Annex A (normative): Test Cases

# A.1 Purpose of annex

# A.2 Requirement classification for statistical testing

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

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

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

## A.2.1 Types of requirements in TS 38.133

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

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

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

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

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

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

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

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

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

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

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

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

### A.2.1.3 Implementation requirements

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

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

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

### A.2.1.4 Physical layer timing requirements

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

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

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

### A.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.  Note 7: When DRX is configured, PDCCH can be scheduled both for downlink assignment and/or UL grant only during ([10]ms - drx-InactivityTimer) from timing when drx-onDurationTimer starts, unless otherwise specified in the test case | | | | | | | | |

#### A.3.1.1.2 TDD

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

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

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

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

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | SR.3.1 TDD | SR.3.2 TDD | SR.3.3 TDD |  |  |  |  |
| Channel bandwidth | MHz | 100 | 100 | 100 |  |  |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 |  |  |  |  |
| Allocated resource blocks for PDSCH |  | 24 Note 1 | 24Note 7 | 48Note 7 |  |  |  |  |
| Allocated slots per Radio Frame |  |  |  |  |  |  |  |  |
| Radio frame containing SSB | slots | Note 5 | Note 5 | Note 5 |  |  |  |  |
| Radio frame not containing SSB | slots | 48 | 48 | 48 |  |  |  |  |
| MCS table |  | 64QAM | 64QAM | 64QAM |  |  |  |  |
| MCS index |  | 4 | 4 | 4 |  |  |  |  |
| Modulation |  | QPSK | QPSK | QPSK |  |  |  |  |
| Target Coding Rate |  | 1/3 | 1/3 | 1/3 |  |  |  |  |
| Number of control symbols |  | 2 | 2 | 2 |  |  |  |  |
| PDSCH mapping type |  | Type A | Type A | Type A |  |  |  |  |
| Information Bit Payload |  |  |  |  |  |  |  |  |
| For slots with RMSI | bits | 1608 | 1608 | 3104 |  |  |  |  |
| For slots without RMSI | bits | 1864 | 1864 | 3624 |  |  |  |  |
| Number of Code Blocks per slot |  | 1 | 1 | 1 |  |  |  |  |
| Binary Channel Bits Per slot |  |  |  |  |  |  |  |  |
| For slots with RMSI Note 4 | bits | 5184 | 5184 | 10368 |  |  |  |  |
| For slots without RMSI Note 6 | bits | 6048 | 6048 | 12096 |  |  |  |  |
| Note 1: Allocated in resource blocks which do not overlap with the resource blocks allocated for SS/PBCH block  Note 2: Void  Note 3: If necessary the information bit payload size can be adjusted to facilitate the test implementation. The payload sizes are defined in TS 38.213 [3].  Note 4: Derived based on the PDSCH DMRS assumption: dmrs-TypeA-Position=2, dmrs-Type=1, dmrs-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.  Note 2: Payload size shall depend upon the test configuration  Note 3: Allocated in the resource blocks where the associated RMC is scheduled. | | | | | | | | |

#### A.3.1.3.2 TDD

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CCR.1.1 TDD | CCR.1.2 TDD | CCR.1.3 TDD | CCR.1.4 TDD | 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 | CCR.2.4 TDD |  |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case |  |  |  |
| Subcarrier spacing | kHz | 30 | 30 | 30 | 30 |  |  |  |
| Allocated resource blocks for CORESET Note 3 |  | 24 | 24 | 18 | 18 |  |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 | 1 |  |  |  |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 |  |  |  |
| REG bundle size |  | 6 | 6 | 6 | 6 |  |  |  |
| DMRS precoder granularity |  | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |  |  |  |
| CCE to REG mapping |  | Interleaved | Interleaved | Interleaved | Interleaved |  |  |  |
| Interleave n\_shift |  | 0 | 0 | 0 | 0 |  |  |  |
| Interleave size |  | 2 | 2 | 2 | 2 |  |  |  |
| Beamforming Pre-Coder |  | N/A | N/A | N/A | N/A |  |  |  |
| Aggregation level | CCE | 4 | 8 | 4 | 2 |  |  |  |
| DCI formats |  | Note 1 | Note 1 | Note 1 | Note 1 |  |  |  |
| Payload size (without CRC) | bits | Note 2 | Note 2 | Note 2 | Note 2 |  |  |  |
| Note 1: DCI format shall depend upon the test configuration.  Note 2: Payload size shall depend upon the test configuration.  Note 3: Allocated in the same resource blocks where the associated RMC is scheduled. | | | | | | | | |

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

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

### A.3.1.4 TDD UL/DL configuration

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.1.1 | TDDConf.1.2 |  |
| *referenceSubcarrierSpacing* | kHz | 15 | 15 |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘DSUU’  S=’10DL:2GP:2UL’ | ‘DSUU’  S=’ 6DL: 2GP: 6UL’ |  |
| *dl-UL-TransmissionPeriodicity* | ms | 4 | 4 |  |
| *nrofDownlinkSlots* |  | 1 | 1 |  |
| *nrofDownlinkSymbols* |  | 10 | 6 |  |
| *nrofUplinkSlot* |  | 2 | 2 |  |
| *nrofUplinkSymbols* |  | 2 | 6 |  |
| TDD UL/DL pattern 2 Note 2 |  | ‘D’ | ‘D’ |  |
| *dl-UL-TransmissionPeriodicity* | ms | 1 | 1 |  |
| *nrofDownlinkSlots* |  | 1 | 1 |  |
| *nrofDownlinkSymbols* |  | 0 | 0 |  |
| *nrofUplinkSlot* |  | 0 | 0 |  |
| *nrofUplinkSymbols* |  | 0 | 0 |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.2.1 | TDDConf.2.2 | TDDConf.2.3 |
| *referenceSubcarrierSpacing* | kHz | 30 | 30 | 30 |
| TDD UL/DL pattern 1 Note 2 |  | ‘3D1S4U’  S=’6DL:4GP:4UL’ | ‘1D1S2U’  S=’11DL: 1GP:2UL’ | ‘3D1S4U’  S=’4DL:4GP:6UL’ |
| *dl-UL-TransmissionPeriodicity* | ms | 4 | 2 | 4 |
| *nrofDownlinkSlots* |  | 3 | 1 | 3 |
| *nrofDownlinkSymbols* |  | 6 | 11 | 4 |
| *nrofUplinkSlot* |  | 4 | 2 | 4 |
| *nrofUplinkSymbols* |  | 4 | 2 | 6 |
| TDD UL/DL pattern 2 Note 2 |  | ‘DD’ | Not configured | ‘DD’ |
| *dl-UL-TransmissionPeriodicity* | ms | 1 | Not configured | 1 |
| *nrofDownlinkSlots* |  | 2 | Not configured | 2 |
| *nrofDownlinkSymbols* |  | 0 | Not configured | 0 |
| *nrofUplinkSlot* |  | 0 | Not configured | 0 |
| *nrofUplinkSymbols* |  | 0 | Not configured | 0 |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.3.1 | TDDConf.3.2 |  |
| *referenceSubcarrierSpacing* | kHz | 120 | 120 |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘DDDSU’  S=’10DL:2GP:2UL’ | ‘DDDSU’  S=’ 6DL: 2GP: 6UL’ |  |
| *dl-UL-TransmissionPeriodicity* | ms | 0.625 | 0.625 |  |
| *nrofDownlinkSlots* |  | 3 | 3 |  |
| *nrofDownlinkSymbols* |  | 10 | 6 |  |
| *nrofUplinkSlot* |  | 1 | 1 |  |
| *nrofUplinkSymbols* |  | 2 | 6 |  |
| TDD UL/DL pattern 2 Note 2 |  | Not configured | Not configured |  |
| *dl-UL-TransmissionPeriodicity* | ms | Not configured | Not configured |  |
| *nrofDownlinkSlots* |  | Not configured | Not configured |  |
| *nrofDownlinkSymbols* |  | Not configured | Not configured |  |
| *nrofUplinkSlot* |  | Not configured | Not configured |  |
| *nrofUplinkSymbols* |  | Not configured | Not configured |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  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.  Note 2: Payload size shall depend upon the test configuration.  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].  Note 2: Do not configure *tdd-UL-DL-ConfigurationCommon* using RRC configuration  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 S1 = {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 PCCA\_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.  Note 2: REs not allocated to any physical channels, CORESET, SSB or any other reference signal within the channel bandwidth of the cell, confined to BWoccupied where specified in the test case. | | |

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

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

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

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

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

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

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

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

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

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

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

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

### A.3.2.2 Void

## A.3.3 Reference DRX configurations

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### A.3.3.13 DRX Configuration X1: DRX cycle = 80 ms and TAT = Infinity

Table A.3.3.13-1: DRX.X1: DRX cycle = 80 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 | 80 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.3.4 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. For beam failure detection and link recovery tests, the SNR levels are modified according to table A.3.6.1.1.2.1-3.

