3GPP TSG-RAN WG4 Meeting # 104-e R4-22xxxxx

Electronic Meeting, August 15 – August 26, 2022

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Big CR for 38.133 maintenance part2 (Rel-16) | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | MCC, Apple | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories 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:*** | | The changes in the following endorsed draft CRs are captured in the spec,  R4-2211932  R4-2212085  R4-2212256  R4-2212938  R4-2212944  R4-2212946  R4-2213470  R4-2213472  R4-2213502  R4-2213504  R4-2213932  R4-2214665  R4-2214666  R4-2214687  R4-2214689  R4-2214693  R4-2214706  R4-2214707  R4-2214718  R4-2214722 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The Spec is not complete | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The Spec is not complete | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | Section 8.3A.2, 8.12.2, 9.1.5.1.2, 9.3.9.1, 9.3.9.3, 9.9.4, 10.1.23.2, 10.1.24, 10.1.25, 10.1.25.2, 10.1.28.1, 10.1.28.2, 10.1.28.3, 12.3, 12.4, A.3.24, A.4.6.9, A.5.7.6.1, A.5.7.6.2, A.5.7.6.3, A.6.3.1.7, A.6.3.1.8, A.6.3.1.9, A.6.3.1.10, A.6.3.1.11, A.6.3.1.12, A.6.5.5.6, A.6.6.11, A.6.6.12, A.6.6.13, A.6.6.14, A.6.7.13, A.6.7.14, A.6.7.15, A.7.3.1.4, A.7.3.1.5, A.7.6.9, A.7.6.10, A.7.6.11, A.7.7.10, A.7.7.11, A.7.7.12, A.9.1.2.2, A.9.1.3.1, A.9.1.3.2, A.9.1.4.1, A.9.1.4.2, A.9.1.4.3, A.9.1.5, A.9.1.6.1, A.10.3.3.2, A.11.4.3.2, A.11.4.3.2, A.13.3.1.1.2, A.13.3.1.2.2, A.13.3.1.3.2, A.13.3.1.4.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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

9.3.9.1 Inter frequency Cell identification

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_without\_index if UE is not indicated to report SSB based RRM measurement result with the associated SSB index (*reportQuantityRsIndexes* or *maxNrofRSIndexesToReport* is not configured). Otherwise UE shall be able to identify a new detectable inter frequency cell within Tidentify\_inter\_with\_index. The UE shall be able to identify a new detectable inter frequency SS block of an already detected cell within Tidentify\_inter\_without\_index. It is assumed that when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2, the following condition is met:

- SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned

Tidentify\_inter\_without\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter) ms

Tidentify\_inter\_with\_index = (TPSS/SSS\_sync\_inter + T SSB\_measurement\_period\_inter + TSSB\_time\_index\_inter) ms

Where:

TPSS/SSS\_sync\_inter: it is the time period used in PSS/SSS detection given in table 9.3.9.1-1 and table 9.3.9.1-2.

TSSB\_time\_index\_inter: it is the time period used to acquire the index of the SSB being measured given in table 9.3.9.1-3.

T SSB\_measurement\_period\_inter: equal to a measurement period of SSB based measurement given in table 9.3.9.2-1 and table 9.3.9.2-2.

CSSFinter: it is a carrier specific scaling factor and is determined according to CSSFoutside\_gap,i in clause 9.1.5.1 for measurement conducted outside measurement gaps, i.e. when interfrequency SMTC is fully non overlapping or partially overlapping with measurement gaps or according to CSSFwithin\_gap,i in clause 9.1.5.2 for measurement conducted within measurement gaps, i.e. when interfrequency SMTC is fully overlapping with measurement gaps.

Mpss/sss\_sync\_inter: For a UE supporting FR2 power class 1, Mpss/sss\_sync\_inter = 40 samples. For a UE supporting FR2 power class 2, Mpss/sss\_sync\_inter = 24 samples. For a UE supporting FR2 power class 3, Mpss/sss\_sync\_inter = 24 samples. For a UE supporting FR2 power class 4, Mpss/sss\_sync = 24 samples.

Mmeas\_period\_inter: For a UE supporting FR2 power class 1, Mmeas\_period\_inter =40 samples. For a vehicle mounted UE supporting FR2 power class 2, Mmeas\_period\_inter =24 samples. For a UE supporting FR2 power class 3, Mmeas\_period\_inter =24 samples. For a UE supporting FR2 power class 4, Mmeas\_period\_inter = 24 samples.

When interfrequency SMTC is fully non overlapping with measurement gaps or interfrequency SMTC is fully overlapping with MGs, Kp=1.

When interfrequency SMTC is partially overlapping with measurement gaps, Kp = 1/(1- (SMTC period /MGRP)), where SMTC period < MGRP.

For FR2,

Klayer1\_measurement=1,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or

- if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting on any FR2 serving frequency in the same band outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that *SSB-ToMeasure* and *SS-RSSI-Measurement* are configured, where SSB symbols are indicated by *SSB-ToMeasure* and RSSI symbols are indicated by *SS-RSSI-Measurement*;

Klayer1\_measurement=1.5, otherwise.

If the above-mentioned reference signal configured for L1-RSRP measurement is aperiodic CSI-RS resource, longer cell identification delay would be expected.

Table 9.3.9.1-1: Time period for PSS/SSS detection, (FR1)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max( 600ms, ceil( 5 x Kp) x SMTC period )Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max( 600ms, ceil(1.5x 5 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil(5 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

Table 9.3.9.1-2: Time period for PSS/SSS detection, (FR2)

|  |  |
| --- | --- |
| DRX cycle | TPSS/SSS\_sync\_inter |
| No DRX | max(600ms, ceil(Mpss/sss\_sync\_inter x Kp x Klayer1\_measurement)x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(600ms, ceil(1.5 x Mpss/sss\_sync\_inter x Kp x Klayer1\_measurement)x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | ceil(Mpss/sss\_sync\_inter x Kp x Klayer1\_measurement) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

Table 9.3.9.1-3: Time period for time index detection (FR1)

|  |  |
| --- | --- |
| DRX cycle | TSSB\_time\_index\_inter |
| No DRX | max(120ms, ceil( 3 x Kp )x SMTC period)Note 1 x CSSFinter |
| DRX cycle≤ 320ms | max(120ms, ceil (1.5 x 3 x Kp) x max(SMTC period,DRX cycle)) x CSSFinter |
| DRX cycle>320ms | Ceil(3 x Kp) x DRX cycle x CSSFinter |
| NOTE 1: If different SMTC periodicities are configured for different cells, the SMTC period in the requirement is the one used by the cell being identified | |

End of Change 1

Start of Change 2

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

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

##### A.4.6.9.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the EN-DC inter-frequency NR cell measurement requirements in clause 9.10.3.

In this test, there are three cells: LTE cell 1 as PCell on E-UTRA RF channel 1, NR cell 2 as PSCell in FR1 on NR RF channel 1 and NR cell 3 as neighbour cell in FR1 on NR RF channel 2. The test parameters and configurations are given in Tables A.4.6.9.1.1-1, A.4.6.9.1.1-2, and A.4.6.9.1.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.4.6.9.1.1-2 is provided for a UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.4.6.2.2.1-2 is provided for UE that support per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

In the measurement control information, it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of NR cell 3.

The configuration of LTE cell 1 is defined in table A.3.7.2.1-1. Supported test configurations are shown in table A.4.6.9.1.1-1.

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

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

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test** | **Value** | | **Comment** |
|  |  | **configuration** | **Test 1** | **Test 2** |  |
| E-UTRA RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | One E-UTRAN TDD carrier frequencies is used. |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1, 2 | | Two FR1 NR carrier frequencies are used. |
| Active cell |  | Config 1,2,3,4,5,6 | LTE Cell 1 (PCell) and NR cell 2 (PScell) | | LTE Cell 1 is on E-UTRA RF channel number 1.  NR Cell 2 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3,4,5,6 | NR cell 3 | | NR cell 3 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3,4,5,6 | 0 | 4 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3,4,5,6 | 39 | 19 |  |
| A3-Offset | dB | Config 1,2,3,4,5,6 | -6 | |  |
| Hysteresis | dB | Config 1,2,3,4,5,6 | 0 | |  |
| CP length |  | Config 1,2,3,4,5,6 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3,4,5,6 | 0 | |  |
| Filter coefficient |  | Config 1,2,3,4,5,6 | 0 | | L3 filtering is not used |
| DRX | ms | Config 1,2,3,4,5,6 | OFF | | DRX is not used |
| Time offset between PCell and PSCell | μs | Config 1,2,3,4,5,6 | 3 | | Synchronous EN-DC |
| Time offset between serving and neighbour cells | μs | Config 1,4 | 4.7 | | Asynchronous cells.  The timing of Cell 3 is CP later than the timing of Cell 2. |
| Config 2,5 | 4.7 | | Synchronous EN-DC |
| Config 3,6 | 2.35 | | Synchronous EN-DC |
| T1 | s | Config 1,2,3,4,5,6 | 5 | |  |
| T2 | s | Config 1,2,3,4,5,6 | 1.1 | 1.1 |  |

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

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test** | **Cell 2** | | **Cell 3** | |
|  |  | **configuration** | **T1** | **T2** | **T1** | **T2** |
| NR RF Channel Number |  | Config 1,2,3,4,5,6 | 1 | | 2 | |
| Duplex mode |  | Config 1,4 | FDD | | | |
|  |  | Config 2,3,5,6 | TDD | | | |
| BWchannel | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
|  |  | Config 2,5 | 10: NRB,c = 52 | | | |
|  |  | Config 3,6 | 40: NRB,c = 106 | | | |
| BWP BW | MHz | Config 1,4 | 10: NRB,c = 52 | | | |
|  |  | Config 2,5 | 10: NRB,c = 52 | | | |
|  |  | Config 3,6 | 40: NRB,c = 106 | | | |
| TDD configuration |  | Config 2,5 | TDDConf.1.1 | | | |
|  |  | Config 3,6 | TDDConf.2.1 | | | |
| Initial DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | Config 1,2,3,4,5,6 | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | Config 1,2,3,4,5,6 | ULBWP.1.1 | | NA | |
| TRS configuration |  | Config 1,4 | TRS.1.1 FDD | | NA | |
|  |  | Config 2,5 | TRS.1.1 TDD | | NA | |
|  |  | Config 3,6 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) |  | Config 1,2,3,4,5,6 | OP.1 | | OP.1 | |
| PDSCH Reference |  | Config 1,4 | SR.1.1 FDD | | - | |
| measurement channel |  | Config 2,5 | SR.1.1 TDD | |  | |
|  |  | Config 3,6 | SR.2.1 TDD | |  | |
| CORESET Reference |  | Config 1,4 | CR.1.1 FDD | | - | |
| Channel |  | Config 2,5 | CR.1.1 TDD | |  | |
|  |  | Config 3,6 | CR.2.1 TDD | |  | |
| SSB parameters |  | Config 1,4 | SSB.1 FR1 | | SSB.5 FR1 | |
|  |  | Config 2,5 | SSB.1 FR1 | | SSB.5 FR1 | |
|  |  | Config 3,6 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration |  | Config 1,4 | SMTC.2 | | | |
|  | Config 2,3,5,6 | SMTC.1 | | | |
| CSI-RS configuration for RRM |  | Config 1,4 | CSI-RS.RRM.FR1.1 FDD | | | |
|  | Config 2,5 | CSI-RS.RRM.FR1.1 TDD | | | |
| Config 3,6 | CSI-RS.RRM.FR1.2 TDD | | | |
| PDSCH/PDCCH subcarrier spacing | kHz | Config 1,2,4,5 | 15 | | | |
|  |  | Config 3,6 | 30 | | | |
| EPRE ratio of PSS to SSS |  |  |  | |  | |
| 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 |  | Config 1,2,3,4,5,6 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  | |  | |
| Note2 | dBm/15kHz |  | -98 | | -98 | |
| Note2 | dBm/SCS | Config 1,2,4,5 | -98 | | -98 | |
|  |  | Config 3,6 | -95 | | -95 | |
| SS-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
|  |  | Config 3,6 | -91 | -91 | -Infinity | -88 |
| CSI-RSRP Note 3 | dBm/SCS | Config 1,2,4,5 | -94 | -94 | -Infinity | -91 |
|  |  | Config 3,6 | -91 | -91 | -Infinity | -88 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
|  | dB | Config 1,2,3,4,5,6 | 4 | 4 | -Infinity | 7 |
| IoNote3 | dBm/9.36MHz | Config 1,2,4,5 | -64.59 | -64.59 | -70.05 | -62.26 |
|  | dBm/38.16MHz | Config 3,6 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition |  | Config 1,2,3,4,5,6 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP, CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | |

