**3GPP TSG-RAN4 Meeting #111R4-2410433**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **4620** | **rev** | **-** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](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:*** | Big CR to TS 38.133 on RRM performance requirements for NR NTN enhancement | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Qualcomm Incorporated | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_NTN\_enh-Perf | | | | |  | ***Date:*** | | | 2024-05-20 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | This big CR compiles the endoresed draft CRs listed below:  Endorsed in RAN4#111:   |  |  |  | | --- | --- | --- | | TDoc Endorsed CR | CR title | Source companies | | R4-2407196 | Introduce the test for NTN to NTN RACH-less HO | MediaTek inc. | | R4-2407364 | (NR\_NTN\_enh-Perf) Test case of SSB based L1-RSRP measurement for NTN above 10GHz | Apple | | R4-2407678 |  |  | | R4-2409291 | draftCR on TC for inter-satellite HO for FR2-NTN | Huawei, HiSilicon | | R4-2409292 | draftCR on UE Rx-Tx time difference accuracy requirements | Huawei, HiSilicon | | R4-2410386 | ( NR\_NTN\_enh-Perf) draft CR on Radio Link Monitoring test for NTN |  | | R4-2410387 | (NR\_NTN\_enh-Perf) draft CR on TC for Connected mode mobility in FR2-NTN | Qualcomm Incorporated | | R4-2410388 | draftCR on test case for L3-RSRP measurement without gap under non-DRX with SSB index reading in above 10 GHz scenario | Xiaomi | | R4-2410391 | (NR\_NTN\_enh-Perf) draftCR to TS 38.133: Introduction of satellite switch test cases for NTN enh | CMCC | | R4-2410394 | Draft CR on NTN To LTE TN inter-RAT cell re-selection | ZTE Corporation, Sanechips | | R4-2410413 |  |  | | R4-2410415 | Draft CR on NTN To NR TN | ZTE Corporation, Sanechips | | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduced performance requirements and test cases for Rel-18 NR NTN enhancement. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The performance requirements and test cases for R18 NR NTN enhancement are missing in TS38.133. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

Start of Change 1 <R4-2407196>

#### A.14.2.1.X1 Intra-frequency SAN Handover from FR1 to FR1

##### A.14.2.1.X1.1 Test Purpose and Environment

This test is to verify the requirement for Intra-frequency SAN RACH-less Handover from FR1 to FR1 specified in clause 6.1C.1.1.

##### A.14.2.1.X1.2 Test Parameters

The test scenario comprises of 1 NR FDD carrier and 2 cells as given in table A.14.2.1.X1.2-1, A.14.2.1.X1.2-2, and A.14.2.1.X1.2-3. Both handover delay and interruption length are tested.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of Cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell with Event A3 report.

Starting T2, cell 2 becomes detectable and offset better than cell 1. The RRC message implying handover to Cell 2 shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is defined as the end of the last TTI containing the RRC message implying handover. During T3, Cell 2 continuously schedules PUSCH for the UE.

Table A.14.2.1.X1.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | GSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| 2 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Table A.14.2.1.X1.2-2: General test parameters Intra-frequency SAN handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | Cell 1: SSC.1  Cell 2: NSC.1 | For GSO satellites configuration |
| Config 2 |  | Cell 1: SSC.2  Cell 2: NSC.2 | For NGSO inter-satellites configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | S | 1 |  |

Table A.14.2.1.X1.2-3: Cell specific test parameters for Intra frequency SAN handover test case

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| NR RF Channel Number | | Config 1,2 |  | 1 | | | 1 | | |
| BWchannel | | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | | |
| BWP BW | | MHz | 10: NRB,c = 52 | | | 10: NRB,c = 52 | | |
| TACommon | | Config 1,2 | s | 0 | | | 0 | | |
| TACommonDrift | | s | 0 | | | 0 | | |
| TACommonDriftVariation | | s | 0 | | | 0 | | |
| Koffset | | Config 1 | ms | 258 | | | 258 | | |
|  | | Config 2 | 14 | | | 14 | | |
| Kmac | | Config 1,2 | ms | 0 | | | 0 | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| SMTC Configuration | |  | SMTC.1 | | | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | | | |
| BWP configuration | Initial DL BWP | Config 1,2 |  | DLBWP.0.1 | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2 | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1,2 | dBm/ 15kHz | -98 | | | | | |
| Note2 | | dBm/ SCS | -98 | | | | | |
|  | | dB | 8 | -3.3 | -3.3 | -Infinity | 2.36 | 2.36 |
|  | | dB | 8 | 8 | 8 | -Infinity | 11 | 11 |
| SSB\_RP | | dBm/ SCS | -90 | -90 | -90 | -Infinity | -87 | -87 |
| IoNote3 | | dBm/ 9.36MHz | -61.41 | -57.06 | -57.06 | -61.41 | -57.06 | -57.06 |
| Propagation condition | | - | AWGN | | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | |

##### A.14.2.1.X1.3 Test Requirements

The UE shall start to transmit the PUSCH to Cell 2 less than 52 + TIU ms from the beginning of time period T3.

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 is defined in clause 6.1C.1.2.2.2.

Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin ms

Here: Tsearch = 0; TIU is the interruption uncertainty in acquiring the first UL transmission resource for PUSCH, which is scheduled by Cell 2 at the fist DL slot not earlier than 52ms after the beginning of T3; Tprocessing = 20ms; T∆ = 20ms; Tmargin = 2ms.

This gives a total of 52 + TIU ms.

End of Change 1

Start of Change 2 <R4-2407364>

#### A.14.6.4.X SSB based L1-RSRP measurement for VSAT UE in FR2-NTN when DRX is not used

##### A.14.6.4.X.1 Test Purpose and Environment

The purpose of this test is to verify that the VSAT UE makes correct reporting of L1-RSRP measurement in FR2-NTN. This test will partly verify the L1-RSRP measurement requirements in clause 9.5C.4.1, with the testing configurations for NR cells in Table A.14.6.4.X.1-1.

The AoA setup for this test is [TBD] as defined in [clause TBD].

Table A.7.6.3.1.1-1: Applicable NR configurations for FR2 SSB based L1-RSRP test for VSAT UE

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 120 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| 2 | NR 240 kHz SSB SCS, 100 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

##### A.14.6.4.X.2 Test parameters

There is one cells in the test, the FR2 PCell (Cell 1). The test parameters for the Cell 1 are given in Table A.14.6.4.X.2-1 and Table A.14.6.4.X.2-2 below.

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

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

Table A.14.6.4.X.2-1: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Value |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | FDD |
| FDD Configuration | 1~2 |  | TBD |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | 1~4 |  | 66 |
| PDSCH Reference measurement channel | 1 |  | TBD |
| 2 | TBD |
| RMSI CORESET Reference Channel | 1 |  | TBD |
| 2 | TBD |
| Dedicated CORESET Reference Channel | 1 |  | TBD |
| 2 | TBD |
| SSB configuration | 1 |  | SSB.1 FR2 |
|  | 2 | SSB.2 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.3  ULBWP.1.3 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| TRS Configuration | 1~2 |  | TBD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| DRX configuration | 1~2 |  | Off |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity | 1~2 |  | ssb-Index-RSRP |
| Number of reported RS | 1~2 |  | 2 |
| L1-RSRP reporting period | 1~2 | slot | 320 |
| T1 | 1~2 | s | 5 |
| T2 | 1~2 | s | 2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |
| EPRE ratio of PDSCH to PDSCH DMRS |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |
| Propagation condition | 1~2 |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | |

Table A.7.6.3.1.x-2: SSB specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | SSB#0 | | SSB#1 | |
|  |  |  | T1 | T2 | T1 | T2 |
| Angle of arrival configuration |  |  | TBD | | | |
| Beam AssumptionNote 4 | 1-2 |  | TBD | | | |
| Note2 | 1~2 | dBm/15kHz | -105 | | | |
| Note2 | 1 | dBm/SSB SCS | -96 | | | |
|  | 2 |  | -93 | | | |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| SSB\_RP Note3 | 1 | dBm/SSB SCS | -96 | -96 | -Infinity | -87 |
|  | 2 |  | -93 | -93 | -Infinity | -84 |
| Io Note3 | 1 | dBm/95.04MHz | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 2 |  | -63.97 | -63.97 | -66.98 | -57.47 |
|  | 1~2 | dB | 0 | 0 | -Infinity | 9 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in [TBD], and does not limit UE implementation or test system implementation | | | | | | |

##### A.14.6.4.X.3 Test Requirements

The UE shall send L1-RSRP report every 320 slots. No later than 640 ms plus 320 slots from the beginning of time period T2, UE shall send L1-RSRP report including the results for both SSB#0 and SSB#1 while meeting the accuracy requirements defined in [clause TBD].

The reported L1-RSRP value shall include the Rx antenna gain in the range of [TBD].

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

End of Change 2

Start of Change 3 <R4-2407678>

#### A.14.3.1.X NR UE Transmit Timing Test for FR2-NTN

##### A.14.3.1.X.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the reference cell and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1C.2. Supported test configurations are shown in Table A.14.3.1.X.1-1.

**Table A.14.3.1.X.1-1: Supported test configurations for FR2-NTN PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, NR FDD, SSB SCS [120] kHz, data SCS [120] kHz, BW [100] MHz |
| 2 | NGSO, NR FDD, SSB SCS [120] kHz, data SCS [120] kHz, BW [100] MHz |
| 3 | GSO, NR FDD, SSB SCS [120] kHz, data SCS [120] kHz, BW [100] MHz |
| Note: Editor’s Note: applicability | |

The test consists a single NR cell (PCell). Table A.14.3.1.X.1-2 and A.14.3.1.X.1-2A defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.14.3.1.X.1-3.

