ = 52 | |
| | 3,6 | | 40: $N_{RB,c}$ = 106 | | 40: $N_{RB,c}$ = 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 SSS[Note 1] | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | | | |
| Propagation condition | 1~6 | - | NA | AWGN | NA | AWGN |
| Antenna configuration | 1~6 | - | Link only, see clause A.3.7A | 1x2 | Link only, see clause A.3.7A | 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.<br>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 beams Note 4 | | | N/A | Rough | N/A | Rough |
| $N_{oc}$ | 1~6 | dBm/15 kHz | Link only, see clause A.3.7A | -90 | Link only, see clause A.3.7A | NA |
| $N_{oc}$ | 1~6 | dBm/SSB SCS | | -80.97 | | NA |
| $\hat{E}_s/N_{oc}$ | 1~6 | dB | | 5 | | NA |
| $E_s$ | 1~6 | dBm/SCS | | | | (Table B.2.3-2 Spherical coverage +1dB) |
| SSB_RP Note1 | 1~6 | dBm/SCS | | -76.0 | | (Table B.2.3-2 Spherical coverage +1dB) |
| $\hat{E}_s/I_{ot\ BB}$ Note6 | 1~6 | dB | | 4.35 | | -3.81 |
| Io Note1 | 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.<br>Note 2: Void<br>Note 3: No additional noise is added by the test system in Test 2.<br>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<br>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 $N_{oc}$ to be fulfilled.<br>Note 6: Calculation of Es/$Iot_{BB}$ 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 $\Delta MB_S$ 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.

### 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 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 SSS Note 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.<br>Note 2: Void<br>Note 3: Void<br>Note 4: Void<br>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 beams Note 9 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -95 | | -95 | |
| $N_{oc}$ Note1 | dBm/SCS Note 3 | -86 | | -86 | |
| $\hat{E}_s/N_{oc}$ | dB | 3 | | 3 | |
| SSB_RP Note2 | dBm/SCS Note4 | -83 | -83 | -89 | -89 |
| SS-RSRQ Note2 | dB | -14.77 | -14.77 | -16.81 | -16.81 |
| $\hat{E}_s/I_{ot}$ | dB | -1.76 | -1.76 | -4.76 | -4.76 |
| Io Note2 | dBm/95.04 MHz Note4 | -50 | | -54 | Io Note2 |

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 $N_{oc}$ 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 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 | - |
| 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 | - |
| 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 SSS Note 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.<br>Note 2: Void<br>Note 3: Void<br>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 A.3.15 | | Setup 1 in clause A.3.15 | |
|---|---|---|---|---|---|
| Assumption for UE beams[Note 8] | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -94.03 | | -94.03 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -85.0 | | -85.0 | |
| $\hat{E}_s/N_{oc}$ | dB | -1.75 | | -1.75 | |
| SSB_RP Note2 | dBm/SCS Note4 | -86.75 | -86.75 | -88 | -88 |
| SS-RSRQ Note2 | dB | -14.75 | -14.75 | -15.56 | -15.56 |
| $\hat{E}_s/I_{ot}$ | dB | -1.75 | -1.75 | -3 | -3 |
| Io Note2 | 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 $N_{oc}$ 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 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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<br>EPRE ratio of PBCH_DMRS to SSS<br>EPRE ratio of PBCH to PBCH_DMRS<br>EPRE ratio of PDCCH_DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH_DMRS<br>EPRE ratio of PDSCH_DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH_DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | dB | 0 | 0 | 0 | 0 |
| 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.<br>Note 2: Void<br>Note 3: Void<br>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 beams Note 9 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | | -105 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | | -96 | |
| $\hat{E}_s/N_{oc}$ | dB | 4.54 | | 2.66 | |
| SS-RSRP Note2 | dBm/SCS Note4 | -91.46 | -93.34 | -99 | -99 |
| SS-SINR Note2 | dB | 0 | -3.2 | -4.76 | -4.76 |
| $\hat{E}_s/I_{ot}$ | dB | 0 | -3.2 | -4.76 | -4.76 |
| Io Note2 | 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 $N_{oc}$ 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

clauseThe 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.5.7.3.2.2-1: 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 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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<br>EPRE ratio of PBCH_DMRS to SSS<br>EPRE ratio of PBCH to PBCH_DMRS<br>EPRE ratio of PDCCH_DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH_DMRS<br>EPRE ratio of PDSCH_DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH_DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| 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.<br>Note 2: Void<br>Note 3: Void<br>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 beams Note 10 | | Rough | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | -105 | -105 | -105 | -105 | -105 |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | -96 | -96 | -96 | -96 | -96 |
| $\hat{E}_s/N_{oc}$ | dB | -0.5 | | -0.5 | | 11 | |
| SS-RSRP Note2 | dBm/SCS Note4 | -96.5 | -96.5 | -85 | -85 | -99 | -99 |
| SS-SINR Note2 | dB | -0.5 | -0.5 | 11 | 11 | -3.0 | -3.0 |
| $\hat{E}_s/I_{ot}$ | dB | -0.5 | -0.5 | 11 | 11 | -3.0 | -3.0 |
| Io Note2 | dBm/95.04 MHz Note4 | -69.3 | | -55.4 | | -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 $N_{oc}$ 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 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 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<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>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 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.<br>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 $N_{oc}$ 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 beams Note 4 | | | Rough | | Rough | |
| $N_{oc}$ | 1~4 | dBm/15 kHz | -100 | | n.a. | |
| $N_{oc}$ | 1,2 | dBm/SS B SCS | -91 | | n.a. | |
| | 3,4 | | -88 | | n.a. | |
| $\hat{E}_s/I_{ot}$ | 1~4 | dB | 10 | -2 | n.a. | |
| SSB_RP Note1 | 1,2 | dBm/SC S | -81 | -93 | As in Table B.2.4-2 | |
| | 3,4 | | -78 | -90 | As in Table B.2.4-2 | |
| Io Note1 | 1~4 | dBm/ 95.04M Hz | -51.57 | | SSB_RP+28.98 | |
| $\hat{E}_s/N_{oc}$ | 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 and absolute accuracy of 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.

