**3GPP TSG- Meeting #**

**, , – May 24th**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** | **4615** | **rev** | **-** | **Current version:** |  |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **x**  | Radio Access Network |  | Core Network |  |

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| --- |
|  |
| ***Title:***  | BigCr Introducing agreed test cases and common parameters for NR\_FR1\_lessthan\_5MHz\_BW |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | Introduction of test cases for NR\_FR1\_lessthan\_5MHz\_BW WI |
|  |  |
| ***Summary of change:*** | Adding following test cases:1. FR1 intra-frequency handover to unknown target cell for less than 5MHz (R4-2407303)
2. RLM IS performance of 15PRB and 12 PRB bandwidth (R4-2408042)
3. RLM-1 Radio Link Monitoring (SSB-based, FR1): DRX, Out-of-sync, 12 PRBs (R4-2408663)
4. RLM-1 Radio Link Monitoring (SSB-based, FR1): DRX, Out-of-sync, 15 PRBs in non-DRX mode (R4-2408664).
5. Cell reselection to FR1 intra-frequency NR for UE operating on a cell with less than 5MHz BW (R4-2408665)
6. intra-frequency measurement delay with SBI reading should be defined for less than 5MHz (R4-2409261)
7. Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode (R4-2409713)
8. Event-4 SA event triggered reporting, SSB based, Time period for time index detection, Inter-frequency, DRX, gaps, 15 PRB (R4-2409749)

Introducing common configurations for 12, 15 and 12 PRB (R4-2408663) |
|  |  |
| ***Consequences if not approved:*** | Feature is incomplete |
|  |  |
| ***Clauses affected:*** | A.3.1.1, A.3.1.2, A.3.1.3, A.3.10.1.1, A.6.1.1.9, A.6.3.1.15, A.6.5.1.10, A.6.5.1.11, A.6.5.1.12, A.6.5.5.8, A.6.6.1.9, A.6.6.2.13 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **x** |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**<Start of change 1>**

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 | SR.1.2 FDD |  |  |  |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case by the parameter NRB,c |  |  |  |  |  |
| Number of transmitter antennas |  | 1 | 1 |  |  |  |  |  |
| Allocated resource blocks for PDSCH Note 1 |  | 24 | Defined by test case  |  |  |  |  |  |
| Allocated slots per Radio Frame |  | 10 | 10 |  |  |  |  |  |
|  Radio frame containing SSB | slots | Note 5 | Note 5 |  |  |  |  |  |
|  Radio frame not containing SSB | slots | 10 | 10 |  |  |  |  |  |
| 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 |  |  |  |  |  |
| 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 |  |  |  |  |  |
| 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 |

**<Start of change 2>**

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 | CR.1.2 FDD | CR.1.3 FDD | CR.1.4 FDD |  |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case  | Defined in test case |  |  |  |
| Subcarrier spacing for RMSI CORESET | kHz | 15 | 15 | 15 | 15 |  |  |  |
| Allocated resource blocks for RMSI CORESET Note 7 |  | 24 | 12 | 15 | 20 |  |  |  |
| Subcarrier spacing for SSB | kHz | 15 | 15 | 15 | 15 |  |  |  |
| SSB and RMSI CORESET multiplexing configuration Note 7 |  | Pattern 1 | Pattern 1 | Pattern 1 | Pattern 1 |  |  |  |
| Offset between SSB and RMSI CORESET Note 3, 7 | RB | 0 (Note8) | 0 (Note8) | 0 (Note8) | 0 (Note8) |  |  |  |
| Configuration of PDCCH monitoring occasions for RMSI CORESET Note 4 |  | Index 4 | Index 4 | Index 4 | Index 4 |  |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 | 1 |  |  |  |
| Duration of RMSI CORESET Note 7 | symbols | 2 | 2 | 2 | 2 |  |  |  |
| DCI Format Note 1 |  | Note 2 | Note 2 | Note 2 | Note 2 |  |  |  |
| Aggregation level | CCE | 8 | 4 | 8 | 8 |  |  |  |
| DMRS precoder granularity |  | 6 | Same as REG bundle size | Same as REG bundle size | Same as REG bundle size |  |  |  |
| REG bundle size |  | 6 | 6 | 6 | 6 |  |  |  |
| Mapping from REG to CCE |  | Distributed | Distributed | Non-Distributed | Distributed |  |  |  |
| Cell ID |  | Note 5 | Note 5 | Note 5 | Note 5 |  |  |  |
| Payload (without CRC) | bits | Note 6 | Note 6 | 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 13-11 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. |