Table A.14.3.1.X.1-2: Cell Specific Test Parameters for UL Transmit Timing test

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Test1** | **Test2** |
| SSB ARFCN |  | 1,2,3 | Freq1 | Freq1 |
| Serving satellite configuration |  | 1 | SSC.X. | |
| 2 | SSC.X | |
| 3 | SSC.X | |
| BWchannel | MHz | 1,2,3 | 100: NRB,c = 66 | |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1  ULBWP.1.1 | |
| PDSCH/PDCCH TCI state |  |  |  | |
| DRX Cycle | ms | 1,2,3 | N/A | DRX.8Note5 |
| PDSCH Reference measurement channel |  | 1,2,3 | SR.X.X FDD | |
| RMSI CORESET Reference Channel |  | 1,2,3 | CR.X.X FDD | |
| Dedicated CORESET Reference Channel |  | 1,2,3 | CCR.X.X FDD | |
| OCNG Patterns |  | 1,2,3 | OP.1 | |
| SSB configuration |  | 1,2,3 | SSB.3 FR2 | |
| SMTC Configuration |  | 1,2,3 | SMTC.1 | |
| TRS configuration |  | 1,2,3 | TRS.X.X FDD | |
| EPRE ratio of PSS to SSS | dB | 1,2,3 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |  |
| Propagation condition |  | 1,2, | AWGN | |
| 3 | AWGN with constant Doppler [TBD]Hz | |
| SRS Config |  | 1,2,3 | SRSConf.1Note6 | SRSConf.2Note6 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 5: DRX related parameters are given in Table A.3.3.8-1  Note 6: SRS configs are given in Table A.14.3.X.1.1-3 | | | | |

Table A.14.3.1.X.1-2A: OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | Test 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 6 |  | Fine (For electronic steering antenna type)  RX beam of RX beam peak direction (For mechanical steering antenna type) | |
| Note1 | dBm/15kHzNote4 | -112 | |
| Note1 | dBm/SCSNote3 | -103 | |
|  | dB | 4 | |
| SS-RSRPNote2 | dBm/SCS Note4 | -96 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS B\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Void  Note 5: Void  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | |

**Table A.14.3.1.X.1-3: SRS Configuration for Timing Accuracy Test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Field** | **SRSConf.1** | **SRSConf.2** | **Comments** |
| SRS- | srs-ResourceSetId | 0 | 0 |  |
| ResourceSet | srs-ResourceIdList | 0 | 0 |  |
|  | resourceType | Periodic | Periodic |  |
|  | Usage | Codebook | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 | 0 |  |
|  | nrofSRS-Ports | Port1 | Port1 |  |
|  | transmissionComb | n2 | n2 |  |
|  | combOffset-n2 | 0 | 0 |  |
|  | cyclicShift-n2 | 0 | 0 |  |
|  | resourceMapping  startPosition | 0 | 0 |  |
|  | resourceMapping  nrofSymbols | n1 | n1 |  |
|  | resourceMapping  repetitionFactor | n1 | n1 |  |
|  | freqDomainPosition | 0 | 0 |  |
|  | freqDomainShift | 0 | 0 |  |
|  | freqHopping  c-SRS | 17 | 17 | Matches NRB,c |
|  | freqHopping  b-SRS | 0 | 0 |  |
|  | freqHopping  b-hop | 0 | 0 |  |
|  | groupOrSequenceHopping | Neither | Neither |  |
|  | resourceType | Periodic | Periodic |  |
|  | periodicityAndOffset-p | sl1, 0 | Sl2560, 4 | Offset to align with DRX periodicity |
|  | sequenceId | 0 | 0 | Any 10 bit number |

##### A.14.3.1.X.2 Test requirements

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

Following will be the test sequence for this test

1) Set up PCell according to parameters given in Table A.14.3.1.X.1-2.

2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within of the first detected path of DL SSB.

a. The NTA\_offset value (in Tc units) is 0

b. The value is derived from the higher-layer parameters *TACommon*, *TACommonDrift*, and *TACommonDriftVariation*.

c. The value is computed by the UE based on UE position and serving-satellite-ephemeris-related higher-layers parameters.

d. The values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1C.2-2 and 7.1C.2-3

e. The counts for the margin for the GNSS position definition error considered in the core requirement, which needs to be subtracted for the test requirement, due to the usage of AT commands in the test.

3) If the NTN parameters are configured as GSO scenario, the test system shall adjust the timing of the DL path by values given in Table A.14.3.1.X.2-1. If the NTN parameters are configured as NGSO scenario, the test system shall adjust the timing of the DL path according to the serving-satellite-ephemeris-related higher-layers parameters.

**Table A.14.3.1.X.2-1: Adjustment Value for DL Timing**

|  |  |  |
| --- | --- | --- |
| **SCS of SSB signals (kHz)** | **Adjustment Value** | |
|  | **Test1** | **Test2** |
| 120 | +[8]\*64Tc | +[4]\*64Tc |

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1C.2 Table 7.1C.2.1-1 until the UE transmit timing offset is within respective to the first detected path (in time) of DL SSB. Skip this step for test 2 with DRX configured.

5) The test system shall verify that the UE transmit timing offset stays within of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

End of Change 3

Start of Change 4 <R4-2407678>

#### A.14.3.2.X SA FR2-NTN timing advance adjustment accuracy

##### A.14.3.2.X.1 Test Purpose and Environment

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

##### A.14.3.2.X.2 Test Parameters

Supported test configurations are shown in table A.14.3.2.X.2-1. Both timing advance adjustment delay and accuracy are tested by using the parameters in table A.14.3.2.X.2-2, A.14.3.2.X.2-3 and A.14.3.2.X.2-4.

In all test cases, single cell served by SAN is used. Each test consists of two successive time periods, with time duration of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table A.14.3.2.X.2-4, are sent from the UE and received by the test equipment. By measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured.

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

During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value specified in table A.14.3.2.X.2-2. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.

As specified in Clause 7.3C.2.1, the UE adjusts its uplink timing at slot n+k*+1+2µ* for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.

The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321 [7], shall be configured so that it does not expire in the duration of the test.

**Table A.14.3.2.X.2-1: Timing advance supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, NR FDD, SSB SCS [120] kHz, data SCS [120] kHz, BW [100] MHz |
| 2 | NGSO, NR FDD, SSB SCS [120] kHz, data SCS [120] kHz, BW [100] MHz |
| 3 | GSO, NR FDD, SSB SCS [120] kHz, data SCS [120] kHz, BW [100] MHz |
| Note: Editor’s Note: applicability | |

**Table A.14.3.2.X.2-2: General test parameters for timing advance**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF channel number |  | 1 |  |
| Initial DL BWP |  | DLBWP.0.1 | As specified in Table A.3.9.2.1-1 |
| Dedicated DL BWP |  | DLBWP.1.1 | As specified in Table A.3.9.2.2-1 |
| Initial UL BWP |  | ULBWP.0.1 | As specified in Table A.3.9.3.1-1 |
| Dedicated UL BWP |  | ULBWP.1.1 | As specified in Table A.3.9.3.2-1 |
| Timing Advance Command (*TA*) value during T1 |  | 31 | *NTA\_new = NTA\_old* for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2 |
| Timing Advance Command (*TA*) value during T2 |  | 39 | For 120 kHz SCS *NTA\_new = NTA\_old + 1024\*Tc* (based on equation in clause 4.2 of TS 38.213 [3]) |
| T1 | s | 5 |  |
| T2 | s | 5 |  |

**Table A.14.3.2.X.2-3: Cell specific test parameters for timing advance**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test1** | |
|  | | |  | **T1** | **T2** |
| Duplex mode | Config 1,2,3 | |  | FDD | |
| Satellite information | Config 1 | |  | SSC.X | |
|  | Config 2 | |  | SSC.X | |
| Config 3 | |  | SSC.X | |
| BWchannel | Config 1,2,3 | | MHz | 100: NRB,c = 66 | |
| BWP BW | Config 1,2,3 | | MHz | 100: NRB,c = 66 | |
| DRX Cycle | | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 | |  | SR.X.X FDD | |
| RMSI CORESET Reference Channel | Config 1,2,3 | |  | CR.X.X FDD | |
| Dedicated CORESET Reference Channel | Config 1,2,3 | |  | CCR.X.X FDD | |
| TRS configuration | Config 1,2,3 | |  | TRS.X.X FDD | |
| PDSCH/PDCCH TCI state |  | |  |  | |
| OCNG Patterns | | |  | OCNG pattern 1 | |
| SMTC configuration | Config 1,2,3 | |  | SMTC.1 | |
| SSB configuration | Config 1,2,3 | |  | SSB.3 FR2 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3 | | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3 | | kHz | 120 kHz | |
| EPRE ratio of PSS to SSS | | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |
| Propagation condition | | Config 1, 2 | - | AWGN | |
| Config 3 | AWGN with constant Doppler [TBD]Hz | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Void  Note 3: Void | | | | | |

Table A.14.3.2.X.2-3A: OTA related test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test 1 | |
|  |  | T1 | T2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beamsNote 6 |  | Fine (For electronic steering antenna type)  RX beam of RX beam peak direction (For mechanical steering antenna type) | |
| Note1 | dBm/15kHzNote4 | -112 | |
| Note1 | dBm/SCSNote3 | -103 | |
|  | dB | 4 | |
| SS-RSRPNote2 | dBm/SCS Note4 | -99 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | |

Table A.14.3.2.X.2-4: Sounding Reference Symbol Configuration for timing advance

|  |  |  |
| --- | --- | --- |
| **Field** | **Value** | **Comment** |
| c-SRS | 16 | Frequency hopping is disabled |
| b-SRS | 0 |  |
| b-hop | 0 |
| freqDomainPosition | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 |  |
| groupOrSequenceHopping | neither | No group or sequence hopping |
| SRS-PeriodicityAndOffset | sl5=4 for SCS 120kHz | Once every 5 slots |
| pathlossReferenceRS | ssb-Index=0 | SSB #0 is used for SRS path loss estimation |
| usage | Codebook | Codebook based UL transmission |
| startPosition | 0 | resourceMapping setting. SRS on last symbol of slot, and 1symbols for SRS without repetition. |
| nrofSymbols | n1 |  |
| repetitionFactor | n1 |  |
| combOffset-n2 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 |  |
| nrofSRS-Ports | port1 | Number of antenna ports used for SRS transmission |
| Note: For further information see clause 6.3.2 in TS 38.331 [2]. | | |

##### A.14.3.2.1.3 Test Requirements

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. k*+1+2µ* slots after the reception of the timing advance command, where k=11.