For Test 2:

Absolute accuracy of SSB0 and absolute accuracy of 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 + $G_{min}$ ≤ Reported RSRP(dBm) ≤ SSB_RP0 +δ + $G_{max}$ |
| SSB1 | SSB_RP1 -δ + $G_{min}$ ≤ Reported RSRP(dBm) ≤ SSB_RP1 +δ + $G_{max}$ |
| 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<br>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<br>Note 3: $G_{min}$ and $G_{max}$ 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 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 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<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 | DLBWP.1.1<br>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 configutaion | 1~2 | | 1x2 | 1x2 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | 1~2 | dB | 0 | 0 |
| 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.<br>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 $N_{oc}$ 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 beams Note 4 | | | Rough | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -100 | | n.a. | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -91 | | n.a.<br>n.a. | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 10 | -2 | n.a. | |
| CSI-RS-RSRP Note1 | 1~2 | dBm/SCS | -81 | -93 | As in Table B.2.4-2 | |
| Io Note1 | 1~2 | dBm/ 95.04MHz | -59.86 | | SS-RSRP+28.98 | |
| $\hat{E}_s/N_{oc}$ | 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 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.5.7.4.2.3-1.

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-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.5.7.4.2.3-1.

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 + $G_{min}$ ≤ Reported RSRP(dBm) ≤CSI-RS _RP0 +δ + $G_{max}$ |
| CSI-RS1 | CSI-RS _RP1 -δ + $G_{min}$ ≤ Reported RSRP(dBm) ≤CSI-RS _RP1 +δ + $G_{max}$ |
| 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<br>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<br>Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

## A.5.7.5 CLI measurements

### A.5.7.5.1 EN-DC SRS-RSRP measurement accuracy with FR2 serving cell

#### A.5.7.5.1.1 Test Purpose and Environment

The purpose of this test is to verify that the SRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.1.1 with the testing configurations for NR cells in Table A.5.7.5.1.1-1.

**Table A.5.7.5.1.1-1: Applicable NR configurations for FR2 SRS-RSRP accuracy test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SRS 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.5.7.5.1.2 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.5.7.5.1.2-1 and A.5.7.5.1.2-2 below. The test parameter for the (virtual) neighbor cell UE transmitting SRS are given in Table A.5.7.5.1.2-2.

Before the test UE is configured to perform SRS-RSRP measurement. During the test, the test system transmits SRS resources for measurement in the DL slots according to the SRS configuration in Table A.5.7.5.1.2-3. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on SRS symbol to be transmitted and on 2 data symbols before SRS to be transmitted.

**Table A.5.7.5.1.2-1: FR2 test parameters for SRS-RSRP accuracy**

| 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 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 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.3 FR2 | SSB.3 FR2 |
| OCNG Patterns | 1~2 | | OP.1 | OP.1 |
| TRS configuration | 1~2 | | TRS.2.1 TDD | TRS.2.1 TDD |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and SRS from test system | 1~2 | μs | 10.76 | 10.67 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | 1~2 | dB | 0 | 0 |
| Propagation condition | 1~2 | | AWGN | AWGN |
| Antenna configuration | 1~2 | | 1x2 | 1x2 |
| SRS configuration | 1~2 | | SRSConf.1 | SRSConf.1 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | |

**Table A.5.7.5.1.2-2: SRS-RSRP accuracy OTA related test parameters for PSCell and Neighbour cell UE in FR2**

| Parameter | Unit | T1 | T2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined A.3.15.1 | Setup 1 defined A.3.15.1 |
| Beam assumption Note 5 | | Fine | Fine |
| $N_{oc}$ Note1 | dBm/15kHz Note3 | -100 | N/A |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -91 | N/A |
| $\hat{E}_s/N_{oc}$ | dB | 2 | N/A |
| $E_s$ | dBm/SCS Note3 | | (Table B.2.7-2 Rx Beam Peak) |
| SRS_RP Note2 | dBm/SCS | -89 | (Table B.2.7-2 Rx Beam Peak) |
| $\hat{E}_s/I_{ot\ BB}$ Note4 | dB | >1 | 1 |
| Io Note2 | dBm/95.04 MHz Note3 | -57.89 | (Table B.2.7-2 Rx Beam Peak +50.79dB) |

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 $N_{oc}$ to be fulfilled.
Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone
Note 4: Calculation of $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.
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.

**Table A.5.7.5.1.2-3: SRS configuration parameters for FR2 SRS-RSRP accuracy**

| | Field | SRSConf.1 |
|---|---|---|
| SRS-ResourceSet | srs-ResourceSetId | 0 |
| | srs-ResourceIdList | 0 |
| | resourceType | Periodic |
| | Usage | Codebook |
| SRS-Resource | SRS-ResourceId | 0 |
| | nrofSRS-Ports | Port1 |
| | transmissionComb | n2 |
| | combOffset-n2 | 0 |
| | cyclicShift-n2 | 0 |
| | resourceMapping startPosition | 0 |
| | resourceMapping nrofSymbols | n1 |
| | resourceMapping repetitionFactor | n1 |
| | freqDomainPosition | 0 |
| | freqDomainShift | 0 |
| | freqHopping c-SRS | 12 |
| | freqHopping b-SRS | 0 |
| | freqHopping b-hop | 0 |
| | groupOrSequenceHopping | Neither |
| | resourceType | Periodic |
| | periodicityAndOffset-p | sl160,25 |
| | sequenceId | 0 |

### A.5.7.5.1.3 Test Requirements

The SRS-RSRP measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.1.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table A.5.7.5.1.3-1.

During T2:

The UE is deemed to meet the requirement if the reported SRS-RSRP is in the range shown in table A.5.7.5.1.3-1.

**Table A.5.7.5.1.3-1: SRS-RSRP absolute accuracy test requirement**

| | Test requirement Notes1,2,3 |
|---|---|
| SRS | SRS_RP -δ +$G_{min}$ ≤ Reported SRS-RSRP(dBm) ≤SRS_RP +δ +$G_{max}$ |
| Note 1: SRS_RP is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test<br>Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test<br>Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

### A.5.7.5.2 EN-DC CLI-RSSI measurement accuracy with FR2 serving cell

#### A.5.7.5.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CLI-RSSI measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.22.2.1 with the testing configurations for NR cells in Table A.5.7.5.2.1-1.