##### A.4.6.9.1.2 Test Requirements

In test 1 with per-UE gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 1040 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 920 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

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

End of Change 2

Start of Change 3

### A.6.6.11 CSI-RS based inter-frequency Measurements

#### A.6.6.11.1 SA event triggered reporting tests with gap under DRX

##### A.6.6.11.1.1 Test Purpose and Environment

The purpose of this test is to verify that the UE makes correct reporting of an event. This test will partly verify the SA CSI-RS based L3 inter-frequency measurement requirements in clause 9.10.3.

In this test, there are two cells: NR cell 1 as PCell in FR1 on NR RF channel 1 and NR cell 2 as neighbour cell in FR1 on NR RF channel 2. The test parameters are given in Tables A.6.6.11.1.1-1, A.6.6.11.1.1-2 and A.6.6.11.1.1-3.

In test 1&2 measurement gap pattern configuration # 0 as defined in Table A.6.6.11.1.1-2 is provided for UE that does not support per-FR gap and in test 3&4 measurement gap pattern configuration #4 as defined in Table A.6.6.11.1.1-2 is provided for UE that supports per-FR gap. If a UE supports per-FR gap and gap pattern configuration #4, it is only required to pass test 3&4. Otherwise it is only required to pass test 1&2.

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

UE needs to be provided at least once every 500 ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furthermore, UE is allocated with PUSCH resource at every DRX cycle.

Table A.6.6.11.1.1-1: SA event triggered reporting tests for FR1-FR1

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

Table A.6.6.11.1.1-2: General test parameters for SA inter-frequency event triggered reporting for FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | **Comment** |
| **Test 1** | **Test 2** |
| NR RF Channel Number |  | Config 1,2,3 | 1, 2 | | Two FR1 NR carrier frequencies is used. |
| Active cell |  | Config 1,2,3 | NR cell 1 (Pcell) | | NR Cell 1 is on NR RF channel number 1. |
| Neighbour cell |  | Config 1,2,3 | NR cell2 | | NR cell 2 is on NR RF channel number 2. |
| Gap Pattern Id |  | Config 1,2,3 | 0 | 4 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1,2,3 | 39 | 19 |  |
| A3-Offset | dB | Config 1,2,3 | -6 | |  |
| Hysteresis | dB | Config 1,2,3 | 0 | |  |
| CP length |  | Config 1,2,3 | Normal | |  |
| TimeToTrigger | s | Config 1,2,3 | 0 | |  |
| Filter coefficient |  | Config 1,2,3 | 0 | | L3 filtering is not used |
| DRX |  | Config 1,2,3 | DRX.5 | DRX.5 | As specified in clause A.3.3 |
| Time offset between serving and neighbour cells | μs | Config 1 | 4.7 | | Asynchronous cells.  The timing of Cell 2 is CP later than the timing of Cell 1. |
| Config 2 | 4.7 | | Synchronous cells. |
| Config 3 | 2.35 | | Synchronous cells. |
| T1 | s | Config 1,2,3 | 5 | |  |
| T2 | s | Config 1,2,3 | 10 | 10 |  |

Table A.6.6.11.1.1-3: Cell specific test parameters for SA inter-frequency event triggered reporting for FR1 with SSB time index detection

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| NR RF Channel Number | |  | Config 1,2,3 | 1 | | 2 | |
| Duplex mode | |  | Config 1 | FDD | | | |
|  | Config 2,3 | TDD | | | |
| TDD configuration | |  | Config 1 | Not Applicable | | | |
|  | Config 2 | TDDConf.1.1 | | | |
|  | Config 3 | TDDConf.2.1 | | | |
| BWchannel | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| Config 3 | 40: NRB,c = 106 | | | |
| BWP BW | | MHz | Config 1,2 | 10: NRB,c = 52 | | | |
| Config 3 | 40: NRB,c = 106 | | | |
| BWP configuration | Initial DL BWP |  | Config 1, 2, 3 | DLBWP.0.1 | | NA | |
| Initial UL BWP |  | ULBWP.0.1 | | NA | |
| Dedicated DL BWP |  | DLBWP.1.1 | | NA | |
| Dedicated UL BWP |  | ULBWP.1.1 | | NA | |
| TRS configuration | |  | Config 1 | TRS.1.1 FDD | | NA | |
| Config 2 | TRS.1.1 TDD | | NA | |
| Config 3 | TRS.1.2 TDD | | NA | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1,2,3 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.1.1 FDD | |  | |
|  | Config 2 | SR.1.1 TDD | |
|  | Config 3 | SR2.1 TDD | |
| CORESET Reference Channel | |  | Config 1 | CR.1.1 FDD | | - | |
|  | Config 2 | CR.1.1 TDD | |
|  | Config 3 | CR2.1 TDD | |
| SSB parameters | |  | Config 1 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 2 | SSB.1 FR1 | | SSB.5 FR1 | |
|  | Config 3 | SSB.2 FR1 | | SSB.6 FR1 | |
| SMTC configuration defined in A.3.11 | |  | Config 1 | SMTC.2 | | SMTC.5 | |
|  | Config 2, 3 | SMTC.1 | | SMTC.4 | |
| CSI-RS configuration for RRM | |  | Config 1 | CSI-RS.RRM.FR1.1 FDD | | CSI-RS.RRM.FR1.1 FDD | |
| Config 2 | CSI-RS.RRM.FR1.1 TDD | | CSI-RS.RRM.FR1.1 TDD | |
| Config 3 | CSI-RS.RRM.FR1.2 TDD | | CSI-RS.RRM.FR1.2 TDD | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1,2 | 15 | | | |
| Config 3 | 30 | | | |
| EPRE ratio of PSS to SSS | |  | Config 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) | |  |
| Note2 | | dBm/15kHz |  | -98 | | -98 | |
| Note2 | | dBm/SCS | Config 1,2 | -98 | | -98 | |
| Config 3 | -95 | | -95 | |
| CSI-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| Config 3 | -91 | -91 | -Infinity | -88 |
| SS-RSRP Note 3 | | dBm/SCS | Config 1,2 | -94 | -94 | -Infinity | -91 |
| Config 3 | -91 | -91 | -Infinity | -88 |
|  | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
|  | | dB | Config 1,2,3 | 4 | 4 | -Infinity | 7 |
| IoNote3 | | dBm/9.36MHz | Config 1,2 | -64.59 | -64.59 | -70.05 | -62.26 |
| dBm/38.16MHz | Config 3 | -58.49 | -58.49 | -63.94 | -56.15 |
| Propagation Condition | |  | Config 1,2,3 | 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: CSI-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: CSI-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

##### A.6.6.11.1.2 Test Requirements

In test 1 with per-UE gap and test 2 with per-FR gap, the UE shall send one Event A3 triggered measurement report, with a measurement reporting delay less than 9280 ms from the beginning of time period T2. The UE shall not send event triggered measurement reports, as long as the reporting criteria are not fulfilled. The rate of correct events observed during repeated tests shall be at least 90%.

In test 1 and 2 UE is required to report SSB time index.

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

End of Change 3

Start of Change 4

### 8.12.2 Known conditions for spatial relation when associated with DL-RS

The spatial relation associated to DL RS is known if the following conditions are met:

- During the period from the last transmission of the DL RS resource used for the L1-RSRP measurement reporting for the target spatial relation to the completion of active spatial relation switch, where the DL RS resource for L1-RSRP measurement is the DL RS in target spatial relation or QCLed to the target spatial relation with QCL type-D.

- Spatial relation switch command is received within 1280 ms upon the last transmission of the DL RS resource for beam reporting or measurement

- The UE has sent at least 1 L1-RSRP report for the target spatial relation before the spatial relation switch command

- The DL RS configured in spatial relation remains detectable during the spatial relation switching period

- SNR of the DL RS configured in spatial relation ≥ -3dB

- The SSB associated with the spatial relation remain detectable during the spatial relation switching period

- SNR of the SSB associated with the spatial relation ≥ -3dB

Otherwise, the spatial relation is unknown.

End of Change 4

Start of Change 5

#### 12.3.1.4 Initiation/Cease of SLSS transmissions with SyncRef UE as synchronization reference source

The requirements apply when SyncRef UE is used as synchronization reference source and when the UE is

* in any cell selection state, or
* out of coverage on the V2X sidelink carrier and is associated with a serving cell on a non-V2X sidelink carrier,

and when the conditions for SLSS transmissions specified in TS 38.331[2] are met and when SyncRef UE is used as synchronization reference source and if *syncTxThreshOoC* is included in the preconfigured V2X parameters.

The UE shall be capable of measuring the PSBCH-RSRP of the selected SyncRef UE used as synchronization reference source and evaluate it to initiate/cease SLSS transmissions within Tevaluate,SLSS = 4 S-SSB periods.

If higher layer filtering for PSBCH-RSRP measurements is pre-configured, an additional delay in evaluation to initiate/cease SLSS transmissions can be expected.

For the selected SyncRef UE as defined in TS 38.331 [2] used to derive transmission timing for V2X sidelink communication:

- PSBCH-RSRP related side conditions given in Clause 12.4 for a corresponding Band are fulfilled,

- S-SSB\_RP and S-SSB Ês/Iot according to Annex B.4.3 for a corresponding Band are fulfilled.

End of Change 5

Start of Change 6

## 12.4 Selection / Reselection of V2X Synchronization Reference Source

The requirements defined in this clause do not apply to the UEs that do not support transmission and reception of SLSS.