The Timing Advance adjustment accuracy shall be within the limits specified in clause 7.3C.2.2.

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

End of Change 4

Start of Change 5 <R4-2409291>

#### A.14.2.1.8 Intra-frequency inter-satellite handover from FR2-NTN to FR2-NTN

##### A.14.2.1.8.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR2-NTN – NR FR2-NTN intra-frequency handover requirements specified in clause 6.1C.1.3.

##### A.14.2.1.8.2 Test Parameters

The test consists two sub-tests. Sub-test 1 is applicable for UE indicating ‘electronic’ via *ntn-VSAT-AntennaType-r18*, and sub-test 2 is applicable for UE indicating ‘mechanical’ via *ntn-VSAT-AntennaType-r18*. The test configurations are same for the two sub-tests unless specified otherwise.

Supported test configurations are shown in Table A.14.2.1.8.2-1. Both handover delay and interruption length are tested by using the parameters in Table A.14.2.1.8.2-2, and A.14.2.1.8.2-3.

The test scenario comprises of one carrier and two cells on the carrier. The test consists of two successive time periods, with time durations of T1, T2 respectively. At the start of time duration T1, the UE does not have any timing information of cell 2. Starting T2, cell 2 becomes detectable and the UE receives a RRC handover command from the network to handover from cell 1 to cell 2. The start of T2 is the instant when the last TTI containing the RRC message implying handover is sent to the UE.

Table A.14.2.1.8.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | GSO, NR FDD, 120 kHz SSB SCS, 100 MHz BW |
| 2 | NGSO, NR FDD, 120 kHz SSB SCS, 100 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Table A.14.2.1.8.2-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For GSO satellites configuration |
| Config 2 |  | RMC in [A.x] | For NGSO satellites configuration |
| UE position (N,S,H) | |  | [(0, 0, 0)] | Set by AT command |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Time offset between cells | | μs | 3 | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | 1 for sub-test 1  TBD for sub-test 2 |  |

Table A.14.2.1.8.2-3: Cell specific test parameters for NR FR2-FR2 Intra frequency handover test case

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Setup X1 for sub-test 1  Setup X2 for sub-test 1 | | | |
| NR RF Channel Number | |  | **1** | | **1** | |
| Duplex mode | |  | FDD | | | |
| BWchannel | | MHz | 100: NRB,c = 66 | | | |
| BWP BW | | MHz | 100: NRB,c = 66 | | | |
| TACommon | | s | 0 | | | |
| TACommonDrift | | s | 0 | | | |
| TACommonDriftVariation | | s | 0 | | | |
| Koffset | Config 1 | ms | 239 | | | |
| Config 2 | ms | 4 | | | |
| Kmac | | ms | 0 | | | |
| Data RBs allocated | |  | 66 | | | |
| DRx Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR3.1 FDD | | | |
| RMSI CORESET Reference Channel | |  | CR3.1 FDD | | | |
| Control Channel RMC | |  | CCR.3.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | |  | SSB.3 FR2 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | | | |
| TRS configuration | |  | TRS.2.1 TDD | | | |
| PDSCH/PDCCH TCI state | |  | TCI.State.2 | | | |
| BWP configuraiton | Initial DL BWP |  | DLBWP.0.1 | | | |
|  | Dedicated DL BWP |  | DLBWP.1.1 | | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | | |
|  | Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |  | |
| Note2 | | dBm/15kHz | -104.7 | | | |
| Note2 | | dBm/SCS | -95.7 | | | |
|  | | dB | 6 | -1.8 | -Infinity | 0 |
|  | | dB | 6 | 6 | -Infinity | 7 |
| IoNote3 | | dBm/  BW | -59.7 | -56.7 | -59.7 | -56.7 |
| Propagation condition | | - | AWGN | | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: As observed with 0 dBi gain antenna at the centre of the quiet zone | | | | | | |

##### A.14.2.1.8.3 Test Requirements

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

X = 152ms for sub-test 1, and

X = TBD ms for sub-test 2, and

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 = 142 ms in sub-test 1 and TBD in sub-test 2. Tinterrupt is defined in clause 6.1C.1.3.2.

This gives a total of 152 ms sub-test 1 and TBD in sub-test 2.

End of Change 5

Start of Change 6 <R4-2409292>

10.1.25C UE Rx-Tx Time Difference Measurements in Satellite Accesss

10.1.25C.1 Introduction

The requirements in Clause 10.1.25C shall apply, provided the UE has received *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [31] requesting the UE to report one or more UE Rx-Tx time difference measurements defined in TS 38.215 [4]. The requirements in Clause 10.1.25C shall apply:

- when UE is in RRC\_CONNECTED state and the measurement is performed with MG or without MG.

10.1.25C.2 Measurement Accuracy Requirements

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall not apply, if:

- NTA\_offset defined in Table 7.1.2-2 changes during the UE Rx-Tx measurement period or

- if the uplink transmission timing changes during the UE Rx-Tx measurement period due to the network-configured Timing Advance.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one DL PRS resource of each of the TRPs corresponding to the serving cell in the assistance data.

If the uplink transmission timing changes during the UE Rx-Tx measurement period due to the autonomous timing adjustment defined in clause 7.1C.2 then:

- UE Rx-Tx measurement accuracy requirements shall apply for a cell, which is also the downlink reference cell (defined in section 7.1C.1) for SRS transmission even if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment.

The accuracy requirements in Table 10.1.25C.2-1 for FR1-NTN are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-5 [18] for reference sensitivity are fulfilled.

- PRP|dBm according to Annex B.2.X for a corresponding Band.

- AWGN propagation condition.

Table 10.1.25C.2-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetition Note 3 | NR operating band groupsNote 2 | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | RB | kHz |  |  | dBm / SCSPRS | dBm/BW |
| ± 59+δ | 0 | ≥52 | 15 | ≥1 | NR\_FDD\_SAB\_FR1\_A | -121 | -50 |
| ± 30+δ6 | >104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 30+δ | ≥48 | 30 | ≥1 | NR\_FDD\_SAB\_FR1\_A | -118 | -50 |
| ± 15+δ | ≥132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 15+δ | ≥64 | 60 | ≥1 | NR\_FDD\_SAB\_FR1\_A | -115 | -50 |
| ± 7+δ | ≥132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 75+δ | -6 | ≥52 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 37+δ | >104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 39+δ | ≥48 | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 16+δ | ≥132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 16+δ | ≥64 | 60 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 8+δ | ≥132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1.25C.2-2. | | | | | | | |

Table 10.1.25C.2-2: Margin for UE Rx-Tx time difference measurement accuracy in FR1-NTN

|  |  |  |  |
| --- | --- | --- | --- |
| Min(PRS BW, SRS BW) (RB) | | | Margin (Tc Note 1) |
| SCS = 15 kHz | SCS = 30 kHz | SCS = 60 kHz |
| ≥ 24 | N/A | N/A | 160 |
| ≥ 52 | ≥ 24 | N/A | 80 |
| ≥ 104 | ≥ 48 | ≥ 24 | 56 |
| N/A | ≥ 132 | ≥ 64 | 24 |
| N/A | N/A | ≥ 132 | 24 |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies. | | | |

10.1.25C.3 Report mapping

The report mapping provided in clause 10.1.25.3 is applicable for NTN.

End of Change 6

Start of Change 7 <R4-2410386>

#### A.14.4.1.X1 Radio Link Monitoring Out-of-sync Test for FR2 SAN PCell configured with SSB-based RLM RS in non-DRX mode

##### A.14.4.1.X1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the SAN PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1C.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.14.4.1.X1.1-1. The test parameters are given in Tables A.14.4.1.X1.1-2, A.14.4.1.X1.1-3, and A.14.4.1.X1.1-4 below. There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.14.4.1.X1.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.

The UE shall be provided with the valid information about the SAN serving each cell in the test before the test.