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

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

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

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

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

|  |  |
| --- | --- |
| Test case | SNR for RS in set q0 during T3, T4 and T5 (dB) |
|  | Test 1 |
| A.4.5.5.1 | -15 |
| A.4.5.5.2 | -15 |
| A.4.5.5.3 | -15 |
| A.4.5.5.4 | -15 |
| A.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 and beam failure detection thresholds described in clauses A.3.6.1.1.2.1, 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 q0 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 configurationNote1 |  | 6 |
| TDD uplink-downlink configurationNote1 |  | 1 |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD |
| PBCH\_RA | dB |  |
| PBCH\_RB | dB |  |
| PSS\_RA | dB |  |
| SSS\_RA | dB |  |
| PCFICH\_RB | dB |  |
| PHICH\_RA | dB |  |
| PHICH\_RB | dB | 0 |
| PDCCH\_RA | dB |  |
| PDCCH\_RB | dB |  |
| PDSCH\_RA | dB |  |
| PDSCH\_RB | dB |  |
| OCNG\_RANote3 | dB |  |
| OCNG\_RBNote3 | dB |  |
| NocNote4 | dBm/15 kHz | -104 |
| Ês/Noc | dB | 17 |
| Ês/Iot | dB | 17 |
| RSRP Note5 | dBm/15 kHz | -87 |
| SCH\_RP Note5 | dBm/15 kHz | -87 |
| Io Note5 | dBm/Ch BW | -59.13+10log(NRB,c /50) |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 1x2 |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |

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

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

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

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

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

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

## A.3.7B 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 configurationNote1 |  | 6 |
| TDD uplink-downlink configurationNote1 |  | 1 |
| BWchannel |  | 5 MHz: NRB,c = 25  10 MHz: NRB,c = 50  20 MHz: NRB,c = 100 |
| PDSCH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.7 FDD  10 MHz: R.3 FDD  20 MHz: R.6 FDD  5 MHz: R.4 TDD  10 MHz: R.0 TDD  20 MHz: R.3 TDD |
| PCFICH/PDCCH/PHICH parameters:  DL Reference Measurement ChannelNote2 |  | 5 MHz: R.11 FDD  10 MHz: R.6 FDD  20 MHz: R.10 FDD  5 MHz: R.11 TDD  10 MHz: R.6 TDD  20 MHz: R.10 TDD |
| OCNG PatternsNote2 |  | 5 MHz: OP.20 FDD  10 MHz: OP.10 FDD  20 MHz: OP.17 FDD  5 MHz: OP.9 TDD  10 MHz: OP.1 TDD  20 MHz: OP.7 TDD |
| PBCH\_RA | dB |  |
| PBCH\_RB | dB |  |
| PSS\_RA | dB |  |
| SSS\_RA | dB |  |
| PCFICH\_RB | dB |  |
| PHICH\_RA | dB |  |
| PHICH\_RB | dB | 0 |
| PDCCH\_RA | dB |  |
| PDCCH\_RB | dB |  |
| PDSCH\_RA | dB |  |
| PDSCH\_RB | dB |  |
| OCNG\_RANote3 | dB |  |
| OCNG\_RBNote3 | dB |  |
| NocNote4 | dBm/15 kHz | -104 |
| Ês/Noc | dB | 17 |
| Ês/Iot | dB | 17 |
| RSRP Note5 | dBm/15 kHz | -87 |
| SCH\_RP Note5 | dBm/15 kHz | -87 |
| Io Note5 | dBm/Ch BW | -59.13+10log(NRB,c /50) |
| Propagation Condition |  | AWGN |
| Antenna Configuration |  | 1x2 |
| Note 1: Special subframe and uplink-downlink configurations are specified in table 4.2-1 in TS 36.211.  Note 2: DL RMCs and OCNG patterns are specified in clauses A 3.1 and A 3.2 of TS 36.133 respectively.  Note 3: OCNG shall be used such that all cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 4: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.  Note 5: Es/Iot, RSRP, SCH\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | |

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

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

## A.3.7D NE-DC test setup

### A.3.7D.1 Introduction

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

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

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

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

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

## A.3.8 PRACH configurations

### A.3.8.1 Introduction

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

### A.3.8.2 PRACH configurations in FR1

#### A.3.8.2.1 FR1 PRACH configuration 1

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

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

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

#### A.3.8.2.2 FR1 PRACH configuration 2

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

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

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

#### A.3.8.2.3 FR1 PRACH configuration 3

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

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

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

#### A.3.8.2.4 FR1 PRACH configuration 4

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

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

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

### A.3.8.3 PRACH configurations in FR2

#### A.3.8.3.1 FR2 PRACH configuration 1

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

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

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

#### A.3.8.3.2 FR2 PRACH configuration 2

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

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

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

#### A.3.8.3.3 FR2 PRACH configuration 3

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

|  |  |  |
| --- | --- | --- |
| Table A.3.8.3.3-1: Parameters for FR2 PRACH configuration 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, NCS = 23 |
| Backoff Parameter Index | 2 | 20 ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| csirs-ResourceList | ra-PreambleIndex = 50 | Associated with CSI-RS configured |
| ra-OccasionList | 1 | RA occasions allowed corresponding to CSI-RS |
| rsrp-ThresholdCSI-RS | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.8.3.4 FR2 PRACH configuration 4

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

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

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

## A.3.8A 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, NCS = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

#### A.3.8A.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, NCS = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| *ssb-ResourceList* | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn’t use this field if is transmitting CFRA to convey BFR. |
| *BFR-SSB-Resource* | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | 1 | PRACH occasion index 1 is allowed |
| rsrp-ThresholdSSB | RSRP\_51 | The actual value of the threshold is -105dBm, as defined in TS 38.331 [2]. |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

## A.3.9 BWP configurations

### A.3.9.1 Introduction

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

### A.3.9.2 Downlink BWP configurations

#### A.3.9.2.1 Initial BWP

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

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

#### A.3.9.2.2 Dedicated BWP

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| BWP Parameters | Unit | Values | | | | | |
| Reference BWP |  | DLBWP.1.1 | DLBWP.1.2 | DLBWP.1.3 | DLBWP.1.4 | DLBWP.1.5 | DLBWP.1.6 |
| Starting PRB index |  | 0 | RBb Note 1 | RBa Note 2 | 0 | RBb Note 1 | RBa Note 2 |
| Bandwidth | RB | Same as RF channel defined in each test | 25 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  48 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  48 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz  24 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz  24 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz  24 for SSB SCS = 240KHz |
| Note 1: RBb is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10.  Note 2: RBa is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10. | | | | | | | |

### A.3.9.3 Uplink BWP configurations

#### A.3.9.3.1 Initial BWP

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

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

#### A.3.9.3.2 Dedicated BWP

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| BWP Parameters | Unit | Values | | | | | |
| Reference BWP |  | ULBWP.1.1 | ULBWP.1.2 | ULBWP.1.3 | ULBWP.1.4 | ULBWP.1.5 | ULBWP.1.6 |
| Starting PRB index |  | 0 | RBb Note 1 | RBa Note 2 | 0 | RBb Note 1 | RBa Note 2 |
| Bandwidth | RB | Same as RF channel defined in each test | 25 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  48 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  48 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz  24 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz  24 for SSB SCS = 240KHz | 24 for SSB SCS = 120KHz  24 for SSB SCS = 240KHz |
| Note 1: RBb is same as RBb for DLBWP.1.2 as defined in Table A.3.9.2.2-1.  Note 2: RBa is same as RBa for DLBWP.1.3 as defined in Table A.3.9.2.2-1. | | | | | | | |

## A.3.9A BWP configurations for RedCap

### A.3.9A.1 Introduction

This clause provides the typical BWP configurations used for RedCap RRM test cases defined in Annex A. For downlink BWP, RedCap dedicated BWP configurations are specified in clause A.3.9A.2 and for uplink BWP, RedCap dedicated BWP configurations are specified in clause A.3.9A.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.3.9A.2 Downlink BWP configurations

#### A.3.9A.2.1 Dedicated BWP

Table A.3.9A.2.2-1: Downlink BWP patterns for RedCap dedicated BWP configuration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| BWP Parameters | Unit | Values | | |
| Reference BWP |  | DLBWP.1.1 RedCap | DLBWP.1.2 RedCap | DLBWP.1.3 RedCap |
| Starting PRB index |  | RBa Note 1 | RBb Note 2 | RBc Note 3 |
| Bandwidth | RB | 25 for SSB SCS = 15KHz,  25 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  16 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,  25 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  16 for SSB SCS = 240KHz | 52 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  66 for SSB SCS = 120KHz  32 for SSB SCS = 240KHz |
| Note 1: RBa is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10.  Note 2: RBb is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10.  Note 3: RBc is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10. | | | | |

### A.3.9A.3 Uplink BWP configurations

#### A.3.9A.3.2 Dedicated BWP

Table A.3.9A.3.2-1: Uplink BWP patterns for RedCap dedicated BWP configuration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| BWP Parameters | Unit | Values | | |
| Reference BWP |  | ULBWP.1.1 RedCap | ULBWP.1.2 RedCap | ULBWP.1.3 RedCap |
| Starting PRB index |  | RBa Note 1 | RBb Note 2 | RBc Note 3 |
| Bandwidth | RB | 25 for SSB SCS = 15KHz,  25 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  16 for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,  25 for SSB SCS = 30KHz,  32 for SSB SCS = 120KHz  16 for SSB SCS = 240KHz | 52 for SSB SCS = 15KHz,  51 for SSB SCS = 30KHz,  66 for SSB SCS = 120KHz  32 for SSB SCS = 240KHz |
| Note 1: RBa is the same as RBa for DLBWP.1.1 RedCap.  Note 2: RBb is the same as RBb for DLBWP.1.2 RedCap.  Note 3: RBc is the same as RBc for DLBWP.1.3 RedCap. | | | | |

## A.3.10 SSB Configurations

### A.3.10.1 SSB Configurations for FR1

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

#### A.3.10.1.7 SSB pattern 7 in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

Table A.3.10.1.7-1: SSB.7 FR1: SSB Pattern 7 for SSB SCS=15 kHz in 10 MHz channel

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

#### A.3.10.1.8 SSB pattern 8 in FR1: SSB allocation for SSB SCS=30 kHz in 40 MHz

Table A.3.10.1.8-1: SSB.8 FR1: SSB Pattern 8 for SSB SCS=30 kHz in 40 MHz channel

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

### A.3.10.2 SSB Configurations for FR2

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

#### A.3.10.2.9 SSB pattern 9 in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10.2.9-1: SSB.9 FR2: SSB Pattern 9 for SSB SCS = 120 kHz in 100 MHz channel with 2 SSBs per SS-burst

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

#### A.3.10.2.10 SSB pattern 10 in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

Table A.3.10.2.10-1: SSB.10 FR2: SSB Pattern 10 for SSB SCS = 240 kHz in 100 MHz channel with 2 SSBs per SS-burst

|  |  |  |
| --- | --- | --- |
| SSB Parameters | Values | |
| Channel bandwidth | 100 MHz | |
| SSB SCS | 240 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 2 | 3 |
| Symbol numbers containing SSBs Note 2 | 4-7 | 8-11 |
| Slot numbers containing SSB Note 2 | 1 | 1 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

A.3.10.2.11 SSB pattern 9 in FR2: SSB allocation for SSB SCS=480 kHz in 400 MHz

Table A.3.10.2.11-1: SSB.9 FR2: SSB Pattern 9 for SSB SCS = 480 kHz in 400 MHz channel with 2 SSBs per SS-burst

|  |  |  |
| --- | --- | --- |
| SSB Parameters | Values | |
| Channel bandwidth | 400 MHz | |
| SSB SCS | 480 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 0 | 1 |
| Symbol numbers containing SSBs Note 2 | 2-5 | 9-12 |
| Slot numbers containing SSB Note 2 | 0 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