A SyncRef UE is considered to be detectable when

- PSBCH-RSRP related side conditions given in Clause 10 are fulfilled for a corresponding Band,

- S-SSB\_RP and S-SSB Ês/Iot according to Annex B.4.3 for a corresponding Band are fulfilled.

When GNSS synchronization reference source is configured as the highest priority and

- UE is synchronized to GNSS directly,

- UE shall not drop any V2X SLSS and data transmission for the purpose of selection/reselection to the SyncRef UE.

- UE is synchronized to a SyncRef UE that is synchronized to GNSS directly or in-directly,

- UE shall not drop any V2X data transmission for the purpose of selection/reselection to the SyncRef UE. The UE shall be able to identify newly detectable intra-frequency SyncRef UE within Tdetect,SyncRef UE\_V2X seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331[2]. Tdetect,SyncRef UE\_V2X is defined as 1.6 seconds at S-SSB Ês/Iot ≥ 0 dB, provided that the UE is allowed to drop a maximum of 30% of its SLSS transmissions during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE.

- in other case

- The UE shall be able to identify newly detectable intra-frequency SyncRef UE within Tdetect,SyncRef UE\_V2X seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331[2]. Tdetect,SyncRef UE\_V2X is defined as 8 seconds at S-SSB Ês/Iot ≥ 0 dB, provided that the UE is allowed to drop a maximum of 6 % of its V2X data and SLSS transmissions during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE.

- UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its V2X data reception during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE.

When serving cell/PCell synchronization reference source is configured as the highest priority,

- UE shall be able to identify newly detectable intra-frequency SyncRef UE within Tdetect,SyncRef UE\_V2X seconds if the SyncRef UE meets the selection / reselection criterion defined in TS 38.331[2]. Tdetect,SyncRef UE\_V2X is defined as 8 seconds at S-SSB Ês/Iot ≥ 0 dB, provided that the V2X UE is allowed to drop a maximum of 6 % of its V2X data and SLSS transmissions for the purpose of selection / reselection to the SyncRef UE.

- UE is allowed to drop up to 2 slots of its V2X data reception per PSBCH monitoring occasion and overall drop rate shall not exceed 0.3% of its V2X data reception during Tdetect,SyncRef UE\_V2X for the purpose of selection / reselection to the SyncRef UE.

UE shall be capable of performing PSBCH-RSRP measurements for 3 identified intra-frequency SyncRef UEs with the measurement period of 320 ms. It is assumed that the SyncRef UE do not drop or delay any SLSS transmission within the measurement period. Otherwise, the measurement period may be extended.

When UE is synchronized to GNSS directly, before selection / reselection of the new synchronization reference source UE shall evaluate the GNSS synchronization source reliability for at least 20 seconds before changing the synchronization reference from GNSS to another synchronization reference source. UE shall be always synchronized to GNSS directly during the evaluation of GNSS synchronization source reliability.

End of Change 6

Start of Change 7

### 8.3A.2 SCell Activation Delay Requirement for Deactivated SCell

The requirements in this clause shall apply for the UE configured with one downlink SCell operating with CCA in EN-DC or in standalone NR carrier aggregation and when one SCell operating with CCA is being activated but none of the RRC parameters *CO-DurationPerCell-r16*, *SlotFormatIndicator*, and *CSI-RS-ValidationWith-DCI-r16* is configured and all of the CSI reporting resources for being-activated SCell are available.

The delay within which the UE shall be able to activate the deactivated SCell depends upon the specified conditions.

Upon receiving SCell activation command in slot *n*, the UE shall be capable to transmit valid CSI report and apply actions related to the activation command for the SCell being activated no later than in slot n + (THARQ + Tactivation\_time\_withCCA + TCSI\_reporting\_withCCA)/*NR\_slot\_length*, where:

- THARQ (in ms) is the timing between DL data transmission and acknowledgement as specified in TS 38.213 [3]. In the event of UE not being able to transmit the acknowledgment due to UL CCA failures: THARQ is extended to also include the time to all next HARQ feedback transmission and retransmission opportunities, until the time of its successful transmission, as specified in TS 38.213 [3]; no extension of THARQ due to UL CCA failures is allowed for Type 2C UL channel access procedure as defined in TS 37.213 [57].

- Tactivation\_time\_withCCA is the SCell activation delay in millisecond.

- If the SCell is known, Tactivation\_time\_withCCA is:

- TFirstSSB + L1\*Trs + 5ms, if the measurement period of the SCell being activated is equal to or smaller than 2400ms.

- TFirstSSB\_MAX + L2,1\*TSMTC\_MAX + (1 +L2,2)\*Trs + 5ms, if the measurement period of the SCell being activated is larger than 2400ms.

- If the SCell is unknown, provided that the side condition Ês/Iot ≥ -2 dB is fulfilled and the SCell can be successfully detected in one attempt, Tactivation\_time\_withCCA is:

- TFirstSSB\_MAX + (1 + L3,1)\*TSMTC\_MAX + (2 + L3,2)\*Trs + 5ms.

Where,

TSMTC\_MAX:

- In case of intra-band SCell activation, TSMTC\_MAX is the longest SMTC periodicity between active serving cells and SCell being activated provided the cell specific reference signals from the active serving cells and the SCells being activated or released are available in the same slot;

- In case of inter-band SCell activation, TSMTC\_MAX is the SMTC periodicity of SCell being activated;

- TSMTC\_MAX is bounded to a minimum value of 10ms.

End of Change 7

Start of Change 8

#### A.10.3.3.2 SCell Activation and Deactivation of known NR SCell with NR PSCell and NR SCell under CCA, 640 ms SCell measurement cycle

##### A.10.3.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for NR SCell, with NR PSCell and NR SCell both under CCA, are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 640 ms.

The supported test configurations are same as in Table A.10.3.3.1.1-1 above.

The test parameters are same as in Table A.10.3.3.1.1-2 above, except for parameters listed below in Table A.10.3.3.2.1-1. The cell-specific parameters are same as in Table A.10.3.3.1.1-3 above.

The test execution is the same as described in clause A.10.3.3.1 above.

Table A.10.3.3.2.1-1: General test parameters for known NR SCell activation with NR PSCell and SCell under CCA, 640 ms SCell measurement cycle

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

End of Change 8

Start of Change 9

#### A.11.4.3.2 SCell Activation and Deactivation of known SCell with PCell and SCell under CCA, 640 ms SCell measurement cycle

##### A.11.4.3.2.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for SCell, with PCell and SCell under CCA, are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 640 ms.

The supported test configurations are same as in Table A.11.4.3.1.1-1 above.

The test parameters are same as in Table A.11.4.3.1.1-2 above, except for parameters listed below in Table A.11.4.3.2.1-1. The cell-specific parameters are same as in Table A.11.4.3.1.1-3 above.

The test execution is the same as described in clause A.11.4.3.1 above.

Table A.11.4.3.2.1-1: General test parameters for known SCell activation with PCell and SCell under CCA, 640 ms SCell measurement cycle

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

End of Change 9

Start of Change 10

#### A.13.2.2.2 SCell Activation and Deactivation of known SCell under CCA, 640 ms SCell measurement cycle

##### A.13.2.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that SCell activation and deactivation delays for SCell on NR-U SCC with CCA are within the requirements stated in clause 8.3A, when the SCell is known by the UE at the time of activation and the configured SCell measurement cycle is 640 ms.

The supported test configurations are same as in Table A.13.2.2.1.1-1 above.

The test parameters are same as in Table A.13.2.2.1.1-2 above, except for parameters listed below in Table A.13.2.2.2.1-1. The cell-specific parameters are same as in Table A.13.2.2.1.1-3 above.

The test execution is the same as described in clause A.13.2.2.1 above, except that downlink CCA failures L2,1 and L2,2 with limits L2,1 ≤ L2,1,max and L2,2 ≤ L2,2,max replace L1 as described in clause 8.3A.2 for activation of known SCell with a measurement cycle larger than 160 ms.

Table A.13.2.2.2.1-1: General test parameters for known SCell activation with SCell under CCA, 640 ms SCell measurement cycle

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

End of Change 10

Start of Change 11

10.1.28.1 L1-SINR accuracy requirements with CSI-RS based CMR and no dedicated IMR configured

10.1.28.1.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources configured as CMR and no dedicated resource configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements in Table 10.1.28.1.1-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.

- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 10.1.28.1.1-1.

Table 10.1.28.1.1-1: L1-SINR absolute accuracy for CSI-RS based CMR only in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | CSI-RS  CMR  Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±5.5 | ±6.5 | ≥-3 | Same value as CSI-RS\_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 3: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

10.1.28.1.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS compared to the largest measured value of L1-SINR among all CSI-RS resources of the serving cell.

The accuracy requirements in Table 10.1.28.1.2-1 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.1 for a corresponding Band for each relevant CSI-RS based CMR.

- The bandwidth of CSI-RS as CMR is 48 PRBs and the density is 3.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

The performance with larger bandwidth of CSI-RS as CMR is equal to or better than the accuracy requirements in Table 10.1.28.1.2-1.

Table 10.1.28.1.2-1: L1-SINR relative accuracy for CSI-RS based CMR only in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | CSI-RS  CMR  Ês/Iot Note 2, Note 4 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 3 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±4.5 | ±5.5 | ≥-3 | Same value as CSI-RS\_RP in Table in B.2.8.1, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.  NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

10.1.28.2 L1-SINR accuracy requirements with SSB based CMR and dedicated IMR configured

10.1.28.2.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of SSB based L1-SINR in this clause apply to all SSBs configured as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 10.1.28.2.1-1 for SSB based CMR and NZP-IMR and in Table 10.1.28.2.1-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.28.2.1-1 and 10.1.28.2.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.

- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.28.2.1-1 and 10.1.28.2.1-2.

Table 10.1.28.2.1-1: L1-SINR absolute accuracy for SSB based CMR and NZP-IMR in FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB  CMR  Ês/Iot Note 3 | NZP-IMR  Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dB | dBm / SCSSSB Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 120kHz | SCSSSB = 240kHz |  |  |
| ±4.0 | ±5.0 | ≥0 | ≥0 | Same value as SSB\_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 3: In the test cases, the SSB Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | | |

Table 10.1.28.2.1-2: L1-SINR absolute accuracy for SSB based CMR and ZP-IMR in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | SSB  CMR  Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSSSB Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSSSB = 120kHz | SCSSSB = 240kHz |  |  |
| ±4.5 | ±5.5 | ≥-3 | Same value as SSB\_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 3: In the test cases, the SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

10.1.28.2.2 Relative Accuracy

The relative accuracy of SSB based L1-SINR is defined as the L1-SINR measured from one SSB configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all SSB based CMRs and IMRs of the serving cell.

The accuracy requirements are defined in Table 10.1.28.2.2-1 for SSB based CMR and NZP-IMR and in Table 10.1.28.2.2-2 for SSB based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.28.2.2-1 and 10.1.28.2.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.2 for a corresponding Band for each relevant SSB based CMR and IMR.

- The bandwidth of NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

- SSB based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.28.2.2-1 and 10.1.28.2.2-2.