Table A.14.4.1.X1.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | NGSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.14.4.1.X1.1-2: General test parameters for FR2 out-of-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| NTN reference configuration | | Config 1 |  | TBD |
| Config 2 | TBD |
| BWchannel | | Config 1, 2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 24 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | [CR.2.1 FDD] |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | [CCR.2.1 FDD] |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 120 kHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.3.1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | *0* |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | | Config 1, 2 |  | [CSI-RS.2.1 FDD] |
| CSI-RS for tracking | | Config 1, 2 |  | [TRS.2.1 FDD] |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.48 |
| T3 | | | s | 0.48 |
| D1 | | | s | 0.44 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.14.4.1.X1.1-3: Cell specific test parameters for FR2 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | |
|  | |  | T1 | T2 | T3 |
| AoA setup | |  | TBD | | |
| Assumption for UE beams | |  | TBD | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 4 | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | |
| EPRE ratio of PSS to SSS | | dB |  | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | |
| SNR on RLM-RS | Config 1 | dB | 2 | -6 | -15 |
|  | Config 2 |  | 2 | -6 | -15 |
|  | Config 1 | dBm/15kHz | -92.1 | | |
|  | Config 2 |  | -92.1 | | |
| Propagation condition | |  | TBD | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure A.6.5.1C.1.1-1. | | | | | |

Table A.14.4.1.X1.1-4: Measurement gap configuration for out-of-sync tests in non-DRX mode

|  |  |
| --- | --- |
| Field | Test 1 |
|  | Value |
| gapOffset | 0 |

A diagram of a diagram

Description automatically generated

Figure A.14.4.1.X1.1-1: SNR variation for out-of-sync testing

##### A.14.4.1.X1.2 Test Requirements

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

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

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

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

#### A.14.4.1.X2 Radio Link Monitoring In-sync Test for FR2 SAN PCell configured with SSB-based RLM RS in non-DRX mode

##### A.14.4.1.X2.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects the out of sync and in sync for the purpose of monitoring downlink radio link quality of the SAN PCell. This test will partly verify the FR2 radio link monitoring requirements in clause 8.1C.

In the test, UE is configured to perform RLM on SSB, with *detectionResource* included in *RadioLinkMonitoringRS* set to SSB#0, and *purpose* set to ‘*rlf*’. Supported test configurations are shown in table A.14.4.1.X2.1-1. The test parameters are given in Tables A.14.4.1.X2.1-2, and A.14.4.1.X2.1-3 below. There is one cell (Cell 1), which is the active cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.14.4.1.X2.1-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.

The UE shall be provided with the valid information about the SAN serving the each cell in the test before the test.

Table A.14.4.1.X2.1-1: Supported test configurations for FR2 PCell

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | NGSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.14.4.1.X2.1-2: General test parameters for FR2 in-sync testing in non-DRX mode

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value |
|  | | |  | Test 1 |
| Active PCell | | |  | Cell 1 |
| RF Channel Number | | |  | 1 |
| NTN reference configuration | | Config 1 |  | TBD |
| Config 2 | TBD |
| BWchannel | | Config 1, 2 | MHz | 100: NRB,c = 66 |
| Data RBs allocated | | Config 1 |  | 24 |
| DL initial BWP configuration | | Config 1, 2 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | | Config 1, 2 |  | DLBWP.1.1 |
| UL initial BWP configuration | | Config 1, 2 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | | Config 1, 2 |  | ULBWP.1.1 |
| RMSI CORESET Reference Channel | | Config 1, 2 |  | [CR.2.1 FDD] |
| Dedicated CORESET Reference Channel | | Config 1, 2 |  | [CCR.2.1 fDD] |
| SSB Configuration | | Config 1, 2 |  | SSB.1 FR2 |
| SMTC Configuration | | Config 1, 2 |  | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | | Config 1, 2 |  | 120 kHz |
| PRACH Configuration | | Config 1, 2 |  | Table A.3.8.2.1-1 |
| SSB index assigned as RLM RS | | |  | 0 |
| OCNG parameters | | |  | OP.1 |
| CP length | | |  | Normal |
| In sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 4 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 0 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 0 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| Out of sync transmission parameters | DCI format | |  | 1-0 |
|  | Number of Control OFDM symbols | |  | 2 |
|  | Aggregation level | | CCE | 8 |
|  | Ratio of hypothetical PDCCH RE energy to average SSS RE energy | | dB | 4 |
|  | Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy | | dB | 4 |
|  | DMRS precoder granularity | |  | REG bundle size |
|  | REG bundle size | |  | 6 |
| DRX | | |  | *OFF* |
| Gap pattern ID | | |  | N.A. |
| Layer 3 filtering | | |  | *Enabled* |
| T310 timer | | | ms | 1000 |
| T311 timer | | | ms | 1000 |
| N310 | | |  | 1 |
| N311 | | |  | 1 |
| CSI-RS configuration for CSI reporting | Config 1, 2 | |  | [CSI-RS.2.1 FDD] |
| CSI-RS for tracking | Config 1, 2 | |  | [TRS.2.1 FDD] |
| T1 | | | s | 0.2 |
| T2 | | | s | 0.2 |
| T3 | | | s | 0.24 |
| T4 | | | s | 0.2 |
| T5 | | | s | 0.88 |
| D1 | | | s | 0.84 |
| Note 1: All configurations are assigned to the UE prior to the start of time period T1.  Note 2: UE-specific PDCCH is not transmitted after T1 starts. | | | | |

Table A.14.4.1.X2.1-3: Cell specific test parameters for FR2 (Cell 1) for in-sync radio link monitoring tests in non-DRX mode

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test 1 | | | | |
|  | |  | T1 | T2 | T3 | T4 | T5 |
| AoA setup | |  | TBD | | | | |
| Assumption for UE beams | |  | TBD | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 | | | | |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  | | | | |
| EPRE ratio of PSS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  | | | | |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  | | | | |
| EPRE ratio of OCNG DMRS to SSS | | dB |  | | | | |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  | | | | |
| SNR on RLM-RS | Config 1 | dB | 2 | -6 | -15 | -4.5 | 2 |
|  | Config 2 |  | 2 | -6 | -15 | -4.5 | 2 |
|  | Config 1 | dBm/15 kHz | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
|  | Config 1 | dBm/SCS | -98 | | | | |
|  | Config 2 |  | -98 | | | | |
| Propagation condition | |  | TBD | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.  Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5 respectively in Figure A.6.5.1C.2.1-1. | | | | | | | |

A diagram of a diagram

Description automatically generated

Figure A.14.4.1.X2.1-1: SNR variation for in-sync testing

##### A.14.4.1.X2.2 Test Requirements

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

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

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

End of Change 7

Start of Change 8 <R4-2410386>

#### 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. | | | | | | | | |

Table A.3.1.2.1-2: RMSI CORESET Reference Channel for FDD with SCS=120KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CR.2.1 FDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |  |  |
| Subcarrier spacing for RMSI CORESET | kHz | 120 |  |  |  |  |  |  |
| Allocated resource blocks for RMSI CORESET Note 7 |  | 24 |  |  |  |  |  |  |
| Subcarrier spacing for SSB | kHz | 120 |  |  |  |  |  |  |
| 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 13-12 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. | | | | | | | | |

End of Change 8

Start of Change 9 <R4-2410386>

### 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 |  | 1000000  0000000 | 1000000  0000000 | 1000000  0000000 | 1000000  0000000 | 0010000  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.3.1.3.1-2: Control Channel RMC for FDD with SCS=120KHz

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | | | | | |
| Reference channel |  | CCR.2.1 FDD |  |  |  |  |  |  |
| Channel bandwidth | MHz | 100 |  |  |  |  |  |  |
| Subcarrier spacing | kHz | 120 |  |  |  |  |  |  |
| Allocated resource blocks for CORESET Note 3 |  | 24 |  |  |  |  |  |  |
| Number of transmitter antennas |  | 1 |  |  |  |  |  |  |
| Duration of CORESET | symbols | 1 |  |  |  |  |  |  |
| monitoringSlotPeriodicityAndOffset Note 4 |  | sl160  0 |  |  |  |  |  |  |
| monitoringSymbolsWithinSlot |  | 1100000  0000000 |  |  |  |  |  |  |
| REG bundle size |  | 6 |  |  |  |  |  |  |
| DMRS precoder granularity |  | Same as REG bundle size |  |  |  |  |  |  |
| CCE to REG mapping |  | Interleaved |  |  |  |  |  |  |
| Interleave n\_shift |  | 0 |  |  |  |  |  |  |
| Interleave size |  | 2 |  |  |  |  |  |  |
| Beamforming Pre-Coder |  | N/A |  |  |  |  |  |  |
| Aggregation level | CCE | 4 |  |  |  |  |  |  |
| DCI formats |  | Note 1 |  |  |  |  |  |  |
| Payload size (without CRC) | bits | 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.  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. | | | | | | | | |

End of Change 9

Start of Change 10 <R4-2410386>

## 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. | | | | | | | |

Table A.3.14.1-2: CSI-RS Reference Measurement Channels for SCS=120kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CSI-RS.2.1 FDD** |  |  |  |  |  |  |
| **Resource Type** | **periodic** |  |  |  |  |  |  |
| **Resource Set Config** |  |  |  |  |  |  |  |
| nzp-CSI-ResourceSetId | 0 |  |  |  |  |  |  |
| repetition | n.a. |  |  |  |  |  |  |
| aperiodicTriggeringOffset | n.a. |  |  |  |  |  |  |
| trs-Info | n.a. |  |  |  |  |  |  |
| **Resource Config** |  |  |  |  |  |  |  |
| nzp-CSI-RS-ResourceId | 0 for resource #0 |  |  |  |  |  |  |
| powerControlOffset | 0 |  |  |  |  |  |  |
| powerControlOffsetSS | db0 |  |  |  |  |  |  |
| scramblingID | 0 |  |  |  |  |  |  |
| Period (slots) | slot40. |  |  |  |  |  |  |
| Offset | 8 |  |  |  |  |  |  |
| qcl-InfoPeriodicCSI-RS | TCL.State.0 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| frequencyDomainAllocation | 000001 |  |  |  |  |  |  |
| nrofPorts | 2 |  |  |  |  |  |  |
| firstOFDMSymbolInTimeDomain | 5 for resource #0 |  |  |  |  |  |  |
| cdm-Type | FD-CDM2 |  |  |  |  |  |  |
| density | 1 |  |  |  |  |  |  |
| startingRB | 0 |  |  |  |  |  |  |
| nrofRBs | 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. | | | | | | | |

End of Change 10

Start of Change 11 <R4-2410386>

### 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.3.17.2.2 FDD

Table A.3.17.2.2-1: CSI-RS for tracking for SCS=120kHz Set 1

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Value |
| Reference channel |  | TRS.2.1 FDD |
| 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. | | |

End of Change 11

Start of Change 12 <R4-2410387>

#### A.14.2.1.7 Intra-frequency intra-satellite Handover from FR2-NTN to FR2-NTN

##### A.14.2.1.7.1 Test Purpose and Environment

This test is to verify the requirement for intra-frequency intra-satellite handover from FR2-NTN to FR2-NTN specified in clause 6.1C.3.