A.3.10.2.12 SSB pattern 10 in FR2: SSB allocation for SSB SCS=960 kHz in 400 MHz

Table A.3.10.2.12-1: SSB.10 FR2: SSB Pattern 10 for SSB SCS = 960 kHz in 400 MHz channel with 2 SSBs per SS-burst

|  |  |  |
| --- | --- | --- |
| **SSB Parameters** | **Values** | |
| Channel bandwidth | 400 MHz | |
| SSB SCS | 960 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 0 | 1 |
| Symbol numbers containing SSBs Note 2 | 2-5 | 9-12 |
| Slot numbers containing SSB Note 2 | 0 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

A.3.10.2.13 SSB pattern 11 in FR2: SSB allocation for SSB SCS=480 kHz in 400 MHz

Table A.3.10.2.13-1: SSB.11 FR2: SSB Pattern 11 for SSB SCS = 480 kHz in 400 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 400 MHz |
| SSB SCS | 480 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSBs Note 2 | 2-5 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

A.3.10.2.14 SSB pattern 12 in FR2: SSB allocation for SSB SCS=960 kHz in 400 MHz

Table A.3.10.2.14-1: SSB.12 FR2: SSB Pattern 12 for SSB SCS = 960 kHz in 400 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 400 MHz |
| SSB SCS | 960 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSBs Note 2 | 2-5 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

A.3.10.2.15 SSB pattern 13 in FR2: SSB allocation for SSB SCS=480 kHz in 400 MHz

Table A.3.10.2.15-1: SSB.13 FR2: SSB Pattern 13 for SSB SCS = 480 kHz in 400 MHz channel with 2 SSBs per SS-burst

|  |  |  |
| --- | --- | --- |
| **SSB Parameters** | **Values** | |
| Channel bandwidth | 400 MHz | |
| SSB SCS | 480 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 2 | 3 |
| Symbol numbers containing SSBs Note 2 | 2-5 | 9-12 |
| Slot numbers containing SSB Note 2 | 1 | 1 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

A.3.10.2.16 SSB pattern 14 in FR2: SSB allocation for SSB SCS=960 kHz in 400 MHz

Table A.3.10.2.16-1: SSB.14 FR2: SSB Pattern 14 for SSB SCS = 960 kHz in 400 MHz channel with 2 SSBs per SS-burst

|  |  |  |
| --- | --- | --- |
| SSB Parameters | Values | |
| Channel bandwidth | 400 MHz | |
| SSB SCS | 960 kHz | |
| SSB periodicity (TSSB) | 20 ms | |
| Number of SSBs per SS-burst | 2 | |
| SS/PBCH block index | 2 | 3 |
| Symbol numbers containing SSBs Note 2 | 2-5 | 9-12 |
| Slot numbers containing SSB Note 2 | 1 | 1 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

A.3.10.2.17 SSB pattern 15 in FR2: SSB allocation for SSB SCS=480 kHz in 400 MHz

Table A.3.10.2.17-1: SSB.15 FR2: SSB Pattern 15 for SSB SCS = 480 kHz in 400 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 400 MHz |
| SSB SCS | 480 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 1 |
| Symbol numbers containing SSBs Note 2 | 9-12 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

A.3.10.2.18 SSB pattern 16 in FR2: SSB allocation for SSB SCS=960 kHz in 400 MHz

Table A.3.10.2.18-1: SSB.16 FR2: SSB Pattern 16 for SSB SCS = 960 kHz in 400 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 400 MHz |
| SSB SCS | 960 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 1 |
| Symbol numbers containing SSBs Note 2 | 9-12 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+39)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

## A.3.10A 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 (TSSB) | 20 ms |
| Number of SSB indexes per SS-burst () | 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(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves | |

#### A.3.10A.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 (TSSB) | 20 ms | |
| Number of SSB indexes per SS-burst () | 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(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves | | |

#### A.3.10A.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 (TSSB) | 20 ms | |
| Number of SSB indexes per SS-burst () | 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(TSSB,10ms)/10ms) = 0 | |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | |

#### A.3.10A.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 (TSSB) | 20 ms | | | |
| Number of SSB indexes per SS-burst () | 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(TSSB,10ms)/10ms) = 0 | | | |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 | | | |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | | | | |

## A.3.10B SSB Configurations for RedCap

### A.3.10B.1 SSB Configurations for FR1

#### A.3.10B.1.1 SSB pattern 1 for RedCap in FR1: SSB allocation for SSB SCS=30 kHz in 20 MHz

Table A.3.10B.1.1-1: SSB.1 RedCap FR1: SSB Pattern 1 for SSB SCS=30 kHz in 20 MHz channel

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

#### A.3.10B.1.2 SSB pattern 2 for RedCap in FR1: SSB allocation for SSB SCS=30 kHz in 20 MHz

Table A.3.10B.1.2-1: SSB.2 RedCap FR1: SSB Pattern 2 for SSB SCS=30 kHz in 20 MHz channel

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

#### A.3.10B.1.3 SSB pattern 3 for RedCap in FR1: SSB allocation for SSB SCS=30 kHz starting from odd SFN in 20 MHz

Table A.3.10B.1.3-1: SSB.3 RedCap FR1: SSB Pattern 3 for SSB SCS=30 kHz in 20 MHz channel

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

#### A.3.10B.1.4 SSB pattern 4 for RedCap in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

Table A.3.10B.1.4-1: SSB.4 RedCap FR1: SSB Pattern 4 for SSB SCS=15 kHz in 10 MHz channel

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

#### A.3.10B.1.5 SSB pattern 5 for RedCap in FR1: SSB allocation for SSB SCS=30 kHz in 20 MHz

Table A.3.10B.1.5-1: SSB.5 RedCap FR1: SSB Pattern 5 for SSB SCS=30 kHz in 20 MHz channel

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

#### A.3.10B.1.6 SSB pattern 6 for RedCap in FR1: SSB allocation for SSB SCS=15 kHz in 10 MHz

Table A.3.10B.1.6-1: SSB.6 RedCap FR1: SSB Pattern 6 for SSB SCS=15 kHz in 10 MHz channel

|  |  |
| --- | --- |
| **SSB Parameters** | **Values** |
| Channel bandwidth | 10 MHz |
| SSB SCS | 15 kHz |
| SSB periodicity (TSSB) | 80 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 | 5 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the RBs for allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10B.1.7 SSB pattern 7 for RedCap in FR1: SSB allocation for SSB SCS=30 kHz in 20 MHz

Table A.3.10B.1.7-1: SSB.7 RedCap FR1: SSB Pattern 7 for SSB SCS=30 kHz in 40 MHz channel

|  |  |
| --- | --- |
| **SSB Parameters** | **Values** |
| Channel bandwidth | 20 MHz |
| SSB SCS | 30 kHz |
| SSB periodicity (TSSB) | 80 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 | 10 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the RBs for allowed synchronization raster defined in TS 38.104 [13].  Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen.  Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves | |

### A.3.10B.2 SSB Configurations for FR2

#### A.3.10B.2.1 SSB pattern 1 for RedCap in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10B.2.1-1: SSB.1 RedCap FR2: SSB Pattern 1 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst

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

#### A.3.10B.2.2 SSB pattern 2 for RedCap in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10B.2.2-1: SSB.2 RedCap FR2: SSB Pattern 2 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 120 kHz |
| SSB periodicity (TSSB) | 40 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSBs Note 2 | 4-7 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the RBs for allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10B.2.3 SSB pattern 3 for RedCap in FR2: SSB allocation for SSB SCS=120 kHz in 100 MHz

Table A.3.10B.2.3-1: SSB.3 RedCap FR2: SSB Pattern 3 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 120 kHz |
| SSB periodicity (TSSB) | 80 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 | 40 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the RBs for allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10B.2.4 SSB pattern 4 for RedCap in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

Table A.3.10B.2.4-1: SSB.4 RedCap FR2: SSB Pattern 4 for SSB SCS = 240 kHz in 100 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 240 kHz |
| SSB periodicity (TSSB) | 40 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSBs Note 2 | 8-11 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the RBs for allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

#### A.3.10B.2.5 SSB pattern 5 for RedCap in FR2: SSB allocation for SSB SCS=240 kHz in 100 MHz

Table A.3.10B.2.5-1: SSB.5 RedCap FR2: SSB Pattern 5 for SSB SCS = 240 kHz in 100 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 240 kHz |
| SSB periodicity (TSSB) | 80 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 | 80 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the RBs for allowed synchronization raster defined in TS 38.104 [13].  Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. | |

## A.3.11 SMTC Configurations

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### A.3.11.7 SMTC pattern 7: SMTC period = 20 ms with SMTC duration = 5 ms

Table A.3.11.7-1: SMTC.7: SMTC Pattern 7 for SMTC period = 20 ms and duration = 5 ms

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

### A.3.11.8 SMTC pattern 8: SMTC period = 10 ms with SMTC duration = 1 ms

Table A.3.11.8-1: SMTC.8: SMTC Pattern 8 for SMTC period = 10 ms and duration = 1 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 10 ms |
| SMTC offset | 0 ms |
| SMTC duration | 1 ms |

## A.3.11A SMTC Configurations for RedCap

### A.3.11A.1 SMTC pattern 1 for RedCap: SMTC period = 40 ms with SMTC duration = 1 ms

Table A.3.11A.1-1: SMTC.1 RedCap: SMTC Pattern 1 for SMTC period = 40 ms and duration = 1 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 40 ms |
| SMTC offset | 0 ms |
| SMTC duration | 1 ms |

### A.3.11A.2 SMTC pattern 2 for RedCap: SMTC period = 80 ms with SMTC duration = 1 ms

Table A.3.11A.2-1: SMTC.2 RedCap: SMTC Pattern 2 for SMTC period = 80 ms and duration = 1 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 80 ms |
| SMTC offset | 5 ms |
| SMTC duration | 1 ms |

### A.3.11A.3 SMTC pattern 3 for RedCap: SMTC period = 40 ms with SMTC duration = 1 ms

Table A.3.11A.3-1: SMTC.3 RedCap: SMTC Pattern 3 for SMTC period = 40 ms and duration = 1 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 40 ms |
| SMTC offset | 20 ms |
| SMTC duration | 1 ms |

### A.3.11A.4 SMTC pattern 4 for RedCap: SMTC period = 80 ms with SMTC duration = 5 ms

Table A.3.11A.4-1: SMTC.4 RedCap: SMTC Pattern 4 for SMTC period = 80 ms and duration = 5 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 80 ms |
| SMTC offset | 5 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.5.5.2.7 | E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching |
| A.5.5.3.2 | SCell Activation and deactivation of known SCell in FR1 for 160ms SCell measurement cycle |
| A.5.5.3.5 | SCell Activation and deactivation of SCell in FR2 |
| A.5.5.3.6 | Multiple SCell Activation and deactivation of one unknown SCell and one known SCell in FR2 |
| A.5.5.6.4.2 | E-UTRAN – NR FR1 PSCell SCell dormancy switch of two FR2 SCells outside active time |
| A.5.7.1.3 | EN-DC inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell |

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

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

- UE does not have to pass the test case.