**<Start of change 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 | CCR.1.6 FDD | CCR.1.7 FDD | CCR.1.8 FDD |  |  |
| Channel bandwidth | MHz | Defined in test case | Defined in test case | Defined in test case | Defined in test case | 10 | 3MHz | 3MHz | 5MHz |  |  |
| Subcarrier spacing | kHz | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |  |  |
| Allocated resource blocks for CORESET Note 3 |  | 24 | 18 | 24 | 18 | 24 | 12 | 12 | 18 |  |  |
| Number of transmitter antennas |  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |  |  |
| Duration of CORESET | symbols | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |  |  |
| monitoringSymbolsWithinSlot |  | 10000000000000 | 10000000000000 | 10000000000000 | 10000000000000 | 00100000000000 | 10000000000000 | 10000000000000 | 10000000000000 |  |  |
| REG bundle size |  | 6 | 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 | Same as REG bundle size |  |  |
| CCE to REG mapping |  | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | Interleaved | Non-Interleaved | Interleaved |  |  |
| Interleave n\_shift |  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |  |  |
| Interleave size |  | 2 | 2 | 2 | 2 | 2 | 2 | N/A | 2 |  |  |
| Beamforming Pre-Coder |  | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |  |  |
| Aggregation level | CCE | 4 | 2 | 8 | 4 | 4 | 4 | 8 | 8 |  |  |
| DCI formats |  | Note 1  | Note 1 | Note 1 | Note 1 | Note 1  | 1-0 | 1-0 | 1-0 |  |  |
| Payload size (without CRC) | bits | Note 2 | 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 configurationNote 3: Allocated in the resource blocks where the associated RMC is scheduled. |  |  |  |

**<Start of change 4>**

A.3.10.1.1 SSB pattern X in FR1: SSB allocation for SSB SCS=15 kHz in 3 MHz

**Table A.3.10.1.1-1: SSB.x FR1: SSB Pattern 1 for SSB SCS=15 kHz in 3 MHz channel**

|  |  |
| --- | --- |
| **SSB Parameters** | **Values** |
| Channel bandwidth | 3MHz |
| 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+11)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. |

**<Start of change 5>**

A.6.1.1.9 Cell reselection to FR1 intra-frequency NR case for UE operating on a cell with less than 5MHz BW

A.6.1.1.9.1 Test Purpose and Environment

This test is to verify the requirement for the intra frequency NR cell reselection requirements specified in clause 4.2.2.3. for UE capable of operating on a cell with less than 5MHz BW.

Supported test configurations are specified in Table A.6.1.1.9.2-1. General test parameters as specified in Table A.6.1.1.1.2-2 with config 1 apply except those specified in Table A.6.1.1.9.2-2. Cell specific test parameters as specified in Table A.6.1.1.1.2-3 apply. The test parameters specified in A.6.1.1.1.2 applies to this test. The test procedure specified in A.6.1.1 applies to this test.

**Table A.6.1.1.9.2-1: Supported test configurations**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD duplex mode, 15 kHz SSB SCS, 3 MHz bandwidth |

**Table** **A.6.1.1.9.2-2: General test parameters for intra frequency NR cell re-selection test case**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
|  |  |  | Test 1 |  |
| BWchannel | MHz | Config 1 | 3: NRB,c = 12 |  |
| SSB Configuration |  | Config 1 | TBD |  |
| PRACH Configuration index  |  | Config 1 | TBD |  |

A.6.1.1.9.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 34 s + 2 measurement samples for UE operating on a cell with less than 5MHz BW.