**Table A.5.7.5.2.1-1: Applicable NR configurations for FR2 CLI-RSSI accuracy test**

| Config | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SRS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SRS 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.5.7.5.2.2 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.5.7.5.2.2-1 and A.5.7.5.2.2-2 below.

Before the test UE is configured to perform CLI-RSSI measurement. There is no measurement gap configured in the test. During the test, the test system does not transmit PDCCH/PDSCH/OCNG on symbols for CLI-RSSI resource and on 2 data symbol before. The CLI-RSSI measurement resource configuration is in Table A.5.7.5.2.2-3.

**Table A.5.7.5.2.2-1: FR2 test parameters for CLI-RSSI accuracy**

| 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 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 | 100: $N_{RB,c}$ = 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.3 FR2 | SSB.3 FR2 |
| OCNG Patterns Note2 | 1~2 | | OP.1 | OP.1 |
| TRS configuration | 1~2 | | TRS.2.1 TDD | TRS.2.1 TDD |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.3<br>ULBWP.1.3 | DLBWP.1.3<br>ULBWP.1.3 |
| SMTC configuration | 1~2 | | SMTC.1 | SMTC.1 |
| Time offset between DL from serving cell and OCNG from test system | 1~2 | μs | 10.67 | 10.67 |
| 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 SSS Note 1 | | | | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | | | | |
| Propagation condition | 1~2 | | AWGN | AWGN |
| Antenna configuration | 1~2 | | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that a constant total transmitted power spectral density is achieved for all OFDM symbols.<br>Note 2: OCNG is not transmitted in the CLI-RSSI measurement resources. | | | | |

**Table A.5.7.5.2.2-2: CLI-RSSI accuracy OTA related test parameters**

| Parameter | Unit | T1 | T2 |
|---|---|---|---|
| Angle of arrival configuration | | Setup 1 defined A.3.15.1 | |
| Beam assumption Note 5 | | Fine | |
| $N_{oc}$ on CLI-RSSI measurement resource Note1 | dBm/15kHz Note3 | -100 | |
| $N_{oc}$ on CLI-RSSI measurement resource Note1 | dBm/SCS Note3 | -91 | |
| $\hat{E}_s/N_{oc}$ on CLI-RSSI measurement resource | dB | -Infinity | |
| RSRP on CLI-RSSI measurement resource Note2 | dBm/SCS | -Infinity | |
| $\hat{E}_s/I_{ot\ BB}$ on CLI-RSSI measurement resource Note4 | dB | -Infinity | |
| Io on CLI-RSSI measurement resource Note2 | dBm/95.04 MHz Note3 | -62.01 | |
| Io on CLI-RSSI measurement resource Note2 | dBm/1.08 MHz | -81.46 | |
| 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 $N_{oc}$ to be fulfilled.<br>Note 2: SRS_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone<br>Note 4: Calculation of Es/$Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 2dB for UE multi-band relaxation factor $\sum MB_P$ from TS 38.101-2 [19] Table 6.2.1.3-4.<br>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. | | | |

**Table A.5.7.5.2.2-3: CLI-RSSI measurement resource configuration for FR2 CLI-RSSI accuracy**

| | Field | SRSConf.1 |
|---|---|---|
| CLI-RSSI measurement resource | rssi-ResourceId | 0 |
| | rssi-SCS | 120kHz |
| | startPRB | 0 |
| | nrofPRBs | 66 |
| | startPosition | 3 |
| | nrofSymbols | 11 |
| | rssi-PeriodicityAndOffset | sl160, 25 |

### A.5.7.5.2.3 Test Requirements

The CLI-RSSI measurement accuracy shall fulfil the absolute accuracy requirements in clauses 10.1.22.2.1. The following requirements are to be verified:

During T1:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table A.5.7.5.2.3-1.

During T2:

The UE is deemed to meet the requirement if the reported CLI-RSSI is in the range shown in table A.5.7.5.2.3-1..

**Table A.5.7.5.2.3-1: CLI-RSSI absolute accuracy test requirement**

| | **Test requirement** Notes1,2,3 |
|---|---|
| | Io $-\delta + G_{min} \le$ Reported CLI-RSSI(dBm) $\le$ Io $+\delta + G_{max}$ |
| Note 1: Io is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for 1.08MHz<br>Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.22.1.1-2, selected according to the Io used in the test<br>Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

# A.5.7.6 L1-SINR measurement for beam reporting

## A.5.7.6.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

### A.5.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.8.4.1 and clause 10.1.28.1 for FR2 L1-SINR measurements based on CSI-RS with the testing configurations for NR cells in Table A.5.7.6.1.1-1, which configures the measurement resources for the CSI-RS based CMR and no dedicated IMR.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.6.1.1-1: Applicable NR configurations for FR2 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured**

| 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.5.7.6.1.2 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.5.7.6.1.2-1 and Table A.5.7.6.1.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.1.2-1 and Table A.5.7.6.1.2-2.

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.5.7.6.1.2-1: FR2 CSI-RS based L1-SINR general test parameters**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| SMTC configuration | 1~2 | | SMTC.1 |
| CSI-RS | 1~2 | | CSI-RS.3.2 TDD |
| reportConfigType | 1~2 | | periodic |
| reportQuantity-r16 | 1~2 | | cri-SINR-r16 |
| nrofReportedRS | 1~2 | | 2 |
| L1-RSRP reporting period | 1~2 | | slot640 |
| Propagation condition | 1~2 | | AWGN |
| Antenna configuration | 1~2 | | 1x2 |
| 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 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.<br>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 $N_{oc}$ to be fulfilled. | | | |

**Table A.5.7.6.1.2-1-2: FR2 CSI-RS based L1-SINR OTA related test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beams[Note 4] | | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -100 | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -91 | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 10 | -2 |
| CSI-RS-RSRP[Note1] | 1~2 | dBm/SCS | -81 | -93 |
| Io[Note1] | 1~2 | dBm/ 95.04MHz | -59.86 | |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 10 | -2 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: Void.<br>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.5.7.6.1.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.1.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.1.2-1.