##### A.14.2.1.7.2 Test Parameters

The test scenario comprises of one NR FDD carrier and 2 cells as given in table A.14.2.1.7.2-1, A.14.2.1.7.2-2, and A.14.2.1.7.2-3. Both handover delay and interruption length are tested.

The test consists of three successive time periods, with time durations of T1, T2 and T3 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell with Event A3 report. Starting T2, cell 2 becomes detectable and offset better than cell 1. The RRC message implying handover to cell 2 shall be sent to the UE during period T2, after the UE has reported Event A3. The start of T3 is defined as the end of the last TTI containing the RRC message implying handover.

Table A.14.2.1.7.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | GSO, NR FDD, 120kHz SSB SCS, 100 MHz BW |
| 2 | NGSO, NR FDD, 120kHz SSB SCS, 100 MHz BW |
| Note: If UE supports both NGSO and GSO, the GSO-based test cases can be skipped if the UE passes NGSO-based test cases. | |

Table A.14.2.1.7.2-2: General test parameters Intra-frequency intra-satellite handover from FR2-NTN to FR2-NTN

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 |  |
| Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For GSO satellites configuration |
| Config 2 |  | RMC in [A.x] | For NGSO satellites configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| A3-Offset | | dB | 0 |  |
| Hysteresis | | dB | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 0 μs | Synchronous cells belonging to the same satellite |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |

Table A.14.2.1.7.2-3: Cell specific test parameters for intra-frequency intra-satellite handover from FR2-NTN to FR2-NTN

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | | Cell 2 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Assumption for UE beamsNote4 | |  |  | [Rough] | | | [Rough] | | |
| AoA setup | |  |  | Setup 1 as defined in A.3.15 | | | | | |
| NR RF Channel Number | | Config 1,2 |  | 1 | | | 1 | | |
| Duplex mode | |  | FDD | | | | | |
| BWchannel | | MHz | 10: NRB,c = 66 | | | 10: NRB,c = 66 | | |
| BWP BW | | MHz | 10: NRB,c = 66 | | | 10: NRB,c = 66 | | |
| Data RBs allocated | |  |  | 66 | | | | | |
| TACommon | | Config 1,2 | s | 0 | | | 0 | | |
| TACommonDrift | | s | 0 | | | 0 | | |
| TACommonDriftVariation | | s | 0 | | | 0 | | |
| Koffset | | Config 1 | ms | [239] | | | [239] | | |
|  | | Config 2 | [4] | | | [4] | | |
| Kmac | | Config 1,2 | ms | 0 | | | 0 | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | |  | SR3.1 TDD | | | | | |
| CORESET Reference Channel | |  | CR3.1 TDD | | | | | |
| TRS configuration | |  | TRS.2.1 TDD | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| SMTC Configuration | |  | SMTC.1 | | | | | |
| SSB Configuration | |  | SSB. 3 FR2 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 120 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 120 kHz | | | | | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | | | | | |
| BWP configuration | Initial DL BWP | Config 1,2 |  | DLBWP.0.1 | | | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | | | |
| EPRE ratio of PSS to SSS | | Config 1,2 | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1,2 | dBm/ 15kHz | -104.7 | | | | | |
| Note2 | | dBm/ SCS | -95.7 | | | | | |
|  | | dB | 6 | -1.8 | -1.8 | -Infinity | 0 | 0 |
|  | | dB | 6 | 6 | 6 | -Infinity | 7 | 7 |
| IoNote3 | | dBm/ 9.36MHz | -59.7 | -56.7 | -56.7 | -61.41 | -59.7 | -56.7 |
| Propagation condition | | - | AWGN | | | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in [B.2.1.3], and does not limit UE implementation or test system implementation. | | | | | | | | | |

##### A.14.2.1.7.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 no later than 72ms from the beginning of T3.

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 is defined in clause 6.1C.1.3.2.

Tinterrupt\_inter\_sat = Tsearch + TIU + Tprocessing + Tsat\_beam + T∆ + Tmargin ms

Here: Tsearch = 0; TIU = 20ms; Tprocessing = 20ms; Tsat\_beam = 0; T∆ = 20ms; Tmargin = 2ms.

This gives a total of 72ms.

End of Change 12

Start of Change 13 <R4-2410388>

#### A.14.5.1.X SA event triggered reporting test with SSB time index reading without gap under non-DRX for FR2-NTN

##### A.14.5.1.X.1 Test purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the FDD intra-frequency cell search requirements in FR2-NTN in clause 9.2C.7.1 and 9.2C.7.2.

##### A.14.5.1.X.2 Test parameters

Two cells are deployed in the test, which are FR2 PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell. The test parameters for FDD PCell and neighbour cell are given in Table A.14.5.1.X.2-1 and A.14.5.1.X.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the PCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2.

The UE shall be provided with the valid information about the SAN serving the each cell in the test before the test.

UE is configured with 1 SMTC for the intra-frequency measurement. Both Cell 1 and Cell 2 are associated with the configured SMTC.

Table A.14.5.1.X.2-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | GSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | NGSO, NR FDD, SSB SCS 120 kHz, data SCS 120 kHz, BW 100 MHz |
| Note: The UE is only required to be tested in one of the supported test configurations | |

Table A.14.5.1.X.2-2: General test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR2-NTN with SSB index reading

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2 | Cell 1 |  |
| Neighbour cell |  | 1, 2 | Cell 2 | Cell to be identified. |
| RF Channel Number |  | 1, 2 | 1: Cell 1 and Cell 2 |  |
| SMTC configuration |  | 1, 2 | SMTC.2 |  |
| A3-Offset | dB | 1, 2 | -11 |  |
| CP length |  | 1, 2 | Normal |  |
| Hysteresis | dB | 1, 2 | 0 |  |
| Time To Trigger | s | 1, 2 | 0 |  |
| Filter coefficient |  | 1, 2 | 0 | L3 filtering is not used |
| DRX | ms | 1, 2 |  | OFF |
| Time offset between serving and neighbour cells |  | 1, 2 | 3 μs | Synchronous cells |
| T1 | s | 1, 2 | 5 |  |
| T2 | s | 1, 2 | 5 |  |

**Table A.14.5.1.X.2-3: NR Cell specific test parameters for SA intra-frequency event triggered reporting without gap for FDD PCell in FR2-NTN with SSB index reading**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Config | Cell 1 | | Cell 2 | |
|  | |  |  | T1 | T2 | T1 | T2 |
| FDD configuration | |  | 1, 2 | TBD | | TBD | |
| BWchannel | | MHz | 1, 2 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Data RBs allocated | |  | 1 | 24 | | 24 | |
| 2 | 48 | | 48 | |
| Intial BWP configuration | |  | 1, 2 | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Active DL BWP configuration | |  | 1, 2 | DLBWP.1.1 | | DLBWP.1.1 | |
| Active UL BWP configuration | |  | 1, 2 | ULBWP.1.1 | | ULBWP.1.1 | |
| RLM-RS | |  | 1, 2 | SSB | | SSB | |
| PDSCH RMC configuration | |  | 1 | TBD | | N/A | |
| 2 | TBD | |
| RMSI CORESET RMC configuration | |  | 1 | TBD | | N/A | |
| 2 | TBD | | N/A | |
| Dedicated CORESET RMC configuration | |  | 1 | TBD | | N/A | |
| 2 | TBD | | N/A | |
| TRS configuration | |  | 1, 2 | TBD | | N/A | |
| PDSCH/PDCCH TCI states | |  | 1, 2 | TCI.State.2 | | N/A | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1, 2 | 120 | | 120 | |
| OCNG Patterns | |  | 1, 2 | OP.5 | | N/A | |
| cellIndividualOffset | | dB | 1~2 | N/A | | 16 | |
| SSB | |  | 1 | SSB.1 FR2 | | SSB.7 FR2 | |
|  | |  | 2 | SSB.2 FR2 | | SSB.8 FR2 | |
| Propagation Condition | |  | 1, 2 | No external noise (Note 1) | | No external noise (Note 1) | |
| Note 1: The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects as specified in TS 38.521-2 B.0 [40]. | | | | | | | |

Table 14.5.1.X.2-4: NR OTA Cell specific test parameters for intra-frequency event triggered reporting for SA with FDD PCell in FR2-NTN without gap without DRX

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Config | Cell 1 | | Cell 2 | | |
|  |  |  | T1 | T2 | T1 | | T2 |
| Satellite information |  | 1 | [SSC.1] | | [NSC.1] | | |
|  |  | 2 | [SSC.2] | | [NSC.2] | | |
| AoA setup |  | 1, 2 | TBD | | | | |
| Beam assumptionNote 4 |  | 1,2 | TBD | | TBD | | |
| Es | dBm/SCS | 1 | -89 | -89 | | -Infinity | -89 |
|  |  | 2 | -86 | -86 | | -Infinity | -86 |
| BB Note 5 | dB | 1, 2 | -0.12 | -0.12 | | -Infinity | -0.12 |
| SSB\_RP | dBm/SCS | 1 | -89 | -89 | -Infinity | | -89 |
|  |  | 2 | -86 | -86 | -Infinity | | -86 |
|  | dBm/95.04MHz | 1 | -64.41 | -64.41 | -Infinity | | -64.41 |
| 2 | -61.41 | -61.41 | -Infinity | | -61.41 |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Void  Note 3: Es/Iot, SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | |

##### A.14.5.1.X.3 Test Requirements

For both UE indicating [Type 1] and [Type 2] via UE capability [Beam steering], the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE is required to read the neighbour cell SSB index and report the acquired SSB index in this test.