The cell reselection delay to an already detected cell is defined as the time from the beginning of time period T3, to the moment when the UE camps on cell 1, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on cell 1.

The cell re-selection delay to an already detected cell shall be less than 8 s + 2 measurement samples for UE operating on a cell with less than 5MHz BW.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect, NR\_Intra + TSI-NR, and to an already detected cell can be expressed as: Tevaluate, NR\_ intra + TSI-NR,

Where:

Tdetect, NR\_Intra +40ms See Table 4.2.2.3-1 in clause 4.2.2.3

Tevaluate, NR\_ intra See Table 4.2.2.3-1 in clause 4.2.2.3

TSI-NR Maximum repetition period of relevant system info blocks that needs to be received by the UE to camp on a cell; 1280ms is assumed in this test case.

This gives a total of 33.32 s, allow 34 s for the cell re-selection delay to a newly detectable cell and 7.72 s for the cell re-selection delay to an already detected cell in the test case, which we allow 8 s.

**<Start of change 6>**

A.6.3.1.15 Intra-frequency handover from FR1 to FR1; unknown target cell operating with 12 PRB SSB bandwidth

A.6.3.1.15.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency handover requirements for unknown target cell operating with 12 PRB SSB bandwidth specified in clause 6.1.1.2.

A.6.3.1.15.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.15.2-1. General test parameters as specified in A.6.3.1.2.2-2 with config 1 apply except those specified in A.6.3.1.15.2-2. Cell specific test parameters as specified in A.6.3.1.2.2-3 with config 1 apply except those specified in A.6.3.1.15.2-3.

The test procedure specified in A.6.3.1.2.2 applies to this test. The cell 2 is the unknown target cell operating with 12 PRB SSB bandwidth.

**Table A.6.3.1.15.2-1: Intra-frequency handover from FR1 to FR1 test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 3 MHz bandwidth with 15PRB CBW, FDD duplex modeTarget cell: NR 15 kHz SSB SCS, 3 MHz bandwidth with 15PRB CBW, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 3 MHz bandwidth with 12PRB CBW, FDD duplex modeTarget cell: NR 15 kHz SSB SCS, 3 MHz bandwidth with 12PRB CBW, FDD duplex mode |
| Note1: The UE is only required to be tested in one of the supported test configurationsNote2: Configuration 2 is only applied for the testing on band n100 |

**Table A.6.3.1.15.2-2: General test parameters Intra-frequency handover from FR1 to FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| **Initial conditions** | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 | unknown target cell operating with 12 PRB SSB bandwidth |
| Final condition | Active cell |  | Cell 2 | unknown target cell operating with 12 PRB SSB bandwidth |

**Table A.6.3.1.15.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency handover test case**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 1** | **Cell 2** |
|  |  | **T1** | **T2** | **T1** | **T2** |
| BWchannel | Config 1 | MHz | 3: NRB,c = 15 |
|  | Config 2 |  | 3: NRB,c = 12 |
| BWP BW | Config 1 | MHz | 3: NRB,c = 15 |
|  | Config 2 |  | 3: NRB,c = 12 |
| PDSCH Reference measurement channel  | Config 1 |  | [TBD] |
|  | Config 2 |  | [TBD] |
| CORESET Reference Channel | Config 1 |  | [TBD] |
|  | Config 2 |  | [TBD] |
| SSB Configuration | Config 1,2 |  | [TBD] |
| IoNote1 | Config 1 | dBm/2.7MHz | -66.81 | -64.11 | -66.81 | -64.11 |
|  | Config 2 | dBm/2.16MHz | -67.78 | -65.07 | -67.78 | -65.07 |
| Propagation condition | - | AWGN | AWGN |
| Note 1: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

A.6.3.1.15.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 132 ms from the beginning of time period T2.