Table 10.1.28.2.2-1: L1-SINR relative accuracy for SSB based CMR and NZP-IMR in FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | SSB  CMR  Ês/Iot Note 2, Note 4 | NZP-IMR  Ês/Iot Note 4 | Io Note 1 range | | | |
|  |  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dB | dBm / SCSSSB Note 3 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSSSB = 120kHz | SCSSSB = 240kHz |  |  |
| ±3.0 | ±4.0 | ≥0 | ≥0 | Same value as SSB\_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB CMR Ês/Iot is the minimum SSB CMR Ês/Iot of the pair of SSBs to which the requirement applies.  NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 4: In the test cases, the SSB CMR Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | | |

Table 10.1.28.2.2-2: L1-SINR relative accuracy for SSB based CMR and ZP-IMR in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | SSB  CMR  Ês/Iot Note 2, Note 4 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSSSB Note 3 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSSSB = 120kHz | SCSSSB = 240kHz |  |  |
| ±3.5 | ±4.5 | ≥-3 | Same value as SSB\_RP in Table in B.2.8.2, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter SSB CMR Ês/Iot is the minimum SSB CMR Ês/Iot of the pair of SSBs to which the requirement applies.  NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 4: In the test cases, the SSB CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

10.1.28.3 L1-SINR accuracy requirements with CSI-RS based CMR and dedicated IMR configured

10.1.28.3.1 Absolute Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RS based L1-SINR in this clause apply to all CSI-RS resources as CMR and dedicated resources configured as IMR of the serving cell configured for L1-SINR measurement.

The accuracy requirements are defined in Table 10.1.28.3.1-1 for CSI-RS based CMR and NZP-IMR and in Table 10.1.28.3.1-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.28.3.1-1 and 10.1.28.3.1-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.

- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.28.3.1-1 and 10.1.28.3.1-2.

Table 10.1.28.3.1-1: L1-SINR absolute accuracy for CSI-RS based CMR and NZP-IMR in FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | NZP-IMR  Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dB | dBm / SCSCSI-RS Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±4.0 | ±5.0 | ≥0 | ≥0 | Same value as CSI-RS\_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 3: In the test cases, the CSI-RS Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | | |

Table 10.1.28.3.1-2: L1-SINR absolute accuracy for CSI-RS based CMR and ZP-IMR in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 3 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 2 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±4.5 | ±5.5 | ≥-3 | Same value as CSI-RS\_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

10.1.28.3.2 Relative Accuracy

The relative accuracy of CSI-RS based L1-SINR is defined as the L1-SINR measured from one CSI-RS configured as CMR and one IMR configured as IMR compared to the largest measured value of L1-SINR among all CSI-RS based CMRs and IMRs of the serving cell.

The accuracy requirements are defined in Table 10.1.28.3.2-1 for CSI-RS based CMR and NZP-IMR and in Table 10.1.28.3.2-2 for CSI-RS based CMR and ZP-IMR.

The accuracy requirements in Tables 10.1.28.3.2-1 and 10.1.28.3.2-2 are valid under the following conditions:

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for L1-SINR measurements are fulfilled according to Annex B.2.8.3 for a corresponding Band for each relevant CSI-RS based CMR and IMR.

- The bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is 48 PRBs and the density is 3.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- AWGN radio propagation conditions.

- CSI-RS based CMR and IMR in the test come from the same direction.

The performance with larger bandwidth of CSI-RS as CMR, NZP-IMR and ZP-IMR is equal to or better than the accuracy requirements in Tables 10.1.28.3.2-1 and 10.1.28.3.2-2.

Table 10.1.28.3.2-1: L1-SINR relative accuracy for CSI-RS based CMR and NZP-IMR in FR2

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | |
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 2, Note 4 | NZP-IMR  Ês/Iot Note 4 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dB | dBm / SCSCSI-RS Note 3 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±3.0 | ±4.0 | ≥0 | ≥0 | Same value as CSI-RS\_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.  NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot, NZP-IMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | | |

Table 10.1.28.3.2-2: L1-SINR relative accuracy for CSI-RS based CMR and ZP-IMR in FR2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | |
| Normal condition | Extreme condition | CSI-RS CMR Ês/Iot Note 2, Note 4 | Io Note 1 range | | | |
|  |  | Minimum Io | | | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 3 | | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±3.5 | ±4.5 | ≥-3 | Same value as CSI-RS\_RP in Table in B.2.8.3, according to UE Power class, operating band and angle of arrival | | N/A | -50 |
| NOTE 1: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.  NOTE 2: The parameter CSI-RS CMR Ês/Iot is the minimum CSI-RS CMR Ês/Iot of the pair of CSI-RS resources to which the requirement applies.  NOTE 3: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.  NOTE 4: In the test cases, the CSI-RS CMR Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. | | | | | | |

End of Change 11

Start of Change 12

### A.5.7.6 L1-SINR measurement for beam reporting

A.5.7.6.1 L1-SINR measurement with CSI-RS based CMR and no dedicated IMR configured and CSI-RS resource set with repetition off

A.5.7.6.1.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.8.4.1 and clause 10.1.28.1 for FR2 L1-SINR measurements based on CSI-RS with the testing configurations for NR cells in Table A.5.7.6.1.1-1, which configures the measurement resources for the CSI-RS based CMR and no dedicated IMR.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.5.7.6.1.1-1: Applicable NR configurations for FR2 L1-SINR test with CSI-RS based CMR and no dedicated IMR configured

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

A.5.7.6.1.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR2 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.6.1.2-1 and Table A.5.7.6.1.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.1.2-1 and Table A.5.7.6.1.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB.

Table A.5.7.6.1.2-1: FR2 CSI-RS based L1-SINR general test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1~2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 |  | CCR.3.1 TDD |
| SSB configuration | 1~2 |  | SSB.1 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.1  ULBWP.1.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| CSI-RS | 1~2 |  | CSI-RS.3.2 TDD |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity-r16 | 1~2 |  | cri-SINR-r16 |
| nrofReportedRS | 1~2 |  | 2 |
| L1-SINR reporting period | 1~2 |  | slot640 |
| Propagation condition | 1~2 |  | AWGN |
| Antenna configuration | 1~2 |  | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | |

Table A.5.7.6.1.2-2: FR2 CSI-RS based L1-SINR OTA related test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | |
| CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | |
|  | 1~2 | dBm/15kHz | -100 | |
|  | 1~2 | dBm/SSB SCS | -91 | |
|  | 1~2 | dB | 10 | -2 |
| CSI-RS-RSRPNote1 | 1~2 | dBm/SCS | -81 | -93 |
| IoNote1 | 1~2 | dBm/  95.04MHz | -51.57 | -59.86 |
|  | 1~2 | dB | 10 | -2 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: Void.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

A.5.7.6.1.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0 and CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.1. The following requirements are to be verified:

For Test 1:

Absolute accuracy of CSI-RS0 and absolute accuracy of CSI-RS1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.1.3-1.

Relative accuracy of CSI-RS0 compared with CSI-RS1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.1.2-1.

Table A.5.7.6.1.3-1: L1-SINR absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2 |
| CSI-RS0 | L1-SINR0-δ≤ Reported SINR(dB) ≤L1-SINR0+δ |
| CSI-RS1 | L1-SINR1-δ ≤ Reported SINR(dB) ≤L1-SINR1+δ |
| Note 1: L1-SINRn is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS n under consideration  Note 2: δ is the SINR absolute accuracy requirement from Table 10.1.28.1.1-1, selected according to the Io used in the test | |

#### A.5.7.6.2 L1-SINR measurement with SSB based CMR and dedicated IMR

##### A.5.7.6.2.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will verify the requirements in Clauses 9.8.4.2 and clause 10.1.28.2 for L1-SINR measurements with SSB based CMR and dedicated CSI-RS based IMR, with the testing configurations for NR cells in Table A.5.7.6.2.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.5.7.6.2.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with SSB based CMR and CSI-RS based IMR

|  |  |
| --- | --- |
| Config | Description |
| 1 | LTE FDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 240 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

##### A.5.7.6.2.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.6.2.2-1 and Table A.5.7.6.2.2-2 below. The absolute accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.2.2-1 and Table A.5.7.6.2.2-2.

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

Table A.5.7.6.2.2-1: FR2 L1-SINR measurement test parameters with SSB based CMR and CSI-RS based IMR

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 |
| SSB GSCN | 1~4 |  | freq1 |
| Duplex mode | 1~4 |  | TDD |
| TDD Configuration | 1~4 |  | TDDConf.3.1 |
| BWchannel | 1~4 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1~4 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~4 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~4 |  | CCR.3.1 TDD |
| SSB configuration | 1,2 |  | SSB.1 FR2 |
| 3,4 | SSB.2 FR2 |
| CSI-RS configuration | 1~4 |  | CSI-RS 3.1A TDD |
| OCNG Patterns | 1~4 |  | OP.1 |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~4 |  | DLBWP.1.3  ULBWP.1.3 |
| TRS Configuration | 1~4 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~4 |  | TCI.State.2 |
| SMTC configuration | 1~4 |  | SMTC.1 |
| reportConfigType | 1~4 |  | periodic |
| reportQuantity-r16 | 1~4 |  | ssb-Index-SINR-r16 |
| Number of reported RS | 1~4 |  | 2 |
| L1-SINR reporting period | 1~4 |  | slot640 |
| Propagation condition | 1~4 |  | AWGN |
| Antenna configuration | 1~4 |  | 1x2 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | |

**Table A.5.7.6.2.2-2: FR2 SSB specific test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | |
| SSB#0 | SSB#1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | |
|  | 1~4 | dBm/15kHz | -100 | |
|  | 1,2 | dBm/SSB SCS | -91 | |
| 3,4 | -88 | |
|  | 1~4 | dB | 10 | 0 |
| SSB RSRPNote1 | 1,2 | dBm/SCS | -81 | -91 |
| 3,4 | -78 | -88 |
| IoNote1 | 1~4 | dBm/  95.04MHz | -51.57 | -58.97 |
|  | 1~4 | dB | 10 | 0 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

**Table A.5.7.6.2.2-3: FR2 CSI-RS specific test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | |
| CSI-RS#0 | CSI-RS#1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | |
|  | 1~4 | dBm/15kHz | -100 | |
|  | 1~4 | dBm/CSI-RS SCS | -91 | |
|  | 1~4 | dB | 10 | 0 |
| CSI-RS RSRPNote1 | 1~4 | dBm/SCS | -81 | -91 |
| IoNote1 | 1~4 | dBm/  95.04MHz | -51.57 | -58.97 |
|  | 1~4 | dB | 10 | 0 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

##### A.5.7.6.2.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for SSB#0+CSI-RS#0 and SSB#1+CSI-RS#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.2. The following requirements are to be verified:

For Test 1:

Absolute accuracy of SSB#0+CSI-RS#0 and absolute accuracy of SSB#1+CSI-RS#1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.2.3-1.

Relative accuracy of SSB#0+CSI-RS#0 compared with SSB#1+CSI-RS#1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.2.2-1.