- 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.7.5.3.7 | PUCCH SCell activation and deactivation delay requirements of FR2 unknown cell with FR1 PCell |
| A.7.5.6.1.2 | NR FR1- NR FR2 DL active BWP switch of PCell with non-DRX in SA |
| A.7.5.6.4.2 | NR FR1 PCell SCell dormancy switch of two FR2 SCells outside active time |
| A.7.6.2.5 | SA event triggered reporting tests for FR2 without SSB time index detection when DRX is not used (PCell in FR1) |
| A.7.6.2.6 | SA event triggered reporting tests for FR2 without SSB time index detection when DRX is used (PCell in FR1) |
| A.7.6.2.7 | SA event triggered reporting tests for FR2 with SSB time index detection when DRX is not used (PCell in FR1) |
| A.7.6.2.8 | SA event triggered reporting tests for FR2 with SSB time index detection when DRX is used (PCell in FR1) |
| A.7.7.1.3 | SA inter-frequency measurement accuracy with FR1 serving cell and FR2 target cell |

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

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

- UE does not have to pass the test case.

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

|  |  |
| --- | --- |
| Clause | Test case slogan |
| A.8.2.2.2 | E-UTRA – NR Early Measurement Reporting for NR in FR2 |
| A.8.4.2.5 | NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is not used |
| A.8.4.2.6 | NR Inter-RAT event triggered reporting tests for FR2 without SSB time index detection when DRX is used |
| A.8.4.2.7 | NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is not used |
| A.8.4.2.8 | NR Inter-RAT event triggered reporting tests for FR2 with SSB time index detection when DRX is used |

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

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

#### A.3.13B.1.1 Introduction

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

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

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

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

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

#### A.3.13B.2.1 Introduction

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

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

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

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

## A.3.14 CSI-RS configurations

### A.3.14.1 FDD

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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CSI-RS.1.1 FDD** | **CSI-RS.1.2 FDD** | **CSI-RS.1.3 FDD** | **CSI-RS.1.4 FDD** | **CSI-RS.1.5 FDD** | **CSI-RS.1.6 FDD** | **CSI-RS.1.7 FDD** |
| **Resource Type** | **periodic** | **periodic** | **aperiodic** | **aperiodic** | **aperiodic** | **periodic** | **periodic** |
| **Resource Set Config** |  |  |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | off | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 | 0 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |  |  |  |
|  |  | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |  | 2 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |  |
|  |  |  |  | 2 for resource #2 |  |  |
|  |  |  |  | 3 for resource #3 |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | 1 for resource #1 | 0 for resource #0 | 3 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |  |
|  |  |  |  | 6 for resource #6 |  |  |
|  |  |  |  | 7 for resource #7 |  |  |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. | n.a. | slot40 | slot10 |
| Offset | 1 | 1 | n.a. | n.a. | n.a. | 1 | 1 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | n.a. | TCI.State.0 | TCI.State.0 |
|  |  | TCI.State.1 |  |  |  |  | TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
|  |  | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 | Specified in the test case for resource #0 |  | 6 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |  |  |
|  |  |  |  | 2 for resource #2 |  |  |  |
|  |  |  |  | 3 for resource #3 |  |  |  |
| firstOFDMSymbolInTimeDomain | 4 for resource #0 | 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | n.a. | 5 for resource #0 | 10 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |  |  |
|  |  |  |  | 6 for resource #6 |  |  |  |
|  |  |  |  | 7 for resource #7 |  |  |  |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 3 | 1 | 3 |
| startingRB | 0 | 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) | 276 (Note 1) |
| Note 1: If the configured value of PRBs is larger than the width of the corresponding BWP relevant for the test case, the Test Equipment shall implement CSI-RS only in the width of that BWP. | | | | | | | |

### A.3.14.2 TDD

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **CSI-RS.1.1 TDD** | **CSI-RS.1.2 TDD** | **CSI-RS.1.3 TDD** | **CSI-RS.1.4 TDD** | **CSI-RS.1.5 TDD** | **CSI-RS.1.6 TDD** |
| Resource Type | periodic | periodic | aperiodic | aperiodic | periodic | periodic |
| **Resource Set Config** |  |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |  |  |
|  |  | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |  | 2 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |
|  |  |  |  | 2 for resource #2 |  |
|  |  |  |  | 3 for resource #3 |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | 0 for resource #0 | 3 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |
|  |  |  |  | 6 for resource #6 |  |
|  |  |  |  | 7 for resource #7 |  |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot5 | slot10 | n.a. | n.a. | slot40 | slot10 |
| Offset | 1 | 1 | n.a. | n.a. | 1 | 1 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | TCI.State.0 | TCI.State.0 |
|  |  | TCI.State.1 |  |  |  | TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 2 | 1 |
|  |  | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 |  | 6 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |
|  |  |  |  | 2 for resource #2 |  |
|  |  |  |  | 3 for resource #3 |  |
| firstOFDMSymbolInTimeDomain | 4 for resource #0 | 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | 5 for resource #0 | 10 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |
|  |  |  |  | 6 for resource #6 |  |
|  |  |  |  | 7 for resource #7 |  |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 1 | 3 |
| 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.3.14.2-1A: 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. | 0 | 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

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CSI-RS.2.1 TDD** | **CSI-RS.2.2 TDD** | **CSI-RS.2.3 TDD** | **CSI-RS.2.4 TDD** | **CSI-RS.2.5 TDD** | **CSI-RS.2.6 TDD** | **CSI-RS.2.7 TDD** |
| **Resource Type** | periodic | periodic | aperiodic | aperiodic | aperiodic | periodic | periodic |
| **Resource Set Config** |  |  |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | off | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 0 | 0 | 0 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |  |  |  |
|  |  | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |  | 2 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |  |
|  |  |  |  | 2 for resource #2 |  |  |
|  |  |  |  | 3 for resource #3 |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | 1 for resource #1 | 0 for resource #0 | 3 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |  |
|  |  |  |  | 6 for resource #6 |  |  |
|  |  |  |  | 7 for resource #7 |  |  |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot10 | slot20 | n.a. | n.a. | n.a. | slot80 | slot20 |
| Offset | 2 | 2 | n.a. | n.a. | n.a. | 2 | 2 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | n.a. | TCI.State.0 | TCI.State.0 |
|  |  | TCI.State.1 |  |  |  |  | TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 | 2 | 1 |
|  |  | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 | Specified in the test case for resource #0 |  | 6 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |  |
|  |  |  |  | 2 for resource #2 |  |  |
|  |  |  |  | 3 for resource #3 |  |  |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | n.a. | 5 for resource #0 | 10 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |  |
|  |  |  |  | 6 for resource #6 |  |  |
|  |  |  |  | 7 for resource #7 |  |  |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 3 | 1 | 3 |
| startingRB | 0 | 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) | 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.3.14.2-2A: 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. | 0 | 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 | CSI-RS.3.6 TDD |
| Resource Type | periodic | periodic | aperiodic | aperiodic | periodic | periodic |
| Resource Set Config |  |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 | 0 | 0 | 0 | 0 | 0 |
| repetition | n.a. | off | off | on | n.a. | off |
| aperiodicTriggeringOffset | n.a. | n.a. | 4 | 4 | n.a. | n.a. |
| trs-Info | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| **Resource Config** |  |  |  |  |  |  |
|  |  | 0 for resource #0 | 0 for resource #0 | 0 for resource #0 |  | 2 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |
|  |  |  |  | 2 for resource #2 |  |
|  |  |  |  | 3 for resource #3 |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 | 1 for resource #1 | 1 for resource #1 | 4 for resource #4 | 0 for resource #0 | 3 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |
|  |  |  |  | 6 for resource #6 |  |
|  |  |  |  | 7 for resource #7 |  |
| powerControlOffset | 0 | 0 | 0 | 0 | 0 | 0 |
| powerControlOffsetSS | db0 | db0 | db0 | db0 | db0 | db0 |
| scramblingID | 0 | 0 | 0 | 0 | 0 | 0 |
| Period (slots) | slot40 | slot80 | n.a. | n.a. | slot320 | slot80 |
| Offset | 8 | 16 | n.a. | n.a. | 8 | 16 |
| qcl-InfoPeriodicCSI-RS | TCI.State.0 | TCI.State.0 | n.a. | n.a. | TCI.State.0 | TCI.State.0 |
|  |  | TCI.State.1 |  |  |  | TCI.State.1 |
| frequencyDomainAllocation | 000001 | 0001 | 0001 | 0001 | 000001 | 0100 |
| nrofPorts | 2 | 1 | 1 | 1 | 1 | 1 |
|  |  | 6 for resource #0 | 6 for resource #0 | 0 for resource #0 |  | 6 for resource #0 |
|  |  |  |  | 1 for resource #1 |  |
|  |  |  |  | 2 for resource #2 |  |
|  |  |  |  | 3 for resource #3 |  |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 | 10 for resource #1 | 10 for resource #1 | 4 for resource #4 | 5 for resource #0 | 10 for resource #1 |
|  |  |  |  | 5 for resource #5 |  |
|  |  |  |  | 6 for resource #6 |  |
|  |  |  |  | 7 for resource #7 |  |
| cdm-Type | FD-CDM2 | noCDM | noCDM | noCDM | FD-CDM2 | noCDM |
| density | 1 | 3 | 3 | 3 | 1 | 3 |
| 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.3.14.2-3A: 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 | 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) | 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 | 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. | | | |

## 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 |
| 7 | FFS |

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

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

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

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

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

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

## A.3.16 TCI State Configuration

### A.3.16.1 Introduction

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

### A.3.16.2 TCI states

Table A.3.16.2-1: TCI States

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

Table A.3.16.2-2: Void

## A.3.16A Unified TCI State Configuration

### A.3.16A.1 Introduction

This clause provides the configurations for unified TCI states towards either SSB or CSI-RS. The DLorJoint TCI states defined in this clause are configured in each test when applicable to indicate that certain DL (and UL, if joint DL/UL operation is configured) signals are QCL’ed with the referenceSignal configured in the TCI states. The UL TCI states defined in this clause are configured in each test when applicable to indicate that certain UL signals are QCL’ed with the referenceSignal configured in the TCI states.