The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled.

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

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

End of Change 13

Start of Change 14 <R4-2410391>

#### A.14.2.2.X1 RACH-based Hard Satellite switching with re-synchronization from FR1 to FR1

##### A.14.2.2.X1.1 Test Purpose and Environment

This test is to verify the requirement for RACH-based hard satellite switching with re-synchronization from SAN FR1 to SAN FR1 specified in clause 6.1C.3.

##### A.14.2.2.X1.2 Test Parameters

The test scenario comprises of 1 NR FDD carrier and 2 cells with same PCI as given in table A.14.2.2.X1.2-1, A.14.2.2.X1.2-2, A.14.2.2.X1.2-3 and A.14.2.2.X1.2-4. Both satellite switching delay and interruption length are tested.

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

At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, The SIB19 implying *t-service-r17* andtarget satellite configuration *SatSwitchWithReSync-r18* shall be sent to UE. The target satellite configuration is in Table A.14.2.2.X1.2-3.

At the start of time duration T2, cell 2 becomes detectable and *t-service-r17* of cell 1 is fulfilled.

Table A.14.2.2.X1.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |

Table A.14.2.2.X1.2-2: General test parameters for RACH-based Hard Satellite switching with re-synchronization from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 |  |
| Final condition | Active cell |  | Cell 2 |  |
| UE position (N,S, H) | |  | (0, 0, 0) | Set by AT command |
| Access Barring Information | | - | Not barred | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |

Table A.14.2.2.X1.2-3: Target Satellite configuration pattern for hard satellite switching scenario

|  |  |
| --- | --- |
| Parameter | TSC.1 |
| Interval between adjacent epoch time | 2.56s |
| ntn-UlSyncValidityDuration | 5s |
| cellSpecificKoffset | 14 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [38] |
| ssb-TimeOffset | 0 |

Table A.14.2.2.X1.2-4: Cell specific test parameters for RACH-based Hard Satellite switching with re-synchronization from FR1 to FR1 test case

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1Note1 | | Cell 2Note1 | |
| T1 | T2 | T1 | T2 |
| Satellite configurationNote2 | |  | SSC.2 | N/A | N/A | SSC.2 |
| BWchannel | | MHz | 10: NRB,c = 52 |  |  | 10: NRB,c = 52 |
| BWP BW | | MHz | 10: NRB,c = 52 |  |  | 10: NRB,c = 52 |
| Kmac | | ms | 0 |  |  | 0 |
| DRX Cycle | | ms | Not Applicable |  |  | Not Applicable |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD |  |  | SR.1.1 FDD |
| CORESET Reference Channel | |  | CR.1.1 FDD |  |  | CR.1.1 FDD |
| TRS configuration | |  | TRS.1.1 FDD |  |  | TRS.1.1 FDD |
| OCNG Patterns | |  | OP.1 |  |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |  |  | SMTC.1 |
| SSB Configuration | |  | SSB.1 FR1 |  |  | SSB.1 FR1 |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz |  |  | 15 kHz |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz |  |  | 15 kHz |
| PRACH configuration | |  | FR1 PRACH configuration 1 |  |  | FR1 PRACH configuration 1 |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 |  |  | DLBWP.0.1 |
| Dedicated DL BWP |  | DLBWP.1.1 |  |  | DLBWP.1.1 |
| Initial UL BWP |  | ULBWP.0.1 |  |  | ULBWP.0.1 |
| Dedicated UL BWP |  | ULBWP.1.1 |  |  | ULBWP.1.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |  |  | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  |  |
| Note3 | | dBm/ 15kHz | -98 | | | |
| Note3 | | dBm/ SCS | -98 | | | |
|  | | dB | 8 | -Infinity | -Infinity | 8 |
|  | | dB | 8 | -Infinity | -Infinity | 8 |
| SSB\_RP | | dBm/ SCS | -90 | -Infinity | -Infinity | -90 |
| IoNote4 | | dBm/ 9.36MHz | -61.41 | -61.41 | -61.41 | -61.41 |
| Propagation condition | | - | AWGN | | | |
| Note 1: Cell 1 and Cell 2 have same PCI. Satellite serving for Cell 1 and Satellite serving for Cell 2 are two different NGSO satellites.  Note 2: SSB transmit timing from TE should fit the SSB-timeOffset and the nominal propagation delay difference between serving satellite and target satellite. The nominal propagation delay is counted from the SSB-TimeOffset reference point to UE, which based on satellite locations and UE location known to the TE in this test case.  Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 5: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | |

##### A.14.2.2.X1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 52.5 ms from the beginning of time period T2.

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

NOTE: The hard satellite switch with re-sync delay Dswitch\_unchangedPCI can be expressed as: Tinterrupt, where:

Tinterrupt is defined in clause 6.1C.3.2.2.

Dswitch\_unchangedPCI = Tinterrupt = Tsearch + TIU + Tprocessing + T∆ + Tmargin ms

Here: Tsearch = Tfirst\_SSB = 0.5ms; TIU = 20ms; Tprocessing = 10ms; T∆ = 20ms; Tmargin = 2ms.

This gives a total of 52.5 ms.

#### A.14.2.2.X2 RACH-less Soft Satellite switching with re-synchronization from FR1 to FR1

##### A.14.2.2.X2.1 Test Purpose and Environment

This test is to verify the requirement for RACH-less soft satellite switching with re-synchronization from SAN FR1 to SAN FR1 specified in clause 6.1C.3.

##### A.14.2.2.X2.2 Test Parameters

The test scenario comprises of 1 NR FDD carrier and 2 cells with same PCI as given in table A.14.2.2.X2.2-1, A.14.2.2.X2.2-2, A.14.2.2.X2.2-3 and A.14.2.2.X2.2-4. Satellite switching delay is tested.

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

At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, The SIB19 implying *t-service-r17* andtarget satellite configuration *SatSwitchWithReSync-r18* shall be sent to UE. The target satellite configuration is in Table A.14.2.2.X2.2-3. The configured grant PUSCH transmission in the cell2 is configured in the RRC message from cell1.

At the start of time duration T2, cell 2 becomes detectable and *t-ServiceStart-r18* is fulfilled.

At the start of time duration T3, *t-service-r17* of cell 1 is fulfilled.

Table A.14.2.2.X2.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |

Table A.14.2.2.X2.2-2: General test parameters for RACH-less Soft Satellite switching with re-synchronization from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 |  |
| Final condition | Active cell |  | Cell 2 |  |
| UE position (N,S, H) | |  | (0, 0, 0) | Set by AT command |
| Access Barring Information | | - | Not barred | No additional delays in random access procedure. |
| timeDomainOffset | |  | 0 |  |
| mappingType | |  | Type A |  |
| startSymbolAndLength | |  | 42 | *startSymbol S=0*  *Length* L=4 |
| timeReferenceSFN-r16 | |  | sfn512 |  |
| Periodcity | |  | sym10x14 |  |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | ms | 100 |  |
| T3 | | s | ≤5 |  |

Table A.14.2.2.X2.2-3: Target Satellite configuration pattern for soft satellite switching scenario

|  |  |
| --- | --- |
| Parameter | TSC.2 |
| Interval between adjacent epoch time | 2.56s |
| ntn-UlSyncValidityDuration | 5s |
| cellSpecificKoffset | 14 slots |
| ta-Common | 0 |
| ta-CommonDrift | 0 |
| ta-CommonDriftVariant | 0 |
| ntn-PolarizationDL | linear |
| ntn-PolarizationUL | linear |
| ephemerisInfo | Detailed ephemeris information is provided in TS 38.508-1 [38] |
| ssb-TimeOffset | 10 |
| t-ServiceStart | T2 |

Table A.14.2.2.X2.2-4: Cell specific test parameters for Inter frequency SAN handover test case