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

NOTE: The handover delay can be expressed as: RRC procedure delay + Tinterrupt, where:

RRC procedure delay = 10 ms and is specified in clause 12 in TS 38.331 [2].

Tinterrupt = 122 ms in the test. Tinterrupt is defined in clause 6.1.1.2.2.

This gives a total of 132 ms.

**<Start of change 7>**

A.6.5.1.10 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for UE operating on a cell with less than 5MHz BW

A.6.5.1.10.1 Test Purpose and Environment

The purpose of this test is to verify that the UE supporting [FG-x capability] properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell operating on a 3MHz channel bandwidth. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are specified in Table A.6.5.1.10.1-1. General test parameters as specified in Table A.6.5.1.3.1-2 with config 1 apply except those specified in Table A.6.5.1.10.1-2. Cell specific test parameters as specified in Table A.6.5.1.3.1-3 apply except those specified in Table A.6.5.1.10.1-3.

The test procedure specified in A.6.5.1.3.1 applies to this test.

**Table A.6.5.1.10.1-1: Supported test configurations for FR1 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | FDD duplex mode, 15 kHz SSB SCS, 3 MHz bandwidth |

**Table A.6.5.1.10.1-2: General test parameters for FR1 OOS 12 PRB in DRX mode**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
|  |  | **Test 1** |
| BWchannel | Config 1 | MHz | 3: NRB,c = 12 |
| RMSI CORESET Reference Channel | Config 1 |  | [CR.1.2 FDD] |
| Dedicated CORESET Reference Channel | Config 1 |  | [CCR.1.6 FDD] |
| SSB Configuration | Config 1 |  | SSB.x FR1 |
|  | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level  | CCE | 2 |
| In sync transmission parameters | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
|  | Number of Control OFDM symbols |  | 2 |
|  | Aggregation level  | CCE | 4 |
| Out of sync transmission parameters | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
|  | REG bundle size |  | 6 |
|  | CP length |  | Normal |
|  | Mapping from REG to CCE |  | Distributed |

**Table A.6.5.1.10.1-3: Cell specific test parameters for FR1 OOS 12 PRB in DRX mode**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| SNR\_SSB of set q0 | Config 1 | dB | TBD | TBD | TBD | TBD | TBD |
| SNR\_SSB of set q1 | Config 1 | dB | TBD | TBD | TBD | TBD | TBD |
| SSB\_RP of set q1 | Config 1 | dBm/SCS kHz | TBD | TBD | TBD | TBD | TBD |

A.6.5.1.10.2 Test Requirements

Test requirements specified in Clause A.6.5.1.3.2 apply to this test.

**<Start of change 8>**

#### A.6.5.1.11 Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in non-DRX mode for UE operating on a cell with less than 5MHz BW

##### A.6.5.1.11.1 Test Purpose and Environment

The purpose of this test is to verify that the UE supporting [FG-x capability] properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell operating on a 3MHz channel bandwidth. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are specified in Table A.6.5.1.11.1-1. General test parameters as specified in Table A.6.5.1.1.1-2 with config 1 apply except those specified in Table A.6.5.1.11.1-2. Cell specific test parameters as specified in Table A.6.5.1.1.1-3 apply except those specified in Table A.6.5.1.11.1-3. The test procedure specified in A.6.5.1.1 applies to this test.