**Table A.5.7.6.1.3-1: L1-SINR absolute accuracy test requirement**

| | Test requirement [Notes1,2] |
|---|---|
| CSI-RS0 | L1-SINR0-δ≤ Reported SINR(dB) ≤L1-SINR0+δ |
| CSI-RS1 | L1-SINR1-δ ≤ Reported SINR(dB) ≤L1-SINR1+δ |
| Note 1: L1-SINRn is the equivalent SINR 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<br>Note 2: δ is the SINR absolute accuracy requirement from Table 10.1.28.1.1-1, selected according to the Io used in the test | |

## A.5.7.6.2 L1-SINR measurement with SSB based CMR and dedicated IMR

### A.5.7.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.8.4.2 and clause 10.1.28.2 for L1-SINR measurements with SSB based CMR and dedicated CSI-RS based IMR, with the testing configurations for NR cells in Table A.5.7.6.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.6.2.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR**

| 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.5.7.6.2.2 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.5.7.6.2.2-1 and Table A.5.7.6.2.2-2 below. The absolute accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.2.2-1 and Table A.5.7.6.2.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one SSB resource set with two SSB resources and one CSI-RS resource set with two CSI-RS resource. UE is configured to perform RLM and BFD measurement based on the SSB resources 0 and 1. UE is configured to perform L1-SINR measurement based on the SSBs as CMR and the CSI-RS resources as IMR.

**Table A.5.7.6.2.2-1: FR2 L1-SINR measurement test parameters with SSB based CMR and CSI-IM based IMR**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1~4 | | freq1 |
| Duplex mode | 1~4 | | TDD |
| TDD Configuration | 1~4 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~4 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~4 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~4 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~4 | | CCR.3.1 TDD |
| SSB configuration | 1,2 | | SSB.1 FR2 |
| | 3,4 | | SSB.2 FR2 |
| CSI-RS configuration | 1~4 | | CSI-RS 3.1A TDD |
| OCNG Patterns | 1~4 | | OP.1 |
| Initial BWP Configuration | 1~4 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 | | DLBWP.1.3<br>ULBWP.1.3 |
| TRS Configuration | 1~4 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 | | TCI.State.2 |
| SMTC configuration | 1~4 | | SMTC.1 |
| reportConfigType | 1~4 | | periodic |
| reportQuantity-r16 | 1~4 | | ssb-Index-SINR-r16 |
| Number of reported RS | 1~4 | | 2 |
| L1-SINR reporting period | 1~4 | | slot640 |
| Propagation condition | 1~4 | | AWGN |
| Antenna configuration | 1~4 | | 1x2 |
| 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 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.<br>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 $N_{oc}$ to be fulfilled. | | | |

**Table A.5.7.6.2.2-2: FR2 SSB specific test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | SSB#0 | SSB#1 |
| Angle of arrival configuration | | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beams Note 4 | | | Rough | |
| $N_{oc}$ | 1~4 | dBm/15 kHz | -100 | |
| $N_{oc}$ | 1,2 | dBm/SS B SCS | -91 | |
| | 3,4 | | -88 | |
| $\hat{E}_s/I_{ot}$ | 1~4 | dB | 10 | 0 |
| SSB RSRP Note1 | 1,2 | dBm/SC S | -81 | -91 |
| | 3,4 | | -78 | -88 |
| Io Note1 | 1~4 | dBm/ 95.04M Hz | -51.57 | |
| $\hat{E}_s/N_{oc}$ | 1~4 | dB | 10 | 0 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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 | | | | |

**Table A.5.7.6.2.2-3: FR2 CSI-RS specific test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration | | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beams Note 4 | | | Rough | |
| $N_{oc}$ | 1~4 | dBm/15k Hz | -100 | |
| $N_{oc}$ | 1~4 | dBm/CSI-RS SCS | -91 | |
| $\hat{E}_s/I_{ot}$ | 1~4 | dB | 10 | 0 |
| CSI-RS RSRP Note1 | 1~4 | dBm/SCS | -81 | -91 |
| Io Note1 | 1~4 | dBm/ 95.04MHz | -51.57 | |
| $\hat{E}_s/N_{oc}$ | 1~4 | dB | 10 | 0 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>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.5.7.6.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB#0+CSI-RS#0 and absolute accuracy of SSB#1+CSI-RS#1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.2.3-1.

Relative accuracy of SSB#0+CSI-RS#0 compared with SSB#1+CSI-RS#1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.2.2-1.

**Table A.5.7.6.2.3-1: L1-SINR absolute accuracy test requirement**

| | **Test requirement** Notes1,2 |
|---|---|
| SSB#0+CSI-RS#0 | L1_SINR0 -δ + ≤ Reported SINR (dB) ≤ L1_SINR 0 +δ |
| SSB#1+CSI-RS#1 | L1_SINR1 -δ + ≤ Reported SINR (dB) ≤ L1_SINR1 +δ |
| Note 1: L1_SINRn is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB#n+CSI-RS#n under consideration<br>Note 2: δ is the SINR absolute accuracy requirement from Table 10.1.28.2.1-1, selected according to the Io used in the test | |

## A.5.7.6.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR

### A.5.7.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will partly verify the requirements in Clauses 9.8.4.3 and clause 10.1.28.3 for L1-SINR measurements based on CSI-RS as CMR and CSI-IM as IMR with the testing configurations for NR cells in Table A.5.7.6.3.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

**Table A.5.7.6.3.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**

| **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.5.7.6.3.2 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.5.7.6.3.2-1 and A.5.7.6.3.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.3.2-1 and A.5.7.6.3.2-2.

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 and one CSI-IM resource set with two CSI-IM 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. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR.