Table A.5.7.6.2.3-1: L1-SINR absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2 |
| SSB#0+CSI-RS#0 | L1\_SINR0 -δ + ≤ Reported SINR (dB) ≤ L1\_SINR 0 +δ |
| SSB#1+CSI-RS#1 | L1\_SINR1 -δ + ≤ Reported SINR (dB) ≤ L1\_SINR1 +δ |
| Note 1: L1\_SINRn is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the SSB#n+CSI-RS#n under consideration  Note 2: δ is the SINR absolute accuracy requirement from Table 10.1.28.2.1-1, selected according to the Io used in the test | |

#### A.5.7.6.3 L1-SINR measurement with CSI-RS based CMR and dedicated IMR

##### A.5.7.6.3.1 Test Purpose and Environment

The purpose of this test is to verify that the L1-SINR measurement accuracy is within the specified limits. This test will partly verify the requirements in Clauses 9.8.4.3 and clause 10.1.28.3 for L1-SINR measurements based on CSI-RS as CMR and CSI-IM as IMR with the testing configurations for NR cells in Table A.5.7.6.3.1-1.

The AoA setup for this test is Setup 1 as defined in clause A.3.15.

Table A.5.7.6.3.1-1: Applicable NR configurations for FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | LTE TDD, NR 120 kHz CSI-RS SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations in each supported band | |

##### A.5.7.6.3.2 Test parameters

In this set of test cases there are two cells in the test, E-UTRAN PCell (Cell 1), FR1 PSCell (Cell 2). The test parameters and applicability for Cell 1 are defined in A.3.7.2. The test parameters for the Cell 2 are given in Table A.5.7.6.3.2-1 and A.5.7.6.3.2-2 below. The absolute and relative accuracy of L1-SINR measurements are tested by using the parameters in Table A.5.7.6.3.2-1 and A.5.7.6.3.2-2.

There is no measurement gap configured in the test. Before the test, UE is configured one CSI-RS resource set with two CSI-RS resources and one CSI-IM resource set with two CSI-IM resources. UE is configured to perform RLM and BFD based on SSB 0 and 1. CSI-RS is not transmitted in the same OFDM symbols as SSB. UE is configured to perform L1-SINR measurement based on the configured CSI-RS as CMR and CSI-IM as IMR.

Table A.5.7.6.3.2-1: FR2 L1-SINR measurement test with CSI-RS based CMR and CSI-IM based IMR

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 |
| SSB GSCN | 1~2 |  | freq1 |
| Duplex mode | 1~2 |  | TDD |
| TDD Configuration | 1~2 |  | TDDConf.3.1 |
| BWchannel | 1~2 | MHz | 100: NRB,c = 66 |
| PDSCH Reference measurement channel | 1~2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | 1~2 |  | CR.3.1 TDD |
| Dedicated CORESET Reference Channel | 1~2 |  | CCR.3.1 TDD |
| SSB configuration | 1~2 |  | SSB.1 FR2 |
| OCNG Patterns | 1~2 |  | OP.1 |
| Initial BWP Configuration | 1~2 |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP configuration | 1~2 |  | DLBWP.1.1  ULBWP.1.1 |
| TRS Configuration | 1~2 |  | TRS.2.1 TDD |
| PDCCH/PDSCH TCI Configuration | 1~2 |  | TCI.State.2 |
| SMTC configuration | 1~2 |  | SMTC.1 |
| CSI-RS configuration as CMR | 1~2 |  | CSI-RS.3.2 TDD |
| CSI-IM configuration as IMR | 1~2 |  | CSI-IM.3.3 TDD |
| reportConfigType | 1~2 |  | periodic |
| reportQuantity-r16 | 1~2 |  | cri-SINR-r16 |
| nrofReportedRS | 1~2 |  | 2 |
| L1-SINR reporting period | 1~2 |  | slot640 |
| Propagation condition | 1~2 |  | AWGN |
| Antenna configutaion | 1~2 |  | 1x2 |
| EPRE ratio of PSS to SSS | 1~2 | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | |

Table A.5.7.6.3.2-2: FR2 CSI-RS based L1-SINR measurement OTA related test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | |
| CSI-RS0 | CSI-RS1 |
| Angle of arrival configuration |  |  | Setup 1 according to A.3.15.1 | |
| Assumption for UE beamsNote 4 |  |  | Rough | |
|  | 1~2 | dBm/15kHz | -100 | |
|  | 1~2 | dBm/SSB SCS | -91 | |
|  | 1~2 | dB | 10 | -2 |
| CSI-RS-RSRPNote1 | 1~2 | dBm/SCS | -81 | -93 |
| IoNote1 | 1~2 | dBm/  95.04MHz | -51.57 | -59.86 |
|  | 1~2 | dB | 10 | -2 |
| Note 1: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 2: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 3: No additional noise is added by the test system in Test 2.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | |

##### A.5.7.6.3.3 Test Requirements

After 640ms from the beginning of the test, the L1-SINR measurement accuracy for CSI-RS#0+CSI-IM#0 and CSI-RS#1+CSI-IM#1 of Cell 2 shall fulfil the requirements in clauses 10.1.28.3. The following requirements are to be verified:

Absolute accuracy of CSI-RS#0 and absolute accuracy of CSI-RS#1. The UE is deemed to meet the requirement if the reported L1-SINR is in the range shown in Table A.5.7.6.3.3-1.

Relative accuracy of CSI-RS#0 compared with CSI-RS#1. The UE is deemed to meet the requirement if the difference in reported L1-SINR meets the requirements in Table 10.1.28.3.2-2.

Table A.5.7.6.3.3-1: L1-SINR absolute accuracy test requirement

|  |  |
| --- | --- |
|  | Test requirement Notes1,2 |
| CSI-RS#0 | L1-SINR0 -δ≤ Reported SINR(dBm) ≤L1-SINR 0 +δ |
| CSI-RS#1 | L1-SINR 1 -δ≤ Reported SINR(dBm) ≤L1-SINR 1 +δ |
| Note 1: L1-SINRn is the equivalent SINR received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the CSI-RS#n under consideration  Note 2: δ is the SINR absolute accuracy requirement from Table 10.1.28.3.1-2. | |

End of Change 12

Start of Change 13

#### A.6.5.5.6 Beam Failure Detection and Link Recovery Test for FR1 SCell configured with CSI-RS-based BFD and SSB-based LR in DRX mode

##### A.6.5.5.6.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set q0 configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candicate set q1. The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in clause 8.5.

The test parameters are given in Tables A.6.5.5.6.1-1, A.6.5.5.6.1-2, A.6.5.5.6.1-3, and A.6.5.5.6.1-4 below. There are two cells, cell 1 is the PCell and cell 2 is the SCell, in the test. UE is not provided by *schedulingRequestID-BFR-SCell-r16*, i.e., no configuration for PUCCH transmission resources, and UE shall perform the random access procedure to recover the beam failure. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure A.6.5.5.6.1-1 shows the SNR of the CSI-RS in set q0 in the active SCell to emulate beam failure. Figure A.6.5.5.6.1-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled in SCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to “infinity” so that UL timing alignment is maintained during the test.

Table A.6.5.5.6.1-1: Supported test configurations for FR1 PCell and SCell

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

Table A.6.5.5.6.1-2: General test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Value | Comment |
| Test 1 |
| Active PCell | | |  | Cell 1 |  |
| RF Channel Number for PCell | | |  | 1 |  |
| Active SCell | | |  | Cell 2 |  |
| RF Channel Number for SCell | | |  | 2 |  |
| Duplex mode | Config 1 | |  | FDD |  |
| Config 2, 3 | | TDD |  |
| BW channel | Config 1 | |  | 10: NRB,c = 52 |  |
|  | Config 2 | | MHz | 10: NRB,c = 52 |  |
|  | Config 3 | |  | 40: NRB,c = 106 |  |
| TDD Configuration | Config 1 | |  | Not Applicable |  |
| Config 2 | | TDDConf.1.1 |  |
| Config 3 | | TDDConf..21 |  |
| CORESET Reference Channel | Config 1 | |  | CR.1.1 FDD | A.3.1.2 |
| Config 2 | | CR.1.1 TDD |
| Config 3 | | CR.2.1 TDD |
| SSB Configuration | Config 1 | |  | SSB.1 FR1 | A.3.10 |
| Config 2 | | SSB.1 FR1 |
| Config 3 | |  | SSB.2 FR1 |
| SMTC Configuration | Config 1, 2 | |  | SMTC.1 | A.3.11 |
| Config 3 | | SMTC.1 |
| PDSCH/PDCCH subcarrier spacing | Config 1, 2 | |  | 15 KHz |  |
| Config 3 | | 30 KHz |  |
| PRACH Configuration | Config 1, 2, 4, 5 | |  | Table A.3.8.2.1-1 |  |
| Config 3, 6 | |  | Table A.3.8.2.1-1 |  |
| csi-RS-Index assigned as beam failure detection RS in set q0 in activated SCell | | |  | 0 |  |
| OCNG parameters | | |  | OP.1 | A.3.2.1 |
| CP length | | |  | Normal |  |
| Correlation Matrix and Antenna Configuration | | |  | 2x2 Low |  |
| Beam failure detection transmission parameters | DCI format | |  | 1-0 |  |
| Number of Control OFDM symbols | |  | 2 |  |
| Aggregation level | | CCE | 8 |  |
| Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy | | dB | 0 |  |
| Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy | | dB | 0 |  |
| DMRS precoder granularity | |  | REG bundle size |  |
| REG bundle size | |  | 6 |  |
| DRX | | |  | DRX.7 | A.3.3.7 |
| Gap pattern ID | | |  | N.A. |  |
| schedulingRequestID-BFR-SCell-r16 | | |  | absent | When the field is absent, the random access procedure will be triggered for SCell BFR |
| SSB Index assigned as CBD RS (q1) in activated SCell | | |  | 0 |  |
| rlmInSyncOutOfSyncThreshold | | |  | absent | When the field is absent, the UE applies the value 0. (Table 8.1.1-1). |
| rsrp-ThresholdBFR | | Config 1, 2 | dBm/SCS kHz | -98 | Threshold used for Qin\_LR\_SSB |
| Config 3 | -95 |
| powerControlOffsetSS | | |  | db0 | Used for deriving rsrp-ThresholdCSI-RS |
| beamFailureInstanceMaxCount | | |  | n1 | see clause 5.17 of TS 38.321 [7] |
| beamFailureDetectionTimer | | |  | pbfd4 | see clause 5.17 of TS 38.321 [7] |
| CSI-RS configuration for q0in activated SCell | Config 1 | |  | CSI-RS.1.2 FDD | A.3.14.1 |
| Config 2 | | CSI-RS.1.2 TDD |
| Config 3 | | CSI-RS.2.2 TDD |
| CSI-RS configuration for CSI reporting | Config 1 | |  | CSI-RS.1.1 FDD | A.3.14.1 |
| Config 2 | | CSI-RS.1.1 TDD |
| Config 3 | | CSI-RS.2.1 TDD |
| TRS configuration | Config 1 | |  | TRS.1.1 FDD |  |
| Config 2 | |  | TRS.1.1 TDD |  |
| Config 3 | |  | TRS.1.2 TDD |  |
| CSI-RS-Index assigned as RLM RS in PCell | Config 1 | |  | CSI-RS.1.2 FDD |  |
| Config 2 | | CSI-RS.1.2 TDD |
| Config 3 | | CSI-RS.2.2 TDD |
| T310 Timer | | | ms | 1000 |  |
| N310 | | |  | 2 |  |
| T1 | | | s | 1 | During this time the the UE shall be fully synchronized to cell 1 |
| T2 | | | s | 8.37 |  |
| T3 | | | s | 6.44 |  |
| T4 | | | s | 0 |  |
| T5 | | | s | 1.97 |  |
| D1 | | | s | 1.93 |  |
| Note 1: UE-specific PDCCH is not transmitted after T1 starts. | | | | | |