### A.3.16A.2 DLorJoint TCI states

Table A.3.16A.2-1: DLorJoint TCI States

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | DLorJoint TCI.State.0 | DLorJoint TCI.State.1 | DLorJoint TCI.State.2 | DLorJoint TCI.State.3 | DLorJoint TCI.State.4 | DLorJoint TCI.State.5 |
| tci-StateUnifiedId | Id0 | Id1 | Id2 | Id3 | Id4 | Id5 |
| qcl-Type1 | typeA | typeA | typeA | typeA | typeC | typeC |
| qcl-Type2Note1 | typeD | typeD | typeD | typeD | typeD | typeD |
| referenceSignal Note2 | Resource #4 in TRS resource set 1 Note3 | Resource #4 in TRS resource set 2 Note 5 | Resource #4 in TRS resource set 1 Note3 | Resource #4 in TRS resource set 2 Note3 | SSB0 | SSB1 from the cell with different PCI |
| pathlossReferenceRS | N/A | N/A | Resource #4 in TRS resource set 1 Note3 | Resource #4 in TRS resource set 1 Note3 | N/A | N/A |
| additionalPCI | N/A | configured Note4 | N/A | N/A | N/A | configured Note4 |
| Note 1: qcl-Type2 of typeD only where applicable. For RRM test cases, this will be only in FR2  Note 2: referenceSignal configurations towards which the TCI states are configured are defined in a test-specific manner.  Note 3: Reference TRS resource sets are defined in A.3.17, and the applicable TRS resource set(s) are specified in each test case. When a single TRS resource set is configured in a test case, it is considered as resource set 1. The TCI state of the TRS is the DLorJoint TCI.State.4.  Note 4: Only one PCI than serving cell PCI is included in the additionalPCIList, and the additionalPCIIndex is configured as 0.  Note 5: 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. The TCI state of the TRS is the DLorJoint TCI.State.5. | | | | | | |

### A.3.16A.3 UL TCI states

Table A.3.16A.3-1: UL TCI States

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | UL TCI.State.0 | UL TCI.State.1 | UL TCI.State.2 | UL TCI.State.3 |
| ul-TCIState-Id | Id0 | Id1 | Id2 | Id3 |
| referenceSignal Note1 | SSB0 | SSB1 | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 2 Note2 |
| pathlossReferenceRS | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 1 Note2 | Resource #4 in TRS resource set 2 Note2 |
| additionalPCI | N/A | configured Note3 | N/A | N/A |
| Note 1: referenceSignal configurations towards which the UL TCI states are configured are defined in a test-specific manner.  Note 2: 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.  Note 3: Only one PCI than serving cell PCI is included in the additionalPCIList, and the additionalPCIIndex is configured as 0. | | | | |

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

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

#### A.3.17.1.1 FDD

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

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

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

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

Table A.3.17.1.1-3: Aperiodic CSI-RS for tracking for SCS=15kHz

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | TRS.1.3 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2  3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case | | |

Table A.3.17.1.1-4: Aperiodic CSI-RS for tracking for SCS=30kHz

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
| Reference channel |  | TRS.1.4 FDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2  3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case | | |

#### A.3.17.1.2 TDD

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

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.1 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 20 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 10 for CSI-RS resource 1 and 2  11 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note: 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 BWPNote 1 |
| SCS | kHz | 30 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| CSI-RS periodicity | slots | 40 for CSI-RS resource 1,2,3,4 |
| CSI-RS offset | slots | 20 for CSI-RS resource 1 and 2  21 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case | | |

Table A.3.17.1.2-3: Aperiodic CSI-RS for tracking for SCS=15kHz

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.3 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 15 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2  3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 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.3.17.1.2-4: Aperiodic CSI-RS for tracking for SCS=30kHz

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.1.4 TDD |
| Bandwidth |  | BW of Active BWPNote 1 |
| SCS | kHz | 30 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 5 for CSI-RS resource 1 and 3  l0 = 9 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2  3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case | | |

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

#### A.3.17.2.1 TDD

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

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

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

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

Table A.3.17.2.1-3: Aperiodic CSI-RS for tracking for SCS=120kHz Set 1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.2.3 TDD |
| Bandwidth |  | BW of Active BWPNote 1,3 |
| SCS | kHz | 120 |
| First subcarrier index in the PRB used for CSI-RS |  | k0=0 for CSI-RS resource 1,2,3,4 |
| First OFDM symbol in the slot used for CSI-RS |  | l0 = 1 for CSI-RS resource 1 and 3  l0 = 5 for CSI-RS resource 2 and 4 |
| Number of CSI-RS ports (X) |  | 1 for CSI-RS resource 1,2,3,4 |
| CDM Type |  | ‘No CDM’ for CSI-RS resource 1,2,3,4 |
| Density (ρ) |  | 3 for CSI-RS resource 1,2,3,4 |
| aperiodicTriggeringOffsetL2 | slots | 2 |
| Aperiodic CSI-RS offset | slots | 2 for CSI-RS resource 1 and 2  3 for CSI-RS resource 3 and 4 |
| EPRE ratio to SSS | dB | 0Note 2 |
| TCI state |  | TCI.State.0 |
| Note 1: BW of TRS is configured same as the BW size of UE active BWP in the RRM test cases  Note 2: Unless otherwise specified in the test case  Note 3: If active BWP is larger than 52RBs, BW of TRS is configured as 52RBs. Otherwise, same as active BWP size. | | |

## 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, NCS = 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, NCS = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| ssb-ResourceList | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn’t use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | 1 | PRACH occasion index 1 is allowed |
| 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 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, NCS = 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, NCS = 23 |
| Backoff Parameter Index | 2 | 20 ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| ssb-ResourceList | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn’t use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | 1 | PRACH occasion index 1 is allowed |
| 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 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, NCS = 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, NCS = 23 |
| Backoff Parameter Index | 2 | 20ms, as defined in table 7.2-1 in TS 38.321 [7]. |
| ssb-ResourceList | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE doesn’t use this field if is transmitting CFRA to convey BFR. |
| BFR-SSB-Resource | ra-PreambleIndex = 50 | Associated with SSB index 0. UE doesn’t use ssb-ResourceList and BFR-SSB-Resource IEs at the same time. UE uses this field only if is transmitting CFRA to convey BFR |
| ra-ssb-OccasionMaskIndex | 1 | PRACH occasion index 1 is allowed |
| 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

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| SL-BWP-ConfigCommon-r16 |  |  |
| sl-BWP-Generic-r16 |  |  |
| sl-LengthSymbols-r16 | sym14 | All 14 symbols in a slot without S-SSB are used for sidelink |
| sl-StartSymbol-r16 | sym0 | Symbol #0 is the starting symbol used for sidelink in a slot without S-SSB |
| sl-BWP-PoolConfigCommon-r16 |  |  |
| sl-RxPool-r16 |  | Indicates the resource pool for reception on the configured BWP.  1 entry |
| SL-ResourcePool-r16[1] | Set according to Table A.3.21.2-2 | Entry 1 |
| sl-TxPoolSelectedNormal-r16 |  | Indicates the resources pool for mode 2 sidelink communication on the configured BWP.  1 entry |
| SL-ResourcePoolConfig-r16[1] |  | Entry 1 |
| sl-ResourcePool-r16 | Set according to Table A.3.21.2-2 |  |
| sl-TxPoolExceptional-r16 | Not present |  |

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

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| SL-ResourcePool-r16 |  |  |
| sl-PSCCH-Config-r16 | Set according to Table A.3.21.3-1 |  |
| sl-PSSCH-Config-r16 | Set according to Table A.3.21.3-2 |  |
| sl-PSFCH-Config-r16 | Not present |  |
| sl-SyncAllowed-r16 |  | Indicates the allowed synchronization reference(s) which is (are) allowed to use the configured resource pool. |
| gnss-Sync-r16 | true |  |
| gnbEnb-Sync-r16 | true |  |
| ue-Sync-r16 | true |  |
| sl-SubchannelSize-r16 | n10 | Subchannel bandwidth is 10 RB |
| sl-StartRB-Subchannel-r16 | 0 | The offset of lowest RB index of the subchannel with the lowest index in the resource pool with respect to the lowest RB index of a SL BWP |
| sl-NumSubchannel-r16 | 1 | Number of subchannels in resource pool |
| sl-UE-SelectedConfigRP-r16 |  |  |
| sl-Thres-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-MultiReserveResource-r16 | Not present |  |
| sl-MaxNumPerReserve-r16 | n2 | At most 2 PSCCH/PSSCH resources can be reserved by a single SCI. |
| sl-SensingWindow-r16 | ms100 | Length of resource sensing window specified in TS 38.214 [26] subclause 8.1.4. which is 100ms. |
| sl-SelectionWindowList-r16 |  | Parameter that determines the end of the selection window for each priority level  8 entries |
| SL-SelectionWindowConfig-r16[k,k=1..8] |  | entry k |
| sl-Priority-r16 | k | for priority level = k |
| sl-SelectionWindow-r16 | n20 | Length of resource selection window specified in TS 38.214 [26] subclause 8.1.4. which is 20∙2μslots, where µ=0,1,2,3 refers to SCS 15,30,60,120 kHz respectively |
| sl-ResourceReservePeriodList-r16 | Not present |  |
| sl-RS-ForSensing-r16 | pssch | PSSCH-RSRP measurement is used in the sensing operation. |
| sl-RxParametersNcell | Not present |  |
| sl-ZoneConfigMCR-List-r16 | Not present |  |
| sl-PreemptionEnable-r16 | enabled |  |
| sl-MinMaxMCS-List-r16 |  | 1 entry |
| SL-MinMaxMCS-Config-r16[1] |  | Entry 1 |
| sl-MCS-Table-r16 | qam64 | TS 38.214 [26] Table 5.1.3.1-1 is the MCS table used in the resource pool. |
| sl-TimeResource-r16 | 1111111111  1111111111 | Every slot in a period of 20 slots during a SFN or DFN cycle can be used for sidelink |
| SL-TxPercentageList-r16 |  |  |
| SL-TxPercentageConfig-r16 |  |  |
| sl-TxPercentage-r16 | p20 | Indicates the portion of candidate single-slot PSSCH resources over the toal resources. Value p20 corresponds to 20%, and so on. |