**Table A.5.7.6.3.2-1: FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR**

| Parameter | Config | Unit | Test 1 |
|---|---|---|---|
| SSB GSCN | 1~2 | | freq1 |
| Duplex mode | 1~2 | | TDD |
| TDD Configuration | 1~2 | | TDDConf.3.1 |
| $BW_{channel}$ | 1~2 | MHz | 100: $N_{RB,c}$ = 66 |
| PDSCH Reference measurement channel | 1~2 | | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 | | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 | | CCR.3.1 TDD |
| SSB configuration | 1~2 | | SSB.1 FR2 |
| OCNG Patterns | 1~2 | | OP.1 |
| Initial BWP Configuration | 1~2 | | DLBWP.0.1<br>ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 | | DLBWP.1.1<br>ULBWP.1.1 |
| TRS Configuration | 1~2 | | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 | | TCI.State.2 |
| SMTC configuration | 1~2 | | SMTC.1 |
| CSI-RS configuration as CMR | 1~2 | | CSI-RS.3.2 TDD |
| CSI-IM configuration as IMR | 1~2 | | CSI-IM.3.3 TDD |
| reportConfigType | 1~2 | | periodic |
| reportQuantity-r16 | 1~2 | | cri-SINR-r16 |
| nrofReportedRS | 1~2 | | 2 |
| L1-RSRP reporting period | 1~2 | | slot640 |
| Propagation condition | 1~2 | | AWGN |
| Antenna configutaion | 1~2 | | 1x2 |
| 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 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.<br>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 $N_{oc}$ to be fulfilled. | | | |

**Table A.5.7.6.3.2-2: FR2 CSI-RS based L1-SINR measurement OTA related test parameters**

| Parameter | Config | Unit | Test 1 | |
|---|---|---|---|---|
| | | | CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration | | | Setup 1 according to A.3.15.1 | |
| Assumption for UE beams[Note 4] | | | Rough | |
| $N_{oc}$ | 1~2 | dBm/15 kHz | -100 | |
| $N_{oc}$ | 1~2 | dBm/SSB SCS | -91 | |
| $\hat{E}_s/I_{ot}$ | 1~2 | dB | 10 | -2 |
| CSI-RS-RSRP[Note1] | 1~2 | dBm/SCS | -81 | -93 |
| Io[Note1] | 1~2 | dBm/ 95.04MHz | -59.86 | |
| $\hat{E}_s/N_{oc}$ | 1~2 | dB | 10 | -2 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.<br>Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.<br>Note 3: No additional noise is added by the test system in Test 2.<br>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.5.7.6.3.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.3. The following requirements are to be verified:

Absolute accuracy of CSI-RS#0 and absolute accuracy of CSI-RS#1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.3.3-1.

Relative accuracy of CSI-RS#0 compared with CSI-RS#1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.3.2-2.

**Table A.5.7.6.3.3-1: L1-SINR absolute accuracy test requirement**

| | Test requirement [Notes1,2] |
|---|---|
| CSI-RS#0 | L1-SINR0 -δ≤ Reported SINR(dBm) ≤L1-SINR 0 +δ |
| CSI-RS#1 | L1-SINR 1 -δ≤ Reported SINR(dBm) ≤L1-SINR 1 +δ |
| Note 1: L1-SINRn is the equivalent SINR 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<br>Note 2: δ is the SINR absolute accuracy requirement from Table 10.1.28.3.1-2. | |

## A.5.7.7 CSI-RSRP

### A.5.7.7.1 EN-DC intra-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

#### A.5.7.7.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RS based 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.5.7.7.1.2 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.5.7.7.1.2-1. Both absolute and relative accuracy of SS-RSRP intra-frequency measurements are tested by using the parameters in Table A.5.7.7.1.2-2 and A.5.7.7.1.2-3. 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.5.7.7.1.2-1: SS-RSRP Intra frequency SS-RSRP supported test configurations**

| Configuration | Description |
|---|---|
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

**Table A.5.7.7.1.2-2: CSI-RSRP Intra frequency general test parameters**

| Parameter[Note 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 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 | - |
| 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 |
| CSI-RS configuration for RRM | | CSI-RS.RRM.FR2.1 TDD | CSI-RS.RRM.FR2.1 TDD | CSI-RS.RRM.FR2.1 TDD | CSI-RS.RRM.FR2.1 TDD |
| Time offset with Cell 2 | μs | - | 0.58 | - | 0.58 |
| 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 SSS[Note 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
Note 5: All parameters apply for configuration 1 and 2
Note 6: Void

**Table A.5.7.7.1.2-3: CSI-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 beams Note 8 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -91.6 | | N/A | |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -82.6 | | N/A | |
| $\hat{E}_s/N_{oc}$ | dB | 6.0 | 1.0 | N/A | N/A |
| $E_s$ | dBm/SCS Note4 | | | (Table B.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| SSB_RP Note2 | 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) |
| $\hat{E}_s/I_{ot\ BB}$ Note6 | dB | 2.44 | -5.98 | -5.98 | -5.98 |
| CSI_RP | 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) |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.
Note 2: SSB_RP, Es/Iot 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 $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ 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.5.7.7.1.3 Test Requirements

The CSI-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 CSI-RSRP is in the range shown in table A.5.7.6.1.3-1.
- Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-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 CSI-RSRP is in the range shown in table A.5.7.6.1.3-1.
- Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI-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 CSI-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 CSI -RSRP meets the requirements in Table 10.1.3.1.2-1.

**Table A.5.7.7.1.3-1: CSI-RSRP absolute accuracy test requirement**

| | **Test requirement Notes1,2,3** |
|---|---|
| Cell 2 | CSI_RP2 -δ +$G_{min}$ ≤ Reported RSRP(dBm) ≤ CSI_RP2 +δ +$G_{max}$ |
| Cell 3 | CSI_RP3 -δ +$G_{min}$ ≤ Reported RSRP(dBm) ≤ CSI_RP3 +δ +$G_{max}$ |
| Note 1: CSI_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<br>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<br>Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class | |

## A.5.7.7.2 EN-DC inter-frequency case measurement accuracy with FR2 serving cell and FR2 target cell

### A.5.7.7.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RS based RSRP measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 10.1.5.3.1 and 10.1.5.3.2 for inter-frequency measurements with the testing configurations for NR cells in Table A.5.7.7.2.1-1.

**Table A.5.7.7.2.1-1: Applicable NR configurations for FR2 inter-frequency CSI-RSRP accuracy test**

| Configuration | Description |
|---|---|
| 1 | FDD LTE PCell, cells 2&3 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, cells 2&3 120 kHz SSB SCS, 120KHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

### A.5.7.7.2.2 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.5.7.7.2.2-1 and Table A.5.7.7.2.2-2 below. Both absolute and relative accuracy of RSRP intrer-frequency measurements are tested by using the parameters in Table A.5.7.7.2.2-1 and Table A.5.7.7.2.2-2. The inter-frequency measurements are supported by a measurement gap.