Table A.6.5.5.6.1-3: Cell specific test parameters for FR1 SCell for beam failure detection and link recovery testing in DRX mode

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Test 1 Cell2 | | | | |
|  | **T1 to T5** | T1 | T2 | T3 | T4 | T5 |
| EPRE ratio of PDCCH DMRS to SSS | | dB |  | 0 | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB |  |
| EPRE ratio of PBCH DMRS to SSS | | dB |  |
| EPRE ratio of PBCH to PBCH DMRS | | dB |  |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PDSCH DMRS to SSS | | dB |  |
| EPRE ratio of PDSCH to PDSCH DMRS | | dB |  |
| EPRE ratio of OCNG DMRS to SSS | | dB |  |
| EPRE ratio of OCNG to OCNG DMRS | | dB |  |
| SNR\_CSI-RS of set q0 | Config 1 | dB | 5 | 5 | -3 | -12 | -12 | -12 |
| Config 2 | dB | 5 | 5 | -3 | -12 | -12 | -12 |
| Config 3 | dB | 5 | 5 | -3 | -12 | -12 | -12 |
| SNR\_SSB of set q1 | Config 1 | dB | -10 | -10 | -10 | 10 | 10 | 10 |
| Config 2 | dB | -10 | -10 | -10 | 10 | 10 | 10 |
| Config 3 | dB | -10 | -10 | -10 | 10 | 10 | 10 |
| SSB\_RP of set q1 | Config 1 | dBm/ | -108 | -108 | -108 | -88 | -88 | -88 |
| Config 2 | SCS kHz | -108 | -108 | -108 | -88 | -88 | -88 |
| Config 3 |  | -105 | -105 | -105 | -85 | -85 | -85 |
|  | Config 1 | dBm/15 | -98 | -98 | | | | |
| Config 2 | kHz | -98 | -98 | | | | |
| Config 3 |  | -98 | -98 | | | | |
| Propagation condition | |  | TDL-C 300ns 100Hz | TDL-C 300ns 100Hz | | | | |
| Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.  Note 4: Void  Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.  Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.  Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.  Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.4.5.5.1.1-1.  Note 9: The SNR values are specified for testing a UE which supports 2RX on at least one band. For testing of a UE which supports 4RX on all bands, the SNR during T3 is modified as specified in clause A.3.6. | | | | | | | | |

Graphical user interface

Description automatically generated

**Figure A.6.5.5.6.1-1: SNR and L1-RSRP variation for beam failure detection and link recovery testing for SCell in DRX mode**

##### A.6.5.5.6.2 Test Requirements

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

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the shall detect beam failure and initiat link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set q1.

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing  a beam associated with the candidate beam set q1. The UE shall not transmit preamble earlier than time point B.

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

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

End of Change 13

Start of Change 14

A.9.1.6.1 Test for Interruption to WAN due to V2X Sidelink Communication

A.9.1.6.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to interruptions due to V2X sidelink communication defined in clause 12.7.1 under the following additional conditions:

- The UE is out of coverage on the V2X sidelink carrier and is associated with a serving cell on a non-V2X sidelink carrier

This test is applicable for V2X sidelink communication capable UEs that support inter-band concurrent V2X sidelink operation.

For this test, the UE is triggered by the test loop function or the upper layers to monitor V2X sidelink communication.

The test parameters are given in Table A.9.1.6.1.1-1, Table A.9.1.6.1.1-2, Table A.9.1.6.1.1-3 and Table A.9.1.6.1.1-4. The test consists of one active cell (PCell) on the serving RF channel 1, and there are no active cells on RF channel 2. On RF channel 2, the test consists of 8 active Sidelink UEs in this test transmitting V2X sidelink communication. The UE under test and all active sidelink UEs select the active cell as synchonization source.

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

During T1, the UE is in RRC\_IDLE and monitoring the V2X sidelink communication transmission from other active Sidelink UEs on the V2X sidelink communication resources.

During T2, the test system establishes a RRC connection with the UE. No PDSCH traffic is scheduled for UE, and the UE is expected to transmit *SidelinkUEInformationNR* indicating *sl-RxInterestedFreqList*. On reception of *SidelinkUEInformationNR*, thetest system shall send RRC reconfiguration message to the UE and wait for the UE to respond with RRC reconfiguration complete message before transitioning to T3. If the UE does not transmit *SidelinkUEInformationNR* for up to 2 second, the test system shall transition to T3.

During T3, the UE is scheduled with PDSCH traffic on PCell downlink. The test system will count the missed ACK/NACKs during T3 to verify the allowed interruptions during V2X sidelink communication.

**Table A.9.1.6.1.1-1: Supported test configurations for FR1 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.9.1.6.1.1-2: Test Parameters for Interruptions due to V2X Sidelink Communication**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number | - | 1, 2 | RF channel 1 is non-V2X sidelink carrier  RF channel 2 is V2X sidelink carrier |
| SCS | kHz | 30 |  |
| Active cell | - | Cell 1 | PCell on RF channel number 1 |
| CP length of Cell 1 | - | Normal |  |
| T1 | s | 5.12 |  |
| T2 | s | Up to receiving RRC reconfiguration setup complete from the UE, or up to 2 second if UE does not transmit *SidelinkUEInformationNR* during this period. |  |
| T3 | s | 10 |  |

**Table A.9.1.6.1.1-3: Slidelink Communication Configuration for Interruptions due to V2X Sidelink Communication**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| RF Channel Number | | - | 2 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 1 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| V2X sidelink Communication configuration | | - | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| Number of Active Sidelink UEs | | - | 8 | Active Sidelink UE i = 0, .., 7 |
| Active Sidelink UEs (UE i = 0, .., 7) | V2X sidelink Communication configuration | - | As specified in section A.3.21.2 | IE values unless specified otherwise in this test. |
| PSCCH Reference Measurement Channel | - | CC.1A HD | As specified in Table A.3.21.3-1 |
| PSSCH Reference Measurement Channel | - | CD.1A HD | As specified in Table A.3.21.3-2 |
| sl-NumSubchannel-r16 included in SL-ResourcePool | - | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool | - | i | Indicates the lowest RB index of the subchannel with the lowest index for active Sidelink UE i = 0, .., 7. |
| PSBCH-RSRP | dBm/30kHz | -95 |  |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | | |

**Table A.9.1.6.1.1-4: Cell specific test parameters for interruptions due to V2X slidelink communication**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | |
| **T1** | **T2** | **T3** |
| RF Channel Number | |  | 1 | | |
| UE RRC state | |  | IDLE | CONNECTED | |
| Duplex Mode | Config 1 |  | FDD | | |
| Config 2,3 |  | TDD | | |
| TDD configuration | Config 1 |  | Not Applicable | | |
| Config 2 |  | TDDConf.1.1 | | |
| Config 3 |  | TDDConf.2.1 | | |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10: NRB,c = 52 | | |
| Config 3 | 40: NRB,c = 106 | | |
| Initial BWP Configuration | |  | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP Configuration | |  | DLBWP.1.1  ULBWP.1.1 | | |
| DRX Cycle | |  | N/A | | |
| PDSCH Reference measurement channel | Config 1 |  | N/A | None | SR.1.1 FDD |
| Config 2 |  | N/A | None | SR.1.1 TDD |
| Config 3 |  | N/A | None | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | | |
| Config 2 |  | CR.1.1 TDD | | |
| Config 3 |  | CR.2.1 TDD | | |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD | | |
| Config 2 |  | CCR.1.1 TDD | | |
| Config 3 |  | CCR.2.1 TDD | | |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 | | |
| Config 3 |  | SSB.2 FR1 | | |
| SMTC Configuration | |  | SMTC.2 | | |
| OCNG Patterns | |  | OP.1 | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | Config 1,2,3 | dBm/15 kHz | -98 | | |
| Note2 | Config 1,2 | dBm/SCS | -98 | | |
| Config 3 | -95 | | |
|  | | dB | 3 | | |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 | | |
| Config 3 | -92 | | |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.3 | | |
| Config 3 | dBm/38.1 MHz | -59.2 | | |
| Antenna Configuration | |  | 1x2 | | |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that cell is 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.9.1.6.1.2 Test Requirements

The UE shall be continuously scheduled on PCell on RF channel 1 during T3. During T3, the interruption on PCell shall not be more than the values specified in clause 12.7.1..

End of Change 14

Start of Change 15

9.3.9.3 Scheduling availability of UE during inter-frequency measurements

If UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network, UE is required to be capable of measuring without measurement gaps when the SSB is completely contained in the active bandwidth part of the UE. When any of the conditions in the following clauses is met, there are restrictions on the scheduling availability; otherwise, there is no scheduling restriction. Note that the SSB symbols to be measured in the following clauses are the SSB symbols indicated by SSB-ToMeasure [2], if it is configured; otherwise, all L SSB symbols within the SMTC window duration defined in clause 4.1 of TS 38.213 [3] are included.

The scheduling availability requirements when UE performs inter-frequency measurements without measurement gaps in a TDD bands on FR1 and FR2 in clause 9.3.9.3.1~9.3.9.3.3 are valid under the following condition:

- SFN and frame boundary across serving cell and inter-frequency neighbor cells is aligned

End of Change 15

Start of Change 16

9.1.5.1.2 SA mode: carrier-specific scaling factor for SSB-based, CSI-RS based L3 measurements and RSSI and channel occupancy measurements performed outside gaps

For UE in SA operation mode, the carrier-specific scaling factor CSSFoutside\_gap,i for intra-frequency SSB-based measurements, inter-frequency SSB-based measurements performed outside measurements gaps, intra-frequency CSI-RS L3 measurement and RSSI/channel occupancy measurement with no measurement gap on a carrier subject to CCA when SMTC and RMTC are overlapping will be as specified in Table 9.1.5.1.2-1, which shall also be applied for a UE configured with NE-DC operation.