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

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| SL-UE-SelectedConfig-r16 |  |  |
| sl-PSSCH-TxConfigList-r16 |  | 1 entry |
| SL-PSSCH-TxConfig-r16[1] |  | Entry 1 |
| sl-TypeTxSync-r16 | Not present | When this filed is absent, the configuration is applicable for all synchronization reference types. |
| sl-ThresUE-Speed-r16 | kmph200 | UE shall apply the parameters in sl-ParametersAboveThres-r16 if UE absolute speed is higher than 200 km/h, otherwise UE shall apply the parameters in sl-ParametersBelowThres-r16 |
| sl-ParametersAboveThres-r16 |  |  |
| sl-MinMCS-PSSCH-r16 | 0 | The minimum MCS index value can be used for PSSCH transmission. |
| sl-MaxMCS-PSSCH-r16 | 15 | The maximum MCS index value can be used for PSSCH transmission. |
| sl-MinSubChannelNumPSSCH-r16 | 1 | The minimum number of subchannels can be used for PSSCH transmission. |
| sl-MaxSubchannelNumPSSCH-r16 | 1 | The maximum number of subchannels can be used for PSSCH transmission. |
| sl-MaxTxTransNumPSSCH-r16 | 1 | The maximum transmission number for PSSCH (including new transmission and retransmission). |
| sl-MaxTxPower-r16 | Not present | Not applicable |
| sl-ParametersBelowThres-r16 |  |  |
| sl-MinMCS-PSSCH-r16 | 4 | Same as above |
| sl-MaxMCS-PSSCH-r16 | 25 | Same as above |
| sl-MinSubChannelNumPSSCH-r16 | 1 | Same as above |
| sl-MaxSubchannelNumPSSCH-r16 | 1 | Same as above |
| sl-MaxTxTransNumPSSCH-r16 | 1 | Same as above |
| sl-MaxTxPower-r16 | Not present | Same as above |
| sl-ProbResourceKeep-r16 | v0dot8 | The probability of UE keeping current resource is 80% when the resource reselection counter reaches 0 (see TS 38.321 [7]). |
| sl-ReselectAfter-r16 | n1 | Resource reselection is triggered after 1 sidelink transmission is skipped (see TS 38.321 [7]). |

### 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 |  | 00 (SCI format 2-A) |
| 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.  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.  Note 2: 2nd state SCI and PSFCH are not allocated per slot. | | |

### A.3.21.4 Reference SL-DRX configurations

#### A.3.21.4.1 SL-DRX Configuration 1: SL-DRX cycle = 40 ms

Table A.3.21.4.1-1: SL-DRX.1: SL-DRX cycle = 40 ms

|  |  |
| --- | --- |
| Field | Value |
| sl-DRX-GC-BC-OnDurationTimer | 2 ms |
| sl-DRX-GC-InactivityTimer | 2 ms |
| sl-DRX-GC-RetransmissionTimer | 16 slot |
| sl-DRX-GC-BC-CyclelongDRX | 40 ms |
| Note: This SL-DRX configuration is applicable for V2X sidelink communication. For further information see clause 6.3.5 in TS 38.331. | |

#### A.3.21.4.2 SL-DRX Configuration 2: SL-DRX cycle = 320 ms

Table A.3.21.4.2-1: SL-DRX.2: SL-DRX cycle = 320 ms

|  |  |
| --- | --- |
| Field | Value |
| sl-DRX-GC-BC-OnDurationTimer | 2 ms |
| sl-DRX-GC-InactivityTimer | 2 ms |
| sl-DRX-GC-RetransmissionTimer | 16 slot |
| sl-DRX-GC-BC-CyclelongDRX | 320 ms |
| Note: This SL-DRX configuration is applicable for V2X sidelink communication. For further information see clause 6.3.5 in TS 38.331. | |

#### A.3.21.4.3 SL-DRX Configuration 3: SL-DRX cycle = 640 ms

Table A.3.21.4.3-1: SL-DRX.3: SL-DRX cycle = 640 ms

|  |  |
| --- | --- |
| Field | Value |
| sl-DRX-GC-BC-OnDurationTimer | 2 ms |
| sl-DRX-GC-InactivityTimer | 2 ms |
| sl-DRX-GC-RetransmissionTimer | 16 slot |
| sl-DRX-GC-BC-CyclelongDRX | 640 ms |
| Note: This SL-DRX configuration is applicable for V2X sidelink communication. For further information see clause 6.3.5 in TS 38.331. | |

## 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 |
| PUCCH-PathlossReferenceRS | 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 | PDC-SRS.1 | POS-SRS.1 |  |
| Field | Value |  |  | Comment |
| c-SRS | 12 | Same as NRB,c in the test case | Same as NRB,c in the test case |  |
| b-SRS | 0 | 0 | n.a. |  |
| b-hop | 0 | 0 | n.a. | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | 0 |  |
| pathlossReferenceRS  ssb-Index | 0 | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | usagePDC-r17 | n.a. |  |
| startPositionNote 1 | 1 | 5 | 5 | resourceMapping setting |
| nrofSymbols Note 1 | 1 | 4 | 4 |  |
| repetitionFactor | n1 | n.a. | n.a. | without repetition. |
| transmissionComb | n2 | n4 | n4 |  |
| combOffset-n2 | 0 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | 0 |  |
| nrofSRS-Ports Note 1 | port1 | port1 | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | Periodic | Periodic |  |
| periodicityAndOffset-p Note 1 | sl40, 1 | sl160, 20 | sl160, 20 | SRS transmission periodicity |
| Note 1: For test cases in A.4.5.2.11, A.4.5.2.12, A.6.5.2.3, A.6.5.2.4, the startPosition, nrofSymbols, nrofSRS-Ports, periodicityAndOffset-p are specified in each test cases. | | | | |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | SRS.2 TDD | PDC-SRS.2 | POS-SRS.2 |  |
| Field | Value |  |  | Comment |
| c-SRS | 24 | Same as NRB,c in the test case | Same as NRB,c in the test case |  |
| b-SRS | 0 | 0 | n.a. |  |
| b-hop | 0 | 0 | n.a. | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | 0 |  |
| pathlossReferenceRS  ssb-Index | 0 | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | usagePDC-r17 | n.a. |  |
| startPosition Note 1 | 3 | 5 | 5 | resourceMapping setting |
| nrofSymbols Note 1 | 1 | 4 | 4 | SRS symbols belong to the same SRS resource. |
| repetitionFactor | n1 | n.a. | n.a. | without repetition. |
| transmissionComb | n2 | n4 | n4 |  |
| combOffset-n2 | 0 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | 0 |  |
| nrofSRS-Ports Note 1 | port1 | port1 | port1 | Number of antenna ports used for SRS resource transmission |
| resourceType | Periodic | Periodic | Periodic |  |
| periodicityAndOffset-p Note 1 | sl80, 3 | Sl320, 40 | Sl320, 40 | SRS transmission periodicity |
| Note 1: For test cases in A.4.5.2.11, A.4.5.2.12, A.6.5.2.3, A.6.5.2.4, the startPosition, nrofSymbols, nrofSRS-Ports, periodicityAndOffset-p are specified in each test cases. | | | | |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **SRS.3 TDD** | **PDC-SRS.3** | **POS-SRS.3** |  |
| **Field** | **Value** |  |  | **Comment** |
| c-SRS | 17 | Same as NRB,c in the test case | Same as NRB,c in the test case |  |
| b-SRS | 0 | 0 | n.a. |  |
| b-hop | 0 | 0 | n.a. | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | 0 |  |
| pathlossReferenceRS  ssb-Index | 0 | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | usagePDC-r17 | n.a. |  |
| startPosition | 1 | 5 | 5 | resourceMapping setting |
| nrofSymbols | 1 | 4 | 4 | SRS symbols belong to the same SRS resource. |
| repetitionFactor | n1 | n1 | n.a. | without repetition. |
| transmissionComb | n2 | n4 | n4 |  |
| combOffset-n2 | 0 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | 0 |  |
| nrofSRS-Ports | port1 | port1 | port1 | Number of antenna ports used for SRS resource transmission |
| resourceType | Periodic | Periodic | Periodic |  |
| periodicityAndOffset-p | sl320, 3 | Sl1280, 160 | Sl1280, 160 | SRS transmission periodicity |

## 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 | RBy Note 2 | RBx Note 1 |
| carrierBandwidth | RB | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: RBx is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RBx has to be within the CBW of BS.  Note 2: RBy is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RBy has to be within the CBW of BS and different with RBx, and CBW should include SSB and CORESET#0. | | | |

### 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 | RBy Note 2 | RBx Note 1 |
| carrierBandwidth | RB | Same as RF channel defined in each test | Same as RF channel defined in each test |
| Note 1: RBx is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RBx has to be within the CBW of BS.  Note 2: RBy is offset in frequency domain between Point A (lowest subcarrier of common RB 0) and the lowest usable subcarrier on this carrier. Note that RBy has to be within the CBW of BS and different with RBx. | | | |

## 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 cycle is used or not with the following differences:

- The counter, *l*CCA, is used to monitor the number of unavailable DBT samples withing an evaluation window, WCCA\_DL. DBT samples outside of the evaluation window WCCA\_DL are discarded.

- If DRX cycle is not used then prior to each DBT window, the test equipment shall determine whether the DL CCA attempt is successful (i.e., the corresponding signals have to be transmitted), based on probability PCCA\_DL of successful DL CCA configured in the corresponding test case. If DRX cycle is not used, then the DL CCA model shall increment the counter *l*CCA for every unavailable DBT sample due to DL CCA failure.