**Table A.5.7.7.2.2-1: CSI-RSRP inter-frequency general test parameters**

| Parameter | Config | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|---|
| | | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Physical cell ID | | | 489 | 0 | 489 | 0 |
| SSB ARFCN | 1,2 | | freq1 | freq2 | freq1 | freq2 |
| $BW_{channel}$ | 1,2 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | |
| Gap pattern ID | | | 0 | | 0 | |
| Duplex mode | 1,2 | | TDD | TDD | TDD | TDD |
| TDD configuration | 1,2 | | TDDConf.3.1 | | TDDConf.3.1 | |
| 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.3 FR2 | | SSB.3 FR2 | |
| OCNG Patterns | 1,2 | | OP.3 | | OP.3 | |
| Initial BWP Configuration | 1,2 | | DLBWP.0.1 ULBWP.0.1 | | DLBWP.0.1 ULBWP.0.1 | |
| Dedicated BWP configuration | 1,2 | | DLBWP.1.3 ULBWP.1.3 | | DLBWP.1.3 ULBWP.1.3 | |
| TRS Configuration | 1,2 | | TRS.2.1 TDD | | TRS.2.1 TDD | |
| PDCCH/PDSCH TCI Configuration | 1,2 | | TCI.State.2 | | TCI.State.2 | |
| SMTC configuration | 1,2 | | SMTC.1 | | SMTC.1 | |
| CSI-RS configuration for RRM | 1,2 | | CSI-RS.RRM.3.1 TDD | CSI-RS.RRM.3.2 TDD | CSI-RS.RRM.3.1 TDD | CSI-RS.RRM.3.2 TDD |
| Time offset between Cell 2 and Cell 3 | 1,2 | µs | 0.58 | | 0.58 | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH DMRS to SSS<br>EPRE ratio of PBCH to PBCH DMRS<br>EPRE ratio of PDCCH DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH DMRS<br>EPRE ratio of PDSCH DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | 1,2 | dB | 0 | 0 | 0 | 0 |
| Propagation condition | 1,2 | - | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration | 1,2 | - | 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.<br>Note 2: Void | | | | | | |

**Table A.5.7.7.2.2-2: CSI-RSRP inter-frequency OTA related test parameters**

| Parameter | Unit | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Cell 2 | Cell 3 | Cell 2 | Cell 3 |
| Angle of arrival configuration | | 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 beams Note 7 | | Rough | Rough | Assumption for UE beams Note 7 | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -90.6 | -90.6 | (Table B.2.3-2 Rx Beam Peak +1.97dB) | (Table B.2.3-2 Rx Beam Peak - 3.03dB) |
| $N_{oc}$ Note1 | dBm/SCS Note4 | -81.6 | -81.6 | (Table B.2.3-2 Rx Beam Peak +11.0dB) | (Table B.2.3-2 Rx Beam Peak +6.0dB) |
| $\hat{E}_s/N_{oc}$ | dB | 6.0 | 6.0 | 17.0 | -1.0 |
| SSB_RP Note2 | dBm/SCS | -75.60 | -75.60 | (Table B.2.3-2 Rx Beam Peak +28.0dB) | (Table B.2. 3-2 Rx Beam Peak +5.0dB) |
| ($SSB\_RP_{Cell\ 1}$ – $SSB\_RP_{Cell\ 2}$) | dB | 0 | | 23.00 | |
| $\hat{E}_s/I_{ot\ BB}$ Note6 | dB | 5.29 | 5.96 | 8.86 | -3.92 |
| CSI_RP | dBm/SCS | -75.60 | -75.60 | (Table B.2.2-2 Rx Beam Peak +2.1dB) | (Table B.2.2-2 Rx Beam Peak +2.1dB) |
| Io Note2 | dBm/95.04 MHz Note4 | -50.03 | -50.03 | (Table B.2.3-2 Rx Beam Peak +52.68dB) | (Table B.2.3-2 Rx Beam Peak +33.13dB) |
| ($Io_{freq\ 1}$ – $Io_{freq\ 2}$) | 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 $N_{oc}$ to be fulfilled.
Note 2: SSB_RP, Es/Iot, Io, ($SSB\_RP_{Cell\ 2}$ – $SSB\_RP_{Cell\ 1}$) and ($Io_{freq\ 2}$ – $Io_{freq\ 1}$) 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 $Es/Iot_{BB}$ includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor $\Delta MB_P$ or $\Delta MB_S$ 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

#### A.5.7.7.2.3 Test Requirements

The CSI-RSRP measurement accuracy for Cell 2 and Cell 3 shall fulfil the absolute requirements in clause 10.1.5.3.1 and the relative requirements in clause 10.1.5.3.2.

Test 1:

- Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI-RSRP is in the range shown in Table A.5.7.7.2.3-1.
- Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI -RSRP meets the requirements in Table A.5.7.7.2.3-2.

Test 2:

- Absolute accuracy of Cell 2 and absolute accuracy of Cell 3. The UE is deemed to meet the requirement if the reported CSI -RSRP is in the range shown in Table A.5.7.7.2.3-1.
- Relative accuracy of Cell 3 compared with Cell 2. The UE is deemed to meet the requirement if the difference in reported CSI -RSRP meets the requirements in Table A.5.7.7.2.3-2.

**Table A.5.7.7.2.3-1: CSI-RSRP absolute accuracy test requirement**

| | **Test requirement** Notes1,2,3,4 |
|---|---|
| Cell 2 | CSI _RP2 -δ +$G_{min}$ +X ≤ Reported RSRP(dBm) ≤ CSI _RP2 +δ +$G_{max}$ |
| Cell 3 | CSI _RP3 -δ +$G_{min}$ ≤ Reported RSRP(dBm) ≤ CSI _RP3 +δ +$G_{max}$ |
| Note 1: CSI_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<br>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<br>Note 3: $G_{min}$ and $G_{max}$ are the minimum and maximum UE gain values from Table B.2.1.5.1-1, selected according to the UE power class<br>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.5.7.7.2.3-2: CSI-RSRP relative accuracy test requirement**

| | **Test requirement** Notes1,2,3,4 |
|---|---|
| Cell 3 – Cell 2 | CSI _RP3 - CSI _RP2 -δ ≤ Reported RSRP(dB) ≤ CSI_RP3 - CSI_RP2 +δ –(X) |
| Note 1: CSI_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<br>Note 2: δ is the RSRP relative accuracy requirement from Table 10.1.5.1.2-1<br>Note 3: Void<br>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.5.7.8 CSI-RSRQ

### A.5.7.8.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 target cell

#### A.5.7.8.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in Clause 10.1.8 for inter-frequency measurement.

#### A.5.7.8.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configuration are shown in Table A.5.7.8.1.2-1. The absolute accuracy of CSI-RSRQ intra-frequency measurement is test by using the parameters in Table A.5.7.8.1.2-2. In all test cases, Cell 2 is the PSCell and Cell 3 is the target cell. The configuration of cell 1 (E-UTRA PCell) is specified in clause A.3.7.2.1.