Table A.6.5.1.11.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD duplex mode, 15 kHz SSB SCS, 3 MHz bandwidth |

Table A.6.5.1.11.1-2: General test parameters for FR1 OOS 15 PRB in DRX mode

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
|  |  | Test 1 |
| BWchannel | Config 1 | MHz | 3: NRB,c = 15 |
| RMSI CORESET Reference Channel | Config 1 |  | [CR.1.X FDD] |
| Dedicated CORESET Reference Channel | Config 1 |  | [CCR.1.X FDD] |
| SSB Configuration | Config 1 |  | TBD |
|  | DCI format |  | 1-0 |
|  | Number of Control OFDM symbols |  | 3 |
|  | Aggregation level  | CCE | 4 |
| In sync transmission parameters | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 0 |
|  | Number of Control OFDM symbols |  | 3 |
|  | Aggregation level  | CCE | 8 |
| Out of sync transmission parameters | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | dB | 4 |
|  | REG bundle size |  | 6 |
|  | CP length |  | Normal |
|  | Mapping from REG to CCE |  | Non-Distributed |

Table A.6.5.1.11.1-3: Cell specific test parameters for FR1 PCell

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
|  |  | T1 | T2 | T3 | T4 | T5 |
| SNR\_SSB of set q0 | Config 1 | dB | TBD | TBD | TBD | TBD | TBD |
| SNR\_SSB of set q1 | Config 1 | dB | TBD | TBD | TBD | TBD | TBD |
| SSB\_RP of set q1 | Config 1 | dBm/SCS kHz | TBD | TBD | TBD | TBD | TBD |

##### A.6.5.1.11.2 Test Requirements

Test requirements specified in Clause A.6.5.1.1.2 apply to this test.

**<Start of change 9>**

A.6.5.1.12 Radio Link Monitoring In-sync Test for FR1 PCell with 3MHz Channel Bandwidth configured with SSB-based RLM RS in non-DRX mode

A.6.5.1.12.1 Test Purpose and Environment

The purpose of this test is to verify that the UE supporting [FG-x capability] properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the PCell operating on a 3MHz channel bandwidth. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.

Supported test configurations are specified in Table A.6.5.1.12.1-1. General test parameters as specified in Table A.6.5.1.2.1-2 with config 1 apply to this test for both config 1 and 2, except those specified in Table A.6.5.1.12.1-2. Cell specific test parameters as specified in Table A.6.5.1.2.1-3 apply except those specified in Table A.6.5.1.12.1-3.

The test procedure specified in A.6.5.1.2.1 applies to this test.

**Table A.6.5.1.12.1-1: Supported test configurations for FR1 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 3 MHz (15PRB) |
| 2 | FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 3 MHz (12 PRB) |
| Note: The UE is required to pass the test with configuration 1 for every supported 3MHz band in FR1. If the UE indicates the support for band n100, the UE is also required to pass the test with configuration 2 in addition to the test with configuration 1. |

**Table A.6.5.1.12.1-2: General test parameters for FR1 in-sync testing in non-DRX mode**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Value** |
|  |  | **Test 1** |
| BWchannel | Config 1 | MHz | 3: NRB,c = 15 |
|  | Config 2 |  | 3: NRB,c = 12 |
| RMSI CORESET Reference Channel | Config 1 |  | [CR.1.X FDD] |
|  | Config 2 |  | [CR.1.Y FDD] |
| Dedicated CORESET Reference Channel | Config 1 |  | [CCR.1.X FDD] |
|  | Config 2 |  | [CCR.1.Y FDD] |
| SSB Configuration | Config 1, 2 |  | TBD |
| In sync transmission parameters | Number of Control OFDM symbols, Config 1 |  | 3 |
|  | Number of Control OFDM symbols, Config 2 |  | 2 |
|  | Aggregation level, Config 1  | CCE | 4 |
|  | Aggregation level, Config 2 |  | 2 |
|  | Mapping from REG to CCE, Config 1 |  | Distributed |
|  | Mapping from REG to CCE, Config 2 |  | Distributed |
| Out of sync transmission parameters | Number of Control OFDM symbols, Config 1 |  | 3 |
|  | Number of Control OFDM symbols, Config 2 |  | 2 |
|  | Aggregation level, Config 1  | CCE | 8 |
|  | Aggregation level, Config 2 |  | 4 |
|  | Mapping from REG to CCE, Config 1 |  | Non -Distributed |
|  | Mapping from REG to CCE, Config 2 |  | Distributed |