**Table 9.1.5.1.2-1: CSSFoutside\_gap,i scaling factor for SA mode**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Scenario** | ***CSSF*outside\_gap,i for FR1 PCC** | ***CSSF*outside\_gap,i for FR1 SCC** | ***CSSF*outside\_gap,i for FR2 PCC** | ***CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is required** | ***CSSF* outside\_gap,i for FR2 SCC where neighbour cell measurement is not required** | ***CSSF*outside\_gap,i for inter-frequency MO with no measurement gap** |
| **FR1 only CA** | 1+NPCC\_CSIRS + NPCC\_CCA\_RSSI/CO | NSCC\_SSB +Y+2x NSCC\_CSIRS+ NSCC\_CCA\_RSSI/CO | N/A | N/A | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| **FR2 only intra band CA** | N/A | N/A | 1+NPCC\_CSIRS | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| **FR2 only inter band CA** | N/A | N/A | 1+NPCC\_CSIRS | 2\*(1+ NSCC\_CSIRS\_FR2\_NCM) Note 3,5 | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) |
| **FR1 +FR2 CA (FR1 PCell) Note 1** | 1+NPCC\_CSIRS | 2×( NSCC\_SSB +Y+2\* NSCC\_CSIRS -1-NSCC\_CSIRS FR2\_\_NCM) | N/A | 2x(1+ NSCC\_CSIRS\_FR2\_NCM) Note 3,5 | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) | 2×( NSCC\_SSB +Y+2x NSCC\_CSIRS -1-NSCC\_CSIRS\_ FR2\_NCM) |
| **FR1 +FR2 CA (FR2 PCell) Note 1** | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS | 1+NPCC\_CSIRS | N/A | NSCC\_SSB +Y+2x NSCC\_CSIRS | NSCC\_SSB +Y+2x NSCC\_CSIRS |
| Note 1: Only one FR1 operating band and one FR2 operating band are included for FR1+FR2 inter-band CA.  Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.  Note 3: CSSFoutside\_gap,i =1 if only one SCell is configured and no inter-frequency MO without gap and only SSB based L3 measurement is configured on SCC; CSSFoutside\_gap,i =2 if only one SCell is configured and no inter-frequency MO without gap and either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement is configured on SCC.  Note 4: Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG; otherwise, it is 0.  Note 5: Only two NR FR2 operating bands are included for FR2 inter-band CA.  Note 6: NPCC\_CSIRS=1 if PCC is with either both SSB and CSI-RS based L3 configured or only CSI-RS based L3 measurement configured; otherwise, NPCC\_CSIRS =0.  Note 7: NSCC\_CSIRS=Number of configured SCell(s) with either both SSB and CSI-RS based L3 measurement configured or only CSI-RS based L3 measurement configured  Note 8: NSCC\_CSIRS\_FR2\_NCM=1 if FR2 SCC, where neighbour cell measurement is required, is with either both SSB and CSI-RS configured or only CSI-RS measurement configured; otherwise, NSCC\_CSIRS\_FR2\_NCM=0.  Note 9: NSCC\_SSB=Number of configured SCell(s) with only SSB based L3 measurement configured  Note 10: NPCC\_CCA\_RSSI/CO= 1 if PSCC is configured with RSSI/CO measurements without MG when RMTC and SMTC are overlapping; NSCC\_CCA\_RSSI/CO = Number of MOs for SCell(s) configured with RSSI/CO measurements without MG when RMTC and SMTC are overlapping.. | | | | | | |

End of Change 16

Start of Change 17

10.1.25 UE Rx-Tx Time Difference Measurements

10.1.25.1 Introduction

The requirements in Clause 10.1.25 shall apply, provided the UE has received *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more UE Rx-Tx time difference measurements defined in TS 38.215 [4].

10.1.25.2 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 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 7.1.2 then:

- UE Rx-Tx measurement accuracy requirements shall apply for a cell, which is also the downlink reference cell (defined in section 7.1.1) for SRS transmission even if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment.

- UE Rx-Tx measurement accuracy requirements shall not apply for a cell, which is not the downlink reference cell (defined in section 7.1.1) for SRS transmission, if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment.

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

Note: The requirements for fading channel in this clause are derived based on TDL-A (30 ns delay spread, 5Hz) and TDL-C (60 ns delay spread, 300 Hz) channel models for FR1 and FR2 respectively.

The accuracy requirements in Table 10.1.25.2-1 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

**Table 10.1.25.2-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |
| ± [78+δ] | -3 | ≥[24] | 15 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 |
| NR\_TDD\_FR1\_C | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |
| NR\_FDD\_FR1\_F | -118.5 |
| NR\_FDD\_FR1\_G | -118 |
| NR\_FDD\_FR1\_H | -117.5 |
| ± [59+δ] | ≥[52] | ≥[1] | Note 6 | Note 6 | Note 6 |
| ± [30+δ] | >[104] | ≥[1] | Note 6 | Note 6 | Note 6 |
| ± [57+δ] |  | ≥[24] | 30 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
| NR\_FDD\_FR1\_B | -117.5 |
| NR\_TDD\_FR1\_C | -117 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 |
| NR\_FDD\_FR1\_F | -115.5 |
| NR\_FDD\_FR1\_G | -115 |
|  | NR\_FDD\_FR1\_H | -114.5 |
| ± [30+δ] |  | ≥[48] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [15+δ] |  | ≥[132] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [29+δ] | ≥[24] | 60 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
| NR\_FDD\_FR1\_B | -114.5 |
| NR\_TDD\_FR1\_C | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 |
| NR\_FDD\_FR1\_F | -113.5 |
| NR\_FDD\_FR1\_G | -113 |
| NR\_FDD\_FR1\_H | -111.5 |
| ± [15+δ] |  | ≥ [64] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [7+δ] |  | ≥ [132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [101+δ] | -13 | ≥[24] | 15 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [75+δ] | ≥[52] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [37+δ] | >[104] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [58+δ] |  | ≥[24] | 30 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [39+δ] |  | ≥[48] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [16+δ] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [36+δ] | ≥[24] | 60 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [16+δ] |  | ≥ [64] |  | ≥[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 10.1.25.2-5. | | | | | | | |

The accuracy requirements in Table 10.1.25.2-2 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

Fading propagation condition.

**Table 10.1.25.2-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |
| ± [137+δ] | -3 | ≥[24] | 15 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 |
| NR\_TDD\_FR1\_C | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |
| NR\_FDD\_FR1\_F | -118.5 |
| NR\_FDD\_FR1\_G | -118 |
| NR\_FDD\_FR1\_H | -117.5 |
| ± [96+δ] | ≥[52] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [62+δ] | >[104] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [87+δ] |  | ≥[24] | 30 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
| NR\_FDD\_FR1\_B | -117.5 |
| NR\_TDD\_FR1\_C | -117 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 |
| NR\_FDD\_FR1\_F | -115.5 |
| NR\_FDD\_FR1\_G | -115 |
|  | NR\_FDD\_FR1\_H | -114.5 |
| ± [68+δ] |  | ≥[48] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [44+δ] |  | ≥[132] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [59+δ] | ≥[24] | 60 | ≥[4] | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
| NR\_FDD\_FR1\_B | -114.5 |
| NR\_TDD\_FR1\_C | -114 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 |
| NR\_FDD\_FR1\_F | -113.5 |
| NR\_FDD\_FR1\_G | -113 |
| NR\_FDD\_FR1\_H | -111.5 |
| ± [42+δ] |  | ≥ [64] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [36+δ] |  | ≥ [132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [180+δ] | -13 | ≥[24] | 15 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [98+δ] | ≥[52] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [68+δ] | >[104] | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [87+δ] |  | ≥[24] | 30 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [85+δ] |  | ≥[48] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [44+δ] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [139+δ] | ≥[24] | 60 | ≥[4] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [46+δ] |  | ≥ [64] |  | ≥[1] | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [30+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 10.1.25.2-5. | | | | | | | |

The accuracy requirements in Table 10.1.25.2-3 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

**Table 10.1.25.2-3: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± [22+δ] | -3 | ≥[24] | 60 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [15+δ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+δ] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [12+δ] | ≥[32] | 120 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [7+δ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [4+δ] |  | ≥[128] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [35+δ] | -13 | ≥[24] | 60 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [15+δ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [7+δ] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [14+δ] | ≥[32] | 120 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [9+δ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [4+δ] |  | ≥[128] |  | ≥[1] | 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 10.1.25.2-6. | | | | | | |

The accuracy requirements in Table 10.1.25.2-4 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

Fading propagation condition.

**Table 10.1.25.2-4: UE Rx-Tx time difference measurement accuracy in FR2 in fading**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± [75+δ] | -3 | ≥[24] | 60 | ≥[4] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [72+δ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [57+δ] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [61+δ] | ≥[32] | 120 | ≥[1] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [64+δ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [55+δ] |  | ≥[128] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [92+δ] | -13 | ≥[24] | 60 | ≥[4] | NOTE 6 | NOTE 6 |
| ± [70+δ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [57+δ] |  | ≥[132] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [60+δ] | ≥[32] | 120 | ≥[1] | NOTE 6 | NOTE 6 |
| ± [66+δ] |  | ≥[64] |  | ≥[1] | NOTE 6 | NOTE 6 |
| ± [62+δ] |  | ≥[128] |  | ≥[1] | 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 10.1.25.2-6. | | | | | | |

**Table 10.1.25.2-5: Margin for UE Rx-Tx time difference measurement accuracy in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **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. | | | |

**Table 10.1.25.2-6: Margin for UE Rx-Tx time difference measurement accuracy in FR2**

|  |  |  |
| --- | --- | --- |
| Min(PRS BW, SRS BW) (MHz) | | Margin (Tc Note 1) |
| SCS = 60 kHz | SCS = 120 kHz |
| ≥ 24 | N/A | [76] |
| ≥ 64 | ≥ 32 | [32] |
| ≥ 132 | ≥ 64 | [24] |
| N/A | ≥ 128 | [20] |
| 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. | | |

End of Change 17

Start of Change 18

10.1.24 PRS-RSRP Measurements

10.1.24.1 Introduction

The requirements in Clause 10.1.24 shall apply, provided the UE has received *nr-DL-TDOA-RequestLocationInformation* or *nr-Multi-RTT-RequestLocationInformation* or *nr-DL-AoD-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more DL PRS-RSRP measurements defined in TS 38.215 [4].

10.1.24.2 Measurement Accuracy Requirements

10.1.24.2.1 Absolute PRS RSRP accuracy

The absolute accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.1-1 are valid under the following conditions:

Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

The absolute accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.1-2 are valid under the following conditions:

Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

**Table 10.1.24.2.1-1: PRS-RSRP absolute accuracy for FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor**  **(** | **Io Note 7 range** | | | | |
| **NR operating band groups Note 8** | **Minimum Io Note 1**  **dBm / SCSPRS** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | **dBm / SCSPRS** | | | **dBm/BWChannel** |
| **dBm/15kHz** Note 6 | **dBm/30kHz** Note 6 | **dBm/60kHz** Note 6 |
| ±3.5 | ±8 | ≥-3dB | ≥24 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| Note 4 | | | | |
| Note 4 | | | | |
| ±8.5 | ±13 | ≥-13dB | 24 ≤ BW ≤ 52 | All | Note 4 | | | | |
| ±6 | ±10.5 | 52< BW≤ 104 | All | Note 4 | | | | |
| ±4.5 | ±9 | BW >104 | All | Note 4 | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Void.  NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.  NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 8: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

**Table 10.1.24.2.1-2: PRS-RSRP absolute accuracy for FR2**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor**  **(** | **Io Note 7 range** | | |
| **Minimum Io Note 1**  **dBm / SCSPRS** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** | **dBm / SCSPRS** | | **dBm/BWChannel** |
| **dBm/120kHz** Note 6 | **dBm/60kHz** Note 6 |
| ±5 | ±8 | ≥-3dB | ≥24 | All | Same value as PRP in Table B.2.14 -2, according to UE Power class, operating band and angle of arrival | | -50 |
| Note 4 | | |
| Note 4 | | |
| ±8.5 | ±11.5 | ≥-13dB | 24 ≤ BW ≤ 64 | All | Note 4 | | |
| ±6 | ±9 | BW >64 | All | Note 4 | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Void.  NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.  NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 8: NR operating band groups are as defined in Section 3.5.2. | | | | | | | |

10.1.24.2.2 Relative PRS RSRP accuracy

The relative accuracy of PRS-RSRP is defined as accuracy of the difference between two PRS-RSRP measurements.