**Table A.5.7.8.1.2-1: CSI-RSRQ Intra frequency CSI-RSRQ supported test configurations**

| Config | Description |
|---|---|
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB&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 | |

**Table A.5.7.8.1.2-2: CSI-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 | |
| $BW_{channel}$ | | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 | |
| CSI-RS configuration for RRM | | | CSI-RS.RRM.FR2.1 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.1 FR2 | SSB.1 FR2 | SSB.1 FR2 | SSB.1 FR2 |
| Time offset with Cell 2 | | μs | - | 0.58 | - | 0.58 |
| | | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 | 120 | 120 | 120 |
| SS-RSSI-Measurement | | | Not Applicable | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH_DMRS to SSS<br>EPRE ratio of PBCH to PBCH_DMRS<br>EPRE ratio of PDCCH_DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH_DMRS<br>EPRE ratio of PDSCH_DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH_DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | | dB | 0 | 0 | 0 | 0 |
| $\hat{E}_s/N_{oc}$ | | dB | 3 | 3 | -3 | -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: 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 $N_{oc}$ to be fulfilled.

Note 3: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

Note 4: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

Note 5: Void

**Table A.5.7.8.1.2-3: CSI-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 | | | |
| Assumption for UE beams Note 9 | | Rough | | | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -95 | | -95 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -86 | | -86 | |
| CSI-RSRP Note2 | dBm/SCS Note4 | -83 | -83 | -89 | -89 |
| CSI-RSRQ Note2 | dB | -14.77 | -14.77 | -16.81 | -16.81 |
| $\hat{E}_s/I_{ot}$ | dB | -1.76 | -1.76 | -4.76 | -4.76 |
| Io Note2 | dBm/95.04 MHz Note4 | -50 | | -54 | -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 $N_{oc}$ to be fulfilled.
Note 2: CSI-RSRQ, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-RSRQ and CSI-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: NR operating band groups are as defined in Clause 3.5.2.
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.5.7.8.1.3 Test Requirements

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ +2.5dB to Nominal CSI-RSRQ –3.5dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ +3.5dB to Nominal CSI-RSRQ –4.5dB according to the requirements in clause 10.1.8 with an additional -1dB margin reflecting the possible impact of UE self-noise in the test. Nominal CSI-RSRQ is the value shown in table A.5.7.8.1.2-3.

### A.5.7.8.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.8.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-RSRQ measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.10 for inter-frequency measurement.

#### A.5.7.8.2.2 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.5.7.8.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-RSRQ inter-frequency measurement are tested by using test setup in Table A.5.7.8.2.2-2 and Table A.5.7.8.2.2-3. 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.5.7.8.2.2-1: CSI-RSRQ Inter frequency CSI-RSRQ supported test configurations**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB&CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.5.7.8.2.2-2: CSI-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 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 | - |
| OCNG Patterns | | OP.1 | OP.1 | OP.1 | OP.1 |
| SMTC configuration | | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 |
| CSI-RS configuration for RRM | | CSI-RS.RRM.FR2.1 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| Time offset with Cell 2 | μs | - | 0.58 | - | 0.58 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH_DMRS to SSS<br>EPRE ratio of PBCH to PBCH_DMRS<br>EPRE ratio of PDCCH_DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH_DMRS<br>EPRE ratio of PDSCH_DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH_DMRS<br>EPRE ratio of OCNG DMRS to SSS[Note 1] | dB | 0 | 0 | 0 | 0 |
| $\hat{E}_s/N_{oc}$ | dB | -1.75 | -1.75 | -3 | -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: 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 $N_{oc}$ to be fulfilled.
Note 3: CSI-RSRQ, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-RSRQ and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table A.5.7.8.2.2-3: CSI-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 A.3.15 | | Setup 1 in clause A.3.15 | |
| Assumption for UE beams Note 8 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -94.03 | | -94.03 | |
| $N_{oc}$ Note1 | dBm/SCS Note 3 | -85.0 | | -85.0 | |
| CSI-RP Note2 | dBm/SCS Note4 | -86.75 | -86.75 | -88 | -88 |
| CSI-RSRQ Note2 | dB | -14.75 | -14.75 | -15.56 | -15.56 |
| $\hat{E}_s/I_{ot}$ | dB | -1.75 | -1.75 | -3 | -3 |
| Io Note2 | 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 $N_{oc}$ to be fulfilled.
Note 2: CSI-RSRQ, CSI-RP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-RSRQ and CSI-RP 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.5.7.8.2.3 Test Requirements

The CSI-RSRQ absolute measurement accuracy in test 1 shall be within the range Nominal CSI-RSRQ +2.5dB to Nominal CSI-RSRQ -3.5dB and the CSI-RSRQ measurement accuracy in test 2 shall be within the range Nominal CSI-RSRQ +3.5dB to Nominal CSI-RSRQ -4.5dB according to the requirements in clause 10.1.10 with an additional -1dB margin reflecting the possible impact of UE self-noise in the test.

The CSI-RSRQ relative measurement accuracy shall fulfil the requirements in clause 10.1.10.