- If DRX cycle is used, then the DL CCA model shall increment the counter, *l*CCA, once per DRX cycle for a DRX cycle if the first DBT sample in that DRX cycle is unavailable due to DL CCA failure. DL CCA failures in a DRX cycle are determined as follows:

- The test system *in the first DBT window of each DRX cycle* determines whether the DL CCA attempt is successful or not using the principle as follows:

- If the DL CCA is successful then the test system shall transmit in all DBT windows within that DRX cycle.

- If the DL CCA is not successful then the test system shall not transmit in any of the DBT windows within that DRX cycle. In this case *l*CCA is increased by 1.

- The parameters, LCCA\_DL, LCCA\_UL,WCCA\_DL and WCCA\_UL can be used as in non-DRX tests.

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 PCCA\_DL.

The probability can be different in different time intervals Ti 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 PCCA\_DL per time interval Ti where i≥1, and the multiple time intervals (when i>1) do not overlap (e.g., PCCA\_DL=1.0 in T1 and PCCA\_DL=0.75 in T2).*.*

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

For dynamic channel access configuration, the parameters PCCA\_DL\_1 and PCCA\_DL\_2 are used to configure the probability of CCA success on the first and second SSB candidate positions, respectively, in different time intervals Ti during a test realization. An additional limit LCCA\_DL is used to determine the maximum number of unavailable DBT samples within an evaluation window WCCA\_DL. If the number of unavailable DBT samples on the last WCCA\_DL DBT samples is larger or equal to LCCA\_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* ≤ PCCA\_DL, the discovery burst is transmitted at the first candidate SSB location; else if *l*CCA is larger than or equal to LCCA\_DL, the discovery burst is transmitted at the first candidate SSB location, otherwise the discovery burst is muted. If DRX cycle is used, then the decision whether the discover burst is muted or not is repeated for the rest of the DRX cycle.

For dynamic channel access configuration where two candidate SSB positions are modelled, 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* ≤ PCCA\_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* ≤ PCCA\_DL2, the discovery burst is transmitted at the second candidate SSB location; else if *l*CCA is larger than or equal to LCCA\_DL,the discovery burst is transmitted at the second candidate SSB location, otherwise the discovery burst is muted. If DRX cycle is used, then the decision whether the discover burst is muted or not is repeated for the rest of the DRX cycle

The above steps are repeated for each discovery burst transmission window in each time interval Ti of the test. The limit LCCA\_DL and windowWCCA\_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 PCCA\_UL of successful CCA. Probability PCCA\_UL is configured in the corresponding test case, based on a set SCCA\_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 PCCA\_UL, e.g., PCCA\_UL = 0%.

In the same time interval Ti during the same test case, PCCA\_UL can be different from PCCA\_DL.

The probability can be different in different time intervals Ti 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 PCCA\_UL per time interval Ti where I ≥ 1, and the multiple time intervals (when I > 1) do not overlap (e.g., PCCA\_UL = 1.0 in T1 and PCCA\_UL = 0.75 in T2).

TCCA 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>PCCA\_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 TCCA µs. Where TCCA 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].
* TCCA 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 LCCA\_UL within a window WCCA\_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.3.26.3 CCA model for operation on a carrier frequency with CCA in FR2-2

#### A.3.26.3.1 DL CCA model

For DL CCA, the modelling approach is based on probability PCCA\_DL of successful CCA.

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 PCCA\_DL.

To decide whether the CCA attempt for one SSB/SMTC occasion within one SSB/SMTC occasion group, where one SSB/SMTC occasion group consists of 12 consecutive SSB/SMTC occasions is successful or not, TE shall:

1 - Generate a uniform random variable *p* from the range [0, 1].

2 - If *p* > PCCA\_DL,

* TE picks one SSB/SMTC occasion out of a group of 12 consecutive SSB/SMTC occasions based on a fixed pattern, where one SSB/SMTC occasion is equivalent to one SSB burst Set.
* TE models CCA failure in this SSB/SMTC occasion. Note that other 11 SSB/SMTC occasions shall be transmitted by the TE.
* Whole SSB/SMTC occasion group is considered as unavailable to the UE.

2 - If *p* ≤ PCCA\_DL,

* TE transmit 12 consecutive SSB/SMTC occasions.
* Whole SSB/SMTC occasion group is considered as available to the UE.

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.3.26.3.2 UL CCA model

For UL CCA, the modelling approach is based on probability PCCA\_UL of successful CCA. Probability PCCA\_UL is configured in the corresponding test case.

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

In the same time interval Ti during the same test case, PCCA\_UL can be different from PCCA\_DL.

The probability can be different in different time intervals Ti 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 PCCA\_UL per time interval Ti where I ≥ 1, and the multiple time intervals (when I > 1) do not overlap (e.g., PCCA\_UL = 1.0 in T1 and PCCA\_UL = 0.75 in T2).

TCCA 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>PCCA\_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 TCCA µs. Where TCCA 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].
* TCCA is the channel sensing period depending on CCA category for the next UL transmission.

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** |  |
| cellIdnote1 | 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  Note2: unless specified otherwise  Note3: assume the same SS/PBCH block index of the corresponding cell in the test case  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** |  |
| cellIdnote1 | 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  Note2: unless specified otherwise  Note3: assume the same SS/PBCH block index of the corresponding cell in the test case  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** |  |
| cellIdnote1 | 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  Note2: unless specified otherwise  Note3: assume the same SS/PBCH block index of the corresponding cell in the test case  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** |  |
| cellIdnote1 | 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  Note2: unless specified otherwise  Note3: assume the same SS/PBCH block index of the corresponding cell in the test case  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 Note 1 | 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 Note 1 | 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 Note 1 | 0-31 | 0-127 | 0-31 | | 0-127 | |
| PRS Start PRB | 0 | | | | | |
| Note 1: Unless otherwise specified in the test case | | | | | | |

## A.3.32 NR sidelink discovery

### A.3.32.1 Introduction

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

### A.3.32.2 Reference resource pool configurations for NR Sidelink Discovery

Table A.3.32.2-1: SL-BWP configuration for NR sidelink discovery

|  |  |  |
| --- | --- | --- |
| Field | Value | Comment |
| SL-BWP-ConfigCommon-r16 |  |  |
| sl-BWP-Generic-r16 |  |  |
| sl-LengthSymbols-r16 | sym14 | All 14 symbols in a slot without S-SSB are used for sidelink |
| sl-StartSymbol-r16 | sym0 | Symbol #0 is the starting symbol used for sidelink in a slot without S-SSB |
| sl-BWP-DiscPoolConfigCommon-r17 |  |  |
| sl-DiscRxPool-r17 |  | Indicates the resource pool for reception on the configured BWP.  1 entry |
| SL-ResourcePool-r16[1] | Set according to Table A.3.21.2-2 | Entry 1 |
| sl-DiscTxPoolSelected-r17 |  | Indicates the resources pool for mode 2 sidelink communication on the configured BWP.  1 entry |
| SL-ResourcePoolConfig-r16[1] |  | Entry 1 |
| sl-ResourcePool-r16 | Set according to Table A.3.21.2-2 |  |

### A.3.32.3 Principle of Testing

The UE capable of both V2X sidelink communication and NR sidelink discovery does not have to pass the test for interruption at NR sidelink discovery configuration defined in clause 9.1.6.1, if this UE has already passed the test case for interruption due to V2X sidelink communication defined in clause 9.1.6.1.

## A.3.33 PRS Processing Window (PPW) configurations

Table A.3.33-1: Reference PPW configuration

|  |  |  |
| --- | --- | --- |
| PPW Parameters | Unit | Values |
| Reference PPW |  | PPW.1 |
| Periodicity | slot | Note 1 |
| Offset | slot | Note 2 |
| Length | ms | 10 |
| Type |  | 1A |
| Priority |  | st1 |
| Note 1: Same as PRS resource set periodicity as used in the test case.  Note 2: Same as PRS resource with smallest offset as used in the test case. | | |

## A.3.34 Testing principles for test cases related to PRS measurements

### A.3.34.1 Introduction

In annex A test cases are defined for verifying various type of PRS measurement and accuracy requirements.

### A.3.34.2 Test cases in RRC\_INACTIVE state

In Annex A, PRS measurement test cases are defined with 4 samples and with reduced number of samples in RRC\_INACTIVE state. The testing principle for these test cases is as follows:

- A UE capable of *supportedDL-PRS-ProcessingSamples-RRC-Inactive* [34] is only required to pass the test cases with reduced number of samples.

- A UE not capable of *supportedDL-PRS-ProcessingSamples-RRC-Inactive* [34] is required to pass the test cases with 4 samples.

In Annex A, PRS measurement delay test cases are defined for both PRS-RSRP and PRS-RSRPP measurements in RRC\_INACTIVE state. The testing principle for these test cases is as follows:

- A UE capable of both PRS-RSRP and PRS-RSRPP measurements is required to pass either PRS-RSRP measurement delay test or PRS-RSRPP measurement delay test.

In Annex A, PRS measurement delay test cases are defined for both RSTD and UE Rx-Tx time difference measurements in RRC\_INACTIVE state. The testing principle for these test cases is as follows:

- A UE capable of both RSTD and UE Rx-Tx time difference measurements is required to pass either RSTD measurement delay test or UE Rx-Tx time difference measurement delay test.

### A.3.34.3 Test cases for PRS measurements with gaps in RRC\_CONNECTED state

In Annex A, PRS measurement test cases are defined with 4 samples and with reduced number of samples with measurement gaps in RRC\_CONNECTED state. The testing principle for these test cases is as follows:

- A UE capable of *supportedDL-PRS-ProcessingSamples* [34] is only required to pass the test cases with reduced number of samples.

- A UE not capable of *supportedDL-PRS-ProcessingSamples* [34] is required to pass the test cases with 4 samples.

In Annex A, PRS measurement delay test cases are defined for both PRS-RSRP and PRS-RSRPP measurements with measurement gaps in RRC\_CONNECTED state. The testing principle for these test cases is as follows:

- A UE capable of both PRS-RSRP and PRS-RSRPP measurements is required to pass either PRS-RSRP measurement delay test or PRS-RSRPP measurement delay test.