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1Note1 | | | Cell 2Note1 | | |
| T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite configurationNote2 | |  | SSC.2 | | N/A | N/A | SSC.2 | |
| BWchannel | | MHz | 10: NRB,c = 52 | |  |  | 10: NRB,c = 52 | |
| BWP BW | | MHz | 10: NRB,c = 52 | |  |  | 10: NRB,c = 52 | |
| Kmac | | ms | 0 | |  |  | 0 | |
| DRx Cycle | | ms | Not Applicable | |  |  | Not Applicable | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | |  |  | SR.1.1 FDD | |
| CORESET Reference Channel | |  | CR.1.1 FDD | |  |  | CR.1.1 FDD | |
| TRS configuration | |  | TRS.1.1 FDD | |  |  | TRS.1.1 FDD | |
| OCNG Patterns | |  | OP.1 | |  |  | OP.1 | |
| SMTC Configuration | |  | SMTC.1 | |  |  | SMTC.5 | |
| SSB Configuration | |  | SSB.1 FR1 | |  |  | SSB.5 FR1 | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | |  |  | 15 kHz | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | |  |  | 15 kHz | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | |  |  | N/A | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | |  |  | DLBWP.0.1 | |
| Dedicated DL BWP |  | DLBWP.1.1 | |  |  | DLBWP.1.1 | |
| Initial UL BWP |  | ULBWP.0.1 | |  |  | ULBWP.0.1 | |
| Dedicated UL BWP |  | ULBWP.1.1 | |  |  | ULBWP.1.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |  |  | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  | |  |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  | |  |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  | |  |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | |  |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  | |  |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  | |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  | |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  | |  |  |  | |
| Note2 | | dBm/ 15kHz | -98 | | | | | |
| Note2 | | dBm/ SCS | -98 | | | | | |
|  | | dB | 4 | 4 | -Infinity | -Infinity | 9 | 9 |
|  | | dB | 4 | 4 | -Infinity | -Infinity | 9 | 9 |
| SSB\_RP | | dBm/ SCS | -94 | -94 | -Infinity | -Infinity | -89 | -89 |
| IoNote3 | | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -70.05 | -60.53 | -60.53 |
| Propagation condition | | - | AWGN | | | | | |
| Note 1: Cell 1 and Cell 2 have same PCI. Satellite serving for Cell 1 and Satellite serving for Cell 2 are two different NGSO satellites.  Note 2: SSB transmit timing from TE should fit the SSB-timeOffset and the nominal propagation delay difference between serving satellite and target satellite. The nominal propagation delay is counted from the SSB-TimeOffset reference point to UE, which based on satellite locations and UE location known to the TE in this test case.  Note 3: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 5: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols. | | | | | | | | |

##### A.14.2.2.X2.3 Test Requirements

The UE shall start to transmit the PUSCH to Cell 2 less than 130 ms from the beginning of time period T2.

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

NOTE: The satellite switch with re-sync delay Dswitch\_unchangedPCI can be expressed as: Tsoft\_switch, where:

Tsoft\_switch = max(*t-service*-*t-seviceStart*, Tsearch + T∆ + Tmargin) + TIU + Tprocessing ms

Here: *t-service*-*t-seviceStart=* 100ms*;* Tsearch = 10.5ms; T∆ = 20ms; Tmargin = 2ms, TIU = 20ms; Tprocessing = 10ms.

This gives a total of 130 ms.

End of Change 14

Start of Change 15 <R4-2410394>

# A.14.1.Y Cell reselection to FR1 inter-RAT for NR NTN carrier

## A.14.1.Y.1Test purpose and Environment

This test is to verify the requirement for the NR NTN to E-UTRAN TN inter-RAT cell reselection requirements specified in clause 4.2C.3.1 when the E-UTRAN cell is of higher priority.

## A.14.1.Y.2 Test parameters

The test scenario comprises of one NR cell and one E-UTRAN cell as given in tables A.14.1.Y.2-1, A.14.1.Y.2-2, A.14.1.Y.2-3 and A.14.1.Y.2-4. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. NR cell 1 is already identified by the UE prior to the start of the test. E-UTRAN cell 2 is of higher priority than cell 1.

A.14.1.Y.2-1: Supported test configurations

|  |  |  |
| --- | --- | --- |
| Configuration | Description of serving cell | Description of target cell |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode | LTE 10 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | | |

Table A.14.1.Y.2-2: General test parameters for NR to E-UTRAN cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1 | Cell1 | The UE camps on cell 1 in the initial phase and during T2 period the UE reselects to cell 2. |
| T2 end | Active cell |  | 1 | Cell2 | The UE shall perform reselection to cell |
| condition | Neighbour cell |  | 1 | Cell1 | 2 during T2. |
| T3 end | Active cell |  | 1 | Cell1 | The UE shall perform reselection to cell |
| condition | Neighbour cell |  | 1 | Cell2 | 1 during T3 for iteration of the tests. |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| DRX cycle length | | s | 1 | 1.28 | The value shall be used for all cells in the test. |
| NR PRACH configuration index | |  | 1 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| E-UTRAN PRACH configuration index | |  | 1 | 53 | As specified in table 5.7.1-2 in TS 36.211 [23] |
| E-UTRAN PRACH | |  | 1 | 53 | As specified in table 5.7.1-2 in |
| T1 | | s | 1 | >7 | During T1, cell 2 shall be powered off, and during the off time the physical cell identity shall be changed. The intention is to ensure that cell 2 has not been detected by the UE prior to the start of period T2. |
| T2 | | s | 1 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.14.1.Y.2-3: Cell specific test parameters for NR cell 1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | |
|  |  |  | T1 | T2 | T3 |
| TDD configuration |  | 1, | N/A | | |
| PDSCH parameters |  | 1, | SR.1.1 FDD | | |
| RMSI CORESET parameters |  | 1, | CR.1.1 FDD | | |
| Dedicated CORESET parameters |  | 1 | CCR.1.1 FDD | | |
| SSB parameters |  | 1 | SSB.1 FR1 | | |
| NR SMTC parameters |  | 1 | SMTC.2 | | |
| OCNG Pattern |  | 1 | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | | |
| RLM-RS |  | 1 | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -140 | | |
|  | dBm/SCS | 1 | -98 | | |
|  | dBm/15 kHz | 1 | -98 | | |
| SS-RSRP | dBm/SCS | 1 | -84 | -84 | -84 |
|  | dB | 1 | 14 | 14 | 14 |
|  | dB | 1 | 14 | 14 | 14 |
| Io | dBm/9.36 MHz | 1 | -55.88 | -55.88 | -55.88 |
| Treselection | S | 1 | 0 | | |
| SnonintrasearchP | dB | 1 | 50 | | |
| Threshx, highP (Note 2) | dB | 1 | 48 | | |
| Threshserving, lowP | dB | 1 | 44 | | |
| Threshx, lowP | dB | 1 | 50 | | |
| Propagation Condition |  | 1 | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, high** which is included in NR system information, and is a threshold for the E-UTRA target cell | | | | | |

Table A.14.1.Y.2-4: Cell specific test parameters for E-UTRA cell 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Cell 2** | | |
|  |  | **T1** | **T2** | **T3** |
| E-UTRA RF Channel number |  | 1 | | |
| BWchannel | MHz | 10 | | |
| OCNG Patterns defined in TS 36.133 [15] clause A.3.2 |  | OP.2 TDD for test configuration 1, 2, 3;  OP.2 FDD for test configuration 4, 5, 6 | | |
| PBCH\_RA | dB | 0 | | |
| PBCH\_RB | dB |  | | |
| PSS\_RA | dB |  | | |
| SSS\_RA | dB |  | | |
| PCFICH\_RB | dB |  | | |
| PHICH\_RA | dB |  | | |
| PHICH\_RB | dB |  | | |
| PDCCH\_RA | dB |  | | |
| PDCCH\_RB | dB |  | | |
| PDSCH\_RA | dB |  | | |
| PDSCH\_RB | dB |  | | |
| OCNG\_RANote 1 | dB |  | | |
| OCNG\_RBNote 1 | dB |  | | |
| Qrxlevmin | dBm | -140 | | |
|  | dBm/15 kHz | -98 | | |
| RSRP | dBm/15 KHz | -infinity | -86 | -102 |
|  | dB | -infinity | 12 | -4 |
|  | dB | -infinity | 12 | -4 |
| TreselectionEUTRAN | S | 0 | | |
| SnonintrasearchP | dB | Not sent | | |
| Threshx, highP | dB | 48 | | |
| Threshserving, lowP | dB | 44 | | |
| Threshx, lowP (Note 2) | dB | 50 | | |
| Propagation Condition |  | AWGN | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: This refers to the value of Thresh**x, Low** which is included in E-UTRA system information, and is a threshold for the NR target cell | | | | |

## A.14.1.Y.3 Test requirements

The cell reselection delay to a higher priority E-UTRAN 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 Tracking Area Update procedure on cell 2.

The cell re-selection delay to a higher priority cell shall be less than 68 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: Thigher\_priority\_search + Tevaluate, E-UTRAN + TSI-E-UTRA,

Where:

Thigher\_priority\_search See clause 4.2.2.7

Tevaluate, NR\_ inter See Table 4.2C.2.4-1 in clause 4.2C.2.4

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

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority E-UTRAN cell.

End of Change 15

Start of Change 16 <R4-2410413>

#### A.14.2.X1 Intra-frequency SAN time-based conditional Handover without L3 measurement criteria from FR1 to FR1

##### A.14.2.X1.1 Test Purpose and Environment

This test is to verify the requirement for intra-frequency SAN time-based conditional handover without L3 measurement criteria from FR1 to FR1 specified in clause 6.1C.2.3.

##### A.14.2.X1.2 Test Parameters

The test scenario comprises of 1 NR FDD carrier and 2 cells as given in table A.14.2.X1.2-1, and A.14.2.X1.2-2. Both handover delay and interruption length are tested.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, the UE is configured to measure intra-frequency neighbour cell. The RRC message implying time-based handover to cell 2 with Event CondEvent T1 shall be sent to UE, at a time earlier than TRRC (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and time condition event t1-Threshold-r17 is fulfilled.