## A.5.7.9 CSI-SINR

### A.5.7.9.1 EN-DC Intra-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.13.2.1.

#### A.5.7.9.1.2 Test Parameters

In this test case all cells are on the same carrier frequency. Supported test configurations are shown in Table A.5.7.9.1.2-1. The absolute accuracy of CSI-SINR intra-frequency measurement is test by using the parameters in

Table A.5.7.9.1.2-2 and Table A.5.7.9.1.2-3. 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.5.7.9.1.2-1: CSI-SINR Intra frequency CSI-SINR supported test configurations**

| Configuration | Description |
|---|---|
| 1 | FDD LTE PCell, Cell 2&3 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | TDD LTE PCell, Cell 2&3 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to pass in one of the supported test configurations | |

**Table A.5.7.9.1.2-2: CSI-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 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 |
| CSI-RS for mobility | | - | CSI-RS.RRM.FR2.1 TDD | - | CSI-RS.RRM.FR2.1 TDD |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| Time offset with Cell 2 | μs | - | 0.29 | - | 0.29 |
| CSI-RSSI-Measurement | | Not Applicable | | | |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH_DMRS to SSS<br>EPRE ratio of PBCH to PBCH_DMRS<br>EPRE ratio of PDCCH_DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH_DMRS<br>EPRE ratio of PDSCH_DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH_DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1<br>EPRE ratio of OCNG to OCNG DMRS Note 1 | dB | 0 | 0 | 0 | 0 |
| $\hat{E}_s/N_{oc}$ | dB | 4.54 | 2.66 | -3 | -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: 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 $N_{oc}$ to be fulfilled.
Note 3: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table A.5.7.9.1.2-3: CSI-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 beams Note 7 | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | | N/A | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | | N/A | |
| $\hat{E}_s/N_{oc}$ | dB | 4.54 | 2.66 | -3 | -3 |
| CSI-RSRP Note2 | dBm/SCS Note4 | -91.46 | -93.34 | -99 | -99 |
| CSI-SINR Note2 | dB | 0 | -3.2 | -4.76 | -4.76 |
| $\hat{E}_s/I_{ot}$ | dB | 0 | -3.2 | -4.76 | -4.76 |
| Io Note2 | dBm/95.04 MHz Note4 | -59.2 | | -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 $N_{oc}$ to be fulfilled.
Note 2: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-SINR and CSI-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: NR operating band groups are as defined in Clause 3.5.2.
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.5.7.9.1.3 Test Requirements

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR+3dB to Nominal CSI-SINR -4dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR +3.5dB to Nominal CSI-SINR -4.5dB according to the requirements in clause 10.13.2 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal CSI-SINR is the value shown in table A.5.7.9.1.2-3.

### A.5.7.9.2 EN-DC Inter-frequency measurement accuracy with FR2 serving cell and FR2 TDD target cell

#### A.5.7.9.2.1 Test Purpose and Environment

The purpose of this test is to verify that the CSI-SINR measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.15.2.1 and 10.1.15.2.2 for inter-frequency measurement.

#### A.5.7.9.2.2 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.5.7.9.2.2-1. Both absolute accuracy and relative accuracy requirements of CSI-SINR inter-frequency measurement are tested by using test setup in Table A.5.7.9.2.2-2 and Table A.5.7.9.2.2-3. 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.5.7.9.2.2-1: CSI-SINR Inter frequency CSI-SINR supported test configurations**

| Configuration | Description |
|---|---|
| 1 | LTE FDD, NR 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB and CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.5.7.9.2.2-2: CSI-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 | |
| $BW_{channel}$ | MHz | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 66 | | 100: $N_{RB,c}$ = 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 |
| Time offset with cell 2 | µs | - | 0.29 | - | 0.29 | - | 0.29 |
| SMTC configuration | | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 | SMTC.1 FR2 |
| CSI-RS for mobility | | - | CSI-RS.RRM.FR2.1 TDD | - | CSI-RS.RRM.FR2.1 TDD | - | CSI-RS.RRM.FR2.1 TDD |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS<br>EPRE ratio of PBCH_DMRS to SSS<br>EPRE ratio of PBCH to PBCH_DMRS<br>EPRE ratio of PDCCH_DMRS to SSS<br>EPRE ratio of PDCCH to PDCCH_DMRS<br>EPRE ratio of PDSCH_DMRS to SSS<br>EPRE ratio of PDSCH to PDSCH_DMRS<br>EPRE ratio of OCNG DMRS to SSS Note 1 | dB | 0 | 0 | 0 | 0 | 0 | 0 |
| $\hat{E}_s/N_{oc}$ | dB | -0.5 | -0.5 | 11.0 | 11.0 | -3.0 | -3.0 |

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 $N_{oc}$ to be fulfilled.
Note 3: CSI-SINR, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4: CSI-SINR and CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.

**Table A.5.7.9.2.2-3: CSI-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 beams Note 7 | | Rough | | Rough | | Rough | |
| $N_{oc}$ Note1 | dBm/15kHz Note4 | -105 | | -105 | | -105 | |
| $N_{oc}$ Note1 | dBm/SCS Note3 | -96 | | -96 | | -96 | |
| $\hat{E}_s/N_{oc}$ | dB | -0.5 | -0.5 | 11.0 | 11.0 | -3.0 | -3.0 |
| CSI-RSRP Note2 | dBm/SCS Note4 | -96.5 | -96.5 | -85 | -85 | -99 | -99 |
| CSI-SINR Note2 | dB | -0.5 | -0.5 | 11 | 11 | -3.0 | -3.0 |
| $\hat{E}_s/I_{ot}$ | dB | -0.5 | -0.5 | 11 | 11 | -3.0 | -3.0 |
| Io Note2 | dBm/95.04 MHz Note4 | -69.3 | | -55.4 | | -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 $N_{oc}$ to be fulfilled.
Note 2: CSI-SINR, CSI-RSRP, and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 3: CSI-SINR and CSI-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: NR operating band groups are as defined in Clause 3.5.2.
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.5.7.9.2.3 Test Requirements

The CSI-SINR absolute measurement accuracy in test 1 shall be within the range Nominal CSI-SINR+3dB to Nominal CSI-SINR -4dB and the CSI-SINR measurement accuracy in test 2 shall be within the range Nominal CSI-SINR+3.5dB to Nominal CSI-SINR -4.5dB according to the requirements in clause 10.1.15.2.1 with an additional -1dB margin reflecting the possible impact of UE self noise in the test. Nominal CSI-SINR is the value shown in table A.5.7.2.2.2-3

The CSI-SINR relative measurement accuracy shall fulfil the requirements in clause 10.1.15.2.2.

## A.5.8 Void