**Table A.6.5.1.12.1-3: Cell specific test parameters for FR1 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** |
|  |  | **T1** | **T2** | **T3** | **T4** | **T5** |
| SNR on RLM-RS | Config 1 | dB | TBD | TBD | TBD | TBD | TBD |
|  | Config 2 |  | TBD | TBD | TBD | TBD | TBD |

A.6.5.1.12.2 Test Requirements

Test requirements specified in Clause A.6.5.1.2.2 apply to this test.

**<Start of change 10>**

#### A.6.5.5.8 Beam Failure Detection and Link Recovery Test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for a UE operating on a cell with less than 5 MHz BW

##### A.6.5.5.8.1 Test Purpose and Environment

The purpose of this test is to verify that the UE supporting [FG-x capability] properly detects SSB-based beam failure in the set q0 configured for a serving cell operating on a less than 5MHz bandwidth, and that the UE performs correct SSB-based link recovery based on beam candidate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

Supported test configurations are specified in Table A.6.5.5.8.1-1. General test parameters as specified in Table A.6.5.5.1.1-2 with config 1 apply except those specified in Table A.6.5.5.8.1-2. Cell specific test parameters as specified in Table A.6.5.5.1.1-3 apply except those specified in Table A.6.5.5.8.1-3.

The test procedure specified in A.6.5.5.1.1 applies to this test.

Table A.6.5.5.8.1-1: Supported test configurations for FR1 PCell

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | FDD duplex mode, 15 kHz SSB SCS, 3 MHz bandwidth |

Table A.6.5.5.8.1-2: General test parameters for FR1 PCell

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
|  |  | Test 1 |  |
| BWchannel | Config 1 | MHz | 3: NRB,c = 15 |  |
| SSB Configuration | Config 1 |  | TBD |  |
| PRACH Configuration | Config 1 |  | TBD |  |
| Beam failure detection transmission parameters | Number of Control OFDM symbols |  | 3 |  |
|  | Aggregation level  | CCE | 8 |  |
|  | Mapping from REG to CCE |  | [Non-Distributed] |  |
| T1 | s | TBD | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | s | TBD |  |
| T3 | s | TBD |  |
| T4 | s | TBD |  |
| T5 | s | TBD |  |
| D1 | s | TBD |  |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.Note 2: UE-specific PDCCH is not transmitted after T1 starts. |

Table A.6.5.5.8.1-3: Cell specific test parameters for FR1 PCell

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
|  |  | T1 | T2 | T3 | T4 | T5 |
| SNR\_SSB of set q0 | Config 1 | dB | TBD | TBD | TBD | TBD | TBD |
| SNR\_SSB of set q1 | Config 1 | dB | TBD | TBD | TBD | TBD | TBD |
| SSB\_RP of set q1 | Config 1 | dBm/SCS kHz | TBD | TBD | TBD | TBD | TBD |

##### A.6.5.5.8.2 Test Requirements

Test requirements specified in Clause A.6.5.5.1.2 apply to this test.

**<Start of change 11>**

#### A.6.6.1.9 SA event triggered reporting tests without gap under non-DRX with SSB index reading and 12 PRB SSB

##### A.6.6.1.9.1 Test purpose and Environment

The purpose of this test is to verify that the UE supporting [FG-x capability] makes correct reporting of an event when the intra-frequency target cell is transmitting 12 PRB SSB. This test will partly verify the FDD intra-frequency cell search requirements in clause 9.2.5.1 and 9.2.5.2.