### A.3.34.4 Test cases for PRS measurements without gaps in RRC\_CONNECTED state

In Annex A, PRS measurement test cases are defined with 4 samples and with reduced number of samples without measurement gaps in RRC\_CONNECTED state. The testing principle for these test cases is as follows:

- A UE capable of *supportedDL-PRS-ProcessingSamples* [34] is only required to pass the test cases with reduced number of samples.

- A UE not capable of *supportedDL-PRS-ProcessingSamples* [34] is required to pass the test case with 4 samples.

In Annex A, PRS measurement delay test cases are defined for both PRS-RSRP and PRS-RSRPP measurements without measurement gaps in RRC\_CONNECTED state. The testing principle for these test cases is as follows:

- A UE capable of both PRS-RSRP and PRS-RSRPP measurements is required to pass either PRS-RSRP measurement delay test or PRS-RSRPP measurement delay test.

In Annex A, PRS measurement delay test cases are defined for both RSTD and UE Rx-Tx time difference measurements without measurement gaps in RRC\_CONNECTED state. The testing principle for these test cases is as follows:

- A UE capable of both RSTD and UE Rx-Tx time difference measurements is required to pass either RSTD measurement delay test or UE Rx-Tx time difference measurement delay test.

## A.3.35 Testing principle for RedCap UE

### A.3.35.1 Introduction

This clause defines a principle which is applicable to test cases verifying RRM requirements for RedCap UE.

### A.3.35.2 Principle of testing for FR1

For RedCap UEs supporting 1 Rx branch, all single carrier tests specified in clause A.16 and A.18 except for tests defined for 2 Rx and/or FR2 shall be tested on any band.

For RedCap UEs supporting 2Rx branches, all single carrier tests specified in clause A.16 and A.18 except for tests defined for 1 Rx and/or FR2 shall be tested on any band.

### A.3.35.3 Principle of testing for FR2

For RedCap UEs, all single carrier tests specified in clause A.17 and A.18 except for tests defined for FR1 shall be tested on any band.

## A.3.36 Testing related to Satellite access

## A.3.36.1 Introduction

### A.3.36.1 Introduction

In annex A test cases are defined for verifying various type of RRM requirements related to satellite access.

### A.3.36.2 Principle of testing GSO and NGSO scenarios

In Annex A, RRM test cases related to satellite access are defined for both GSO and NGSO. The testing principle for these test cases is as follows:

- A UE capable of GSO only is required to pass the test cases with GSO.

- A UE capable of NGSO only is required to pass the test cases with NGSO.

- A UE capable of both GSO and NGSO is required to pass the test cases with NGSO only.

Support of GSO and NGSO scenario is indicated via *ntn-ScenarioSupport-r17*.

### A.3.36.2 Principle of testing different RRM requirements

In Annex A, RRM test cases related to satellite access are defined for all applicable RRM requirements. The testing principle for these test cases is as follows:

- A UE capable of NTN only is required to pass all the test cases defined in clause A.14.

- A UE capable of both TN and NTN is required to pass the test cases for NTN specific requirements in Table A.3.36.2-1.

Table A.3.36.2-1: Test cases for NTN specific requirements

|  |  |
| --- | --- |
| Clause | Test case slogan |
| A.14.1.2 | Cell reselection to FR1 intra-frequency NR cell for UE configured with [capability for enhanced requirements] |
| A.14.1.3 | Time-based cell reselection to FR1 intra-frequency NR cell |
| A.14.1.4 | Location-based cell reselection to FR1 intra-frequency NR cell |
| A.14.1.7 | Cell reselection to FR1 inter-frequency NR cell for UE configured with [capability for enhanced requirements] |
| A.14.1.8 | Time-based Cell reselection to FR1 inter-frequency NR satellite access case |
| A.14.1.9 | Location-based Cell reselection to FR1 inter-frequency NR satellite access case |
| A.14.2.1.3 | Intra-frequency SAN time-based conditional Handover from FR1 to FR1 |
| A.14.2.1.4 | Inter-frequency SAN time-based conditional Handover from FR1 to FR1 |
| A.14.2.1.5 | Intra-frequency SAN distance-based conditional Handover from FR1 to FR1 |
| A.14.2.1.6 | Inter-frequency SAN distance-based conditional Handover from FR1 to FR1 |
| A.14.3.1.1 | NR UE Transmit Timing Test for FR1 |
| A.14.5.1.1 | SA event triggered reporting tests without gap under non-DRX |
| A.14.5.1.2 | SA event triggered reporting tests without gap under DRX |
| A.14.5.1.3 | SA event triggered reporting tests without gap under non-DRX with SSB index reading |
| A.14.5.1.4 | SA event triggered reporting tests with single measurement gap under non-DRX for satellite access |
| A.14.5.1.5 | SA event triggered reporting tests with FNO concurrent gaps under DRX for satellite access |
| A.14.5.1.6 | SA event triggered reporting tests with PPO concurrent gaps under non-DRX with SSB index reading for satellite access |
| A.14.5.2.1 | Event triggered reporting test without gap under non-DRX |
| A.14.5.2.2 | Event triggered reporting tests without gap under DRX |
| A.14.6.3.1 | SA intra-frequency measurement accuracy with FR1 serving cell and FR1 target cell |
| A.14.6.3.2 | SA Inter-frequency measurement accuracy with FR1 serving cell and FR1 target cell |
| A.14.6.4.1 | SSB based L1-RSRP measurement |
| A.14.6.4.2 | CSI-RS based L1-RSRP measurement on resource set with repetition off |

### A.3.36.3 Principle of testing different ephemeris formats

In Annex A, RRM test cases related to satellite access are defined and satellite ephemeris information are sent to UE in each test case.

EphemerisInfo is configured in format of velocity state vector (PositionVelocity) for the following test cases:

RRC\_IDLE state mobility

A.14.1.3, A.14.1.4, A.14.1.5, A.14.1.6, A.14.1.9 and A.14.1.10

Handover

A.14.2.1.3, A.14.2.1.4, A.14.2.1.5 and A.14.2.1.6

Timing

A.14.3.1

Radio link Monitoring

A.14.4.1.1, A.14.4.1.2, A.14.4.1.5 and A.14.4.1.6

Beam Failure Detection and Link recovery procedures

A.14.4.2.1, A.14.4.2.3 and A.14.4.2.5

Active BWP switch

A.14.4.3.1

UE specific CBW change

A.14.4.4.1

Pathloss reference signal switching delay

A.14.4.5.1

Intra-frequency Measurements

A.14.5.1.1, A.14.5.1.3 and A.14.5.1.5

Inter-frequency Measurements

A.14.5.2.1, A.14.5.2.3 and A.14.5.2.7

L1-RSRP measurement for beam reporting

A.14.5.3.1 and A.14.5.3.3

SS-RSRP

A.14.6.1.1

SS-RSRQ

A.14.6.2.1

SS-SINR

A.14.6.3.1

L1-RSRP measurement for beam reporting

A.14.6.4.1

EphemerisInfo is configured in format of orbital parameters (Orbital) for the following test cases:

RRC\_IDLE state mobility

A.14.1.1, A.14.1.2, A.14.1.5 and A.14.1.6

Handover

A.14.2.1.1, A.14.2.1.2

RRC Connection Mobility Control

A.14.2.2.1, A.14.2.2.2 and A.14.2.2.3

Timing

A.14.3.2

Radio link Monitoring

A.14.4.1.3, A.14.4.1.4, A.14.4.1.7 and A.14.4.1.8

Beam Failure Detection and Link recovery procedures

A.14.4.2.2, A.14.4.2.4 and A.14.4.2.6

Active BWP switch

A.14.4.3.2

Intra-frequency Measurements

A.14.5.1.2, A.14.5.1.4 and A.14.5.1.6

Inter-frequency Measurements

A.14.5.2.2, A.14.5.2.4, A.14.5.2.6 and A.14.5.2.8

L1-RSRP measurement for beam reporting

A.14.5.3.2 and A.14.5.3.4

SS-RSRP

A.14.6.1.2

SS-RSRQ

A.14.6.2.2

SS-SINR

A.14.6.3.2

L1-RSRP measurement for beam reporting

A.14.6.4.2

### A.3.36.4 General setup for SIB19

The general parameters for SIB19 setup is specified in Table A.3.36.4-1.

Table A.3.36.2-1: Test cases for NTN specific requirements

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
| Interval between adjacent epoch time | s | LEO: 2.56  GEO: 10.24 |
| ntn-UlSyncValidityDuration | s | LEO: 5s  GEO: 900s |
| cellSpecificKoffset | slot | LEO: 8  GEO: 256 |
| kmac | slot | Not configured |
| ta-Common |  | 0 |
| ta-CommonDrift |  | 0 |
| ta-CommonDriftVariant |  | 0 |
| ntn-PolarizationDL |  | linear |
| ntn-PolarizationUL |  | linear |
| ephemerisInfo |  |  |
| ta-Report |  | Not configured |

### A.3.36.5 Satellite specific parameters configuration

#### A.3.36.5.1 Satellite specific configuration for serving cell

Table A.3.36.5.1-1: Satellite specific configuration pattern 1 for serving cell in GSO scenario

|  |  |
| --- | --- |
| Parameter | SSC.1 |
| Interval between adjacent epoch time | 10.24s |
| ntn-UlSyncValidityDuration | 900s |
| cellSpecificKoffset | 256 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | [TBD] |

Table A.3.36.5.1-2: Satellite specific configuration pattern 2 for serving cell in NGSO scenario

|  |  |
| --- | --- |
| Parameter | SSC.2 |
| Interval between adjacent epoch time | 2.56s |
| ntn-UlSyncValidityDuration | 5s |
| cellSpecificKoffset | 8 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | [TBD] |

#### A.3.36.5.2 Satellite specific configuration for neighbour cell

Table A.3.36.5.2-1: Satellite specific configuration pattern 1 for neighbour cell in GSO scenario

|  |  |
| --- | --- |
| Parameter | NSC.1 |
| Interval between adjacent epoch time | 10.24s |
| ntn-UlSyncValidityDuration | 900s |
| cellSpecificKoffset | 256 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | [TBD] |

Table A.3.36.5.2-2: Satellite specific configuration pattern 2 for neighbour cell in NGSO scenario

|  |  |
| --- | --- |
| Parameter | NSC.2 |
| Interval between adjacent epoch time | 2.56s |
| ntn-UlSyncValidityDuration | 5s |
| cellSpecificKoffset | 8 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | [TBD] |