Table A.14.2.X1.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |

Table A.14.2.X1.2-2: General test parameters for Intra-frequency SAN time-based conditional handover without L3 measurement criteria from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1 | One NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 | FDD duplex mode cell |
|  | Neighbouring cell |  | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| t1-Threshold-r17.condEventT1-r17 | | s | T2 | Entering condition |
| duration-r17.condEventT1-r17 | | slot | 1000 | Give 1s search duration |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤ 2 |  |

Table A.14.2.X1.2-3: Cell specific test parameters for Intra-frequency SAN time-based conditional handover without L3 measurement criteria from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1 |  | 1 | | 1 | |
| BWchannel | |  | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| BWP BW | |  | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| TACommon | | Config 1 | s | 0 | | 0 | |
| TACommonDrift | |  | s | 0 | | 0 | |
| TACommonDriftVariation | |  | s | 0 | | 0 | |
| Koffset | | Config 1 | ms | [4] | | [4] | |
| Kmac | | Config 1 | ms | 0 | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1 |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1 | dBm/ 15kHz | -98 | | | |
| Note2 | | dBm/ SCS | -98 | | | |
|  | | dB | 8 | -3.3 | -Infinity | 2.36 |
|  | | dB | 8 | 8 | -Infinity | 11 |
| SSB\_RP | | dBm/ SCS | -90 | -90 | -Infinity | -87 |
| IoNote3 | | dBm/ 9.36MHz | -61.41 | -57.06 | -61.41 | -57.06 |
| Propagation condition | | - | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

##### A.14.2.X1.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 92 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 is defined in clause 6.1C.2.3, can be expressed as:

DCHO = TRRC + TEvent\_DU + Tinterrupt + TCHO\_execution

where:

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

TEvent\_DU = start of T2

Tinterrupt = 82ms; TCHO\_execution = 10ms.

This gives a total of 92 ms.

#### A.14.2.X2 Inter-frequency SAN time-based conditional Handover without L3 measurement criteria from FR1 to FR1

##### A.14.2.X2.1 Test Purpose and Environment

This test is to verify the requirement for inter -frequency SAN time-based conditional handover without L3 measurement criteria from FR1 to FR1 specified in clause 6.1C.2.

##### A.14.2.X2.2 Test Parameters

The test scenario comprises of 2 NR FDD carrier and one cell on each carrier as given in table A.14.2.X2.2-1, and A.14.2.X2.2-2. Both handover delay and interruption length are tested.

The test consists of two successive time periods, with time durations of T1 and T2 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. During T1, the UE is configured to measure inter-frequency neighbour cell and Gap pattern ID gp0. The RRC message implying time-based handover to cell 2 with Event CondEvent T1 shall be sent to UE, at a time earlier than TRRC (10ms) before the beginning of T2.

Starting T2, cell 2 becomes detectable and time condition event t1-Threshold-r17 is fulfilled.

Table A.14.2.X2.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NGSO, NR FDD, 15kHz SSB SCS, 10 MHz BW |

Table A.14.2.X2.2-2: General test parameters for Inter-frequency SAN time-based conditional handover from FR1 to FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | |  | 1, 2 | Two NR NTN satellite RF channel |
| Initial conditions | Active cell |  | Cell 1 | FDD duplex mode cell |
|  | Neighbouring cell |  | Cell 2 | FDD duplex mode cell |
| Final condition | Active cell |  | Cell 2 |  |
| Satellite configuration | Config 1 |  | RMC in [A.x] | For NGSO satellite configuration |
| UE position (N,S, H) | |  | [(0, 0, 0)] | Set by AT command |
| t1-Threshold-r17.condEventT1-r17 | | s | T2 | Entering condition |
| duration-r17.condEventT1-r17 | | slot | 1000 | Give 1s search duration |
| Access Barring Information | | - | Not Sent | No additional delays in random access procedure. |
| Time offset between cells | |  | 3 μs | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤ 2 |  |

Table A.14.2.X2.2-3: Cell specific test parameters for Inter-frequency SAN time-based conditional handover from FR1 to FR1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Test configuration | Unit | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| NR RF Channel Number | | Config 1 |  | 1 | | 2 | |
| BWchannel | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| BWP BW | | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| TACommon | | Config 1 | s | 0 | | 0 | |
| TACommonDrift | | s | 0 | | 0 | |
| TACommonDriftVariation | | s | 0 | | 0 | |
| Koffset | | Config 1 | ms | [4] | | [4] | |
| Kmac | | Config 1 | ms | 0 | | 0 | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | |  | CR.1.1 FDD | | | |
| TRS configuration | |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP | Config 1 |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | Config 1 | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | Config 1 | dBm/ 15kHz | -98 | | | |
| Note2 | | dBm/ SCS | -98 | | | |
|  | | dB | 4 | 4 | -Infinity | 9 |
|  | | dB | 4 | 4 | -Infinity | 9 |
| SSB\_RP | | dBm/ SCS | -94 | -94 | -Infinity | -89 |
| IoNote3 | | dBm/ 9.36MHz | -64.59 | -64.59 | -70.05 | -60.53 |
| Propagation condition | | - | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | |

##### A.14.2.X2.3 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 is defined in clause 6.1C.2.3, can be expressed as:

DCHO = TRRC + TEvent\_DU + Tinterrupt + TCHO\_execution

where:

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

TEvent\_DU = start of T2

Tinterrupt = 122ms; TCHO\_execution = 10ms.

This gives a total of 132 ms.

End of Change 16

Start of Change 17 <R4-2410415>

# A.14.1.X Cell re-selection to FR1 inter-frequency NR case with TN carrier

## A.14.1.X.1Test purpose and Environment

This test is to verify the requirement for the inter frequency NR NTN to TN cell re-selection requirements specified in clause 4.2C.3.1.

## A.14.1.X.2Test parameters

The test scenario comprises of 2 cells on 2 different NR carriers, including NR NTN cell/carrier and NR TN cell/carrier respectively as given in tables A.14.1.X.2-1, A.14.1.X.2-2 and A.14.1.X.3-3. The test consists of three successive time periods, with time duration of T1, T2, and T3 respectively. Both cell 1 and cell 2 are already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas and cell 2 is of higher priority than cell 1.

Table A.14.1.X.2-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |

TableA.14.1.X.2-2: General test parameters for inter frequency NR cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
|  | |  |
| Initial condition | Active cell |  | 1 | Cell1 |  |
| T2 end condition | Active cell |  | 1 | Cell2 |  |
|  | Neighbour cells |  | 1 | Cell1 |  |
| Final condition | Active cell |  | 1 | Cell1 |  |
|  | Neighbour cells |  | 1 | Cell2 |  |
| RF Channel Number | |  | 1 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
| Access Barring Information | | - | 1 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.6 | Configured in SIB4 for cell1 and cell 2 |
| DRX cycle length | | s | 1 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index | |  | 1 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1 | Not configured |  |
| Ephemeris information | |  | 1 | [TBD] | The detailed configuration is specified in SIB19 |
| T1 | | s | 1 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 1 | 40 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |
| T3 | | s | 1 | 15 | T3 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.14.1.X.3-3: Cell specific test parameters for inter frequency NR cell re-selection test case

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|  |  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| Satellite information |  | 1 | SSC.1 for GSO test  SSC.2 for NGSO test | | | SSC.1 for GSO test  SSC.2 for NGSO test | | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | | SR.1.1 FDD | | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | | CR.1.1 FDD | | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | | CCR.1.1 FDD | | |
| OCNG Pattern |  | 1 | OP.1 defined in A.3.2.1 | | | OP.1 defined in A.3.2.1 | | |
| Initial DL BWP configuration |  | 1 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1 | SSB | | | SSB | | |
| Qrxlevmin | dBm/SCS | 1 | -130 | | | -130 | | |
| Pcompensation | dB | 1 | 0 | | | 0 | | |
| Qhysts | dB | 1 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1 | SS-RSRP | | | SS-RSRP | | |
|  | dB | 1 | 16 | -3.11 | 2.79 | -infinity | 2.79 | -3.11 |
| Note2 | dBm/SCS | 1 | -98 | | | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | | | |
|  | dB | 1 | 16 | 13 | 16 | -infinity | 16 | 13 |
| SS-RSRP Note3 | dBm/SCS | 1 | -82 | -85 | -82 | -infinity | -82 | -85 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -52.21 | -52.21 | Same as parameters specified in Cell 1 columns- | | |
| Treselection | s | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintersearchP | dB | 1 | 60 | | | 60 | | |
| Propagation Condition |  | 1 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

## A.14.1.X.3 Test requirements

The cell reselection delay to a higher priority cell is defined as the time from the beginning of time period T3, to the moment when the UE camps again 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 higher priority cell shall be less than 68 s.

The cell reselection delay to a lower priority cell is defined as the time from the beginning of time period T1, 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 a lower priority cell shall be less than 8 s.

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

NOTE: The cell re-selection delay to a higher priority cell can be expressed as: Thigher\_priority\_search + Tevaluate, NR\_ inter + TSI-NR, and to a lower priority cell can be expressed as: Tevaluate, NR\_ inter + TSI-NR,

Where:

Thigher\_priority\_search See clause 4.2.2.7

Tevaluate, NR\_ inter See Table 4.2C.2.4-1 in clause 4.2C.2.4

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

This gives a total of 67.68 s, allow 68 s for the cell re-selection delay to a higher priority

End of Change 17