##### A.6.6.1.9.2 Test parameters

The test procedure in clause A.6.6.1.5.2 applies for this test. Supported test configurations are specified in Table A.6.6.1.9.2-1. General test parameters as specified in Table A.6.6.1.5.2-2 with config 1 apply to this test, except those specified in Table A.6.6.1.9.2-2. Cell specific test parameters as specified in Table A.6.6.1.5.2-3 with config 1 apply to this test, except those specified in Table A.6.6.1.92-3.

Table A.6.6.1.9.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 3 MHz bandwidth, FDD duplex mode |

Table A.6.6.1.9.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| SSB configuration |  | 1 | SSB.X FR1 |  |

**Table A.6.6.1.9.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR1 with SSB index reading**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration  | Cell 1 | Cell 2 |
|  |  |  | T1 | T2 | T1 | T2 |
| BWchannel | MHz | 1 | 3: NRB,c = 15 | 3: NRB,c = 15 |
| PDSCH RMC configuration |  | 1 | SR.1.X FDD | N/A |
| RMSI CORESET RMC configuration |  | 1 | CR.1.X FDD | N/A |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.X FDD | N/A |
| Io | dBm/2.7 MHz | 1 | -70.00 | -67.65 | -70.00 | -67.65 |

##### A.6.6.1.9.3 Test Requirements

The test requirements in clause A.6.6.1.5.3 applies to this test, except that the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 940 ms from the beginning of time period T2.

**<Start of change 12>**

#### A.6.6.2.13 SA event triggered reporting tests for FR1 with 3MHz Channel Bandwidth configured without SSB time index detection when DRX is used

##### A.6.6.2.13.1 Test Purpose and Environment

The purpose of this test is to verify that the UE supporting [FG-x capability] makes correct reporting of an event. This test will partly verify the SA inter-frequency NR cell search requirements in clause 9.3.4.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.2.13.1-1 and A.6.6.2.13.1-2.

Measurement gap pattern configuration defined in Table A.6.6.2.13.1-2 is provided for a UE that does not support per-FR gap, and no gap pattern (Gap Pattern Id and Measurement gap offset) is configured for a UE capable of per-FR gap.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 2.

UE needs to be provided with new Timing Advance Command MAC control element at least once during each time alignment timer period to maintain uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle. Supported test configurations are specified in Table A.6.6.2.13.1-1. General test parameters as specified in Table A.6.6.2.2.1-2 with config 1 apply to this test. Cell specific test parameters as specified in Table A.6.6.2.2.1-3 with config 1 apply except those specified in Table A.6.6.1.13.1-2. DRX-Configuration and *TimeAlignmentTimer* -Configuration specified in Table A.6.6.2.2.1-4 and Table A.6.6.2.2.1-5, respectively, apply to this test case.

The test environment specified in A.6.6.2.2.1 applies to this test.

Table A.6.6.2.13.1-1: SA event triggered reporting tests without SSB index reading for FR1-FR1

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 3 MHz bandwidth, FDD duplex mode |
| Note 1: target NR cell has the same SCS, BW and duplex mode as NR serving cell |

Table A.6.6.2.13.1-2: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 without SSB time index detection

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | Cell 2 |
|  |  |  | T1 | T2 | T1 | T2 |
| Duplex mode |  | Config 1 | FDD |
| BWchannel | MHz | Config 1 | 3: NRB,c = 15 |
| BWP BW | MHz | Config 1 | 3: NRB,c = 15 |
| PDSCH Reference measurement channel |  | Config 1 | SR.1.x FDD | NA |
| RMSI CORESET Reference Channel |  | Config 1 | CR.1.x FDD | NA |
| Dedicated CORESET Reference Channel |  | Config 1 | CCR.1.x FDD | NA |
| SSB parameters |  | Config 1 | SSB.x FR1 | SSB.y FR1 |
| IoNote3 | dBm/3MHz | Config 1 | -69.9 | -69.9 | -75.4 | -67.6 |

##### A.6.6.2.13.2 Test Requirements

Test requirements specified in Clause A.6.5.1.1.2 apply to this test.

**<End of changes>**