The relative PRS-RSRP accuracy requirements apply for the cases when PRS-RSRP is measured from PRS resources in the same PRS resource set in FR1 or FR2, and measured with same Rx beam in case of FR2.

The accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.2-1 are valid under the following conditions:

Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

The accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.2-2 are valid under the following conditions:

Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

**Table 10.1.24.2.2-1: PRS-RSRP relative accuracy for FR1**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor**  **(** | **Io Note 7 range** | | | | |
| **NR operating band groups Note 8** | **Minimum Io Note 1**  **dBm / SCSPRS** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | **dBm / SCSPRS** | | | **dBm/BWChannel** |
| **dBm/15kHz** Note 6 | **dBm/30kHz** Note 6 | **dBm/60kHz** Note 6 |
| ±3.5 | ±5.0 | ≥-3dB | ≥24 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| Note 4 | | | | |
| Note 4 | | | | |
| ±9.5 | ±11.0 | ≥-13dB | 24 ≤ BW ≤ 52 | All | Note 4 | | | | |
| ±6.5 | ±8.0 | 52< BW≤ 104 | All | Note 4 | | | | |
| ±5.0 | ±6.5 | BW >104 | All | Note 4 | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Void.  NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.  NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 8: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

**Table 10.1.24.2.2-2: PRS-RSRP relative accuracy for FR2**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor**  **(** | **Io Note 7 range** | | |
| **Minimum Io Note 1**  **dBm / SCSPRS** | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** | **dBm / SCSPRS** | | **dBm/BWChannel** |
| **dBm/120kHz** Note 6 | **dBm/60kHz** Note 6 |
| ±5.0 | ±8.0 | ≥-3dB | ≥24 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | | -50 |
| Note 4 | | |
| Note 4 | | |
| ±10 | ±13 | ≥-13dB | 24 ≤ BW ≤ 64 | All | Note 4 | | |
| ±7.5 | ±10.5 | BW >64 | All | Note 4 | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Void.  NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the OTDOA or DL-AoD assistance data defined in [34].  NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.  NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 8: NR operating band groups are as defined in Section 3.5.2. | | | | | | | |

End of Change 18

Start of Change 19

A.6.6.12 RSTD measurements

A. 6.6.12.1 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA

A. 6.6.12.1.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 9.9.2 in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in Table A.6.6.12.1.1-1.

**Table A.6.6.12.1.1-1: Supported test configurations**

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

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. All 3 cells are on the same RF channel in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during T2.

Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messagesshall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID # 24 or #0 before T2.

The general test parameters are listed in Table A.6.6.12.1.1-2, and cell specific test parameters are listed in Table A.6.6.12.1.1-3.

**Table A.6.6.12.1.1-2: General test parameters for RSTD measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355[34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and secondplaces in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.1.1 TDD |  |
| Config 3 |  | CCR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Config 1,2,3 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Config 1,2,3 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.1 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#0 | GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

**Table A.6.6.12.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | N/A | N/A |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 2 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 3 | dBm/  38.16MHz | -53.54 | -53.54 | -53.54 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.6.6.12.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
| **T2** | **T2** | **T2** |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| SSB | Config 1~3 | dB | 10 | 3 | 3 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 2 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 3 | dBm/  38.16MHz | -62.43 | -62.43 | -62.43 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -95 | -95 |
| Config 2 | dBm/SCS | -88 | -95 | -95 |
| Config 3 | dBm/SCS | -85 | -92 | -92 |
| PRS | | dB | -6.00 | -12.98 | -12.98 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

A.6.6.12.1.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.2.5 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in Clause 10.1.23.3, i.e., between RSTD\_0000000 and RSTD1970049

A. 6.6.12.2 NR RSTD measurement reporting delay test case for dual positioning frequency layers in FR1 SA

A. 6.6.12.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 9.9.2 in an environment with AWGN propagation conditions in FR1 in standalone scenario when dual positioning frequency layers are configured.

The supported test configurations are specified in Table A.6.6.12.2.1-1.

**Table A.6.6.12.2.1-1: Supported test configurations**

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

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. Cell 3 is on a different RF channel with Cell 1 and Cell 2.

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during T2.

Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messagesshall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID # 24 or #0 before T2.

The general test parameters are listed in Table A.6.6.12.2.1-2, and cell specific test parameters are listed in Table A.6.6.12.2.1-3.

**Table A.6.6.12.2.1-2: General test parameters for RSTD measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355[34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.1.1 TDD |  |
| Config 3 |  | CCR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Config 1,2,3 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Config 1,2,3 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1 |  | PRS.1.1 FR1 | As specified in clause A.3. 31 |
| Config 2 |  | PRS.1.1 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#0 | GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

**Table A.6.6.12.2.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
| NR RF Channel Number | |  | 1 | 1 | 2 |
| Positiong frequency layer | |  | 1 | 1 | 2 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | N/A | N/A |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -59.63 | -59.63 | -70.05 |
| Config 2 | dBm/  9.36MHz | -59.63 | -59.63 | -70.05 |
| Config 3 | dBm/  38.16MHz | -53.54 | -53.54 | -63.96 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.6.6.12.2.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2 and T3**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
| **T2** | **T2** | **T2** |
| NR RF Channel Number | |  | 1 | 1 | 2 |
| Positiong frequency layer | |  | 1 | 1 | 2 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| EPRE ratio of PRS to SSS | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -68.73 | -68.73 | -69.76 |
| Config 2 | dBm/  96.48MHz | -68.73 | -68.73 | -69.76 |
| Config 3 | dBm/  38.16MHz | -62.64 | -62.64 | -63.67 |
| PRS | | dB | -6 | -13 | -13 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

A.6.6.12.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.1.5 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in Clause 10.1.23.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

A.6.6.13 PRS-RSRP measurements

A.6.6.13.1 PRS-RSRP reporting delay test case for single positioning frequency layer

A.6.6.13.1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement meets the delay requirements specified in clause 9.9.3.5 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.6.13.1.1-1.

**Table A.6.6.13.1.1-1: Supported test configurations**

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1. The test consists of two consecutive time intervals, with duration of T1 and T2. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is ΔT after slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The general test parameters are listed in Table A.6.6.13.1.1-2, and cell specific test parameters are listed in Table A.6.6.13.1.1-3.

**Table A.6.6.13.1.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | NA | OFF |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 2 |  |
| T2 | s | 1, 2, 3 | 5 |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

**Table A.6.6.13.1.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 2 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 3 | PRS.2.4 FR1 | | PRS.2.4 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -3.41 | -Infinity | -11.76 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -108 |
|  |  | 2 | -Infinity | -101 | -Infinity | -108 |
|  |  | 3 | -Infinity | -98 | -Infinity | -105 |
|  |  |  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Io | dBm/9.36 MHz | 1 | N/A | -68 | N/A | -68 |
|  | dBm/9.36 MHz | 2 | -68 | -68 |
|  | dBm/38.16 MHz | 3 | -61.91 | -61.91 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

A.6.6.13.1.2 Test Requirements

The UE shall perform and report the PRS-RSRP measurements for Cell 1 and Cell 2, within the time limit specified in clause 9.9.3.5, starting from the beginning of time interval T2.

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

A.6.6.13.2 PRS-RSRP reporting delay test case for dual positioning frequency layer

A.6.6.13.2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement meets the delay requirements specified in clause 9.9.3.5 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.6.13.2.1-1.

**Table A.6.6.13.2.1-1: Supported test configurations**

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell on NR RF channel #1 in FR1. Cell 2 is a neighbour cell on a different NR RF channel #2 in FR1. The test consists of two consecutive time intervals, with duration of T1 and T2. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is ΔT after slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The general test parameters are listed in Table A.6.6.13.2.1-2, and cell specific test parameters are listed in Table A.6.6.13.2.1-3.

**Table A.6.6.13.2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1  2: Cell 2 | Cell 1 and Cell 2 are on differnet positioning frequency layers |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | NA | OFF |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 2 |  |
| T2 | s | 1, 2, 3 | 10 |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

**Table A.6.6.13.2.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 2 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 3 | PRS.2.4 FR1 | | PRS.2.4 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -108 |
|  |  | 2 | -Infinity | -101 | -Infinity | -108 |
|  |  | 3 | -Infinity | -98 | -Infinity | -105 |
|  |  |  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Io | dBm/9.36 MHz | 1 | N/A | -68.28 | N/A | -69.63 |
|  | dBm/9.36 MHz | 2 | -68.28 | -69.63 |
|  | dBm/38.16 MHz | 3 | -62.19 | -62.19 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

A.6.6.13.2.2 Test Requirements

The UE shall perform and report the PRS-RSRP measurements for Cell 1 and Cell 2, within the time limit specified in clause 9.9.3.5, starting from the beginning of time interval T2.

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

A.6.6.14 UE Rx-Tx time difference measurements

A.6.6.14.1 UE Rx-Tx time difference measurement for single positioning frequency layer in FR1 SA

A.6.6.14.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.6.6.14.1.1-1.

**Table A.6.6.14.1.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). Both cells are on the same RF channel in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 mute PRS transmission during T1 and transmit PRS during T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID #0 or ID #24 before T2.

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.14.1.1-2 and Table A.6.6.14.1.1-3 respectively.

**Table A.6.6.14.1.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 10 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

**Table A.6.6.14.1.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 2 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 3 | PRS.2.2 FR1 | | PRS.2.2 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.1 | | N/A | |
|  | 2 | POS-SRS.1 | | N/A | |
|  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 | -Infinity | -108 |
|  | 2 | -Infinity | -100 | -Infinity | -108 |
|  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/9.36 MHz | 1 | N/A | -67.67 | N/A | -67.67 |
| dBm/9.36 MHz | 2 | -67.67 | -67.67 |
| dBm/38.16 MHz | 3 | -61.57 | -61.57 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Table A.6.6.14.1.1-4: Void

A.6.6.14.1.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

A.6.6.14.2 UE Rx-Tx time difference measurement for dual positioning frequency layers in FR1 SA

A.6.6.14.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR1 in standalone scenario when dual positioning frequency layers are configured.

The supported test configurations in listed in Table A.6.6.14.2.1-1.

**Table A.6.6.14.2.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). Cell 1 and Cell2 are on different RF channels in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 mute PRS transmission during T1 and transmit PRS during T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID #0 or ID #24 before T2.

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.14.2.1-2 and Table A.6.6.14.2.1-3 respectively.

**Table A.6.6.14.2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For Cell 1 |
| RF Channel Number |  | 1, 2, 3 | 2 | For Cell 2 |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 40: NRB,c = 106 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 10 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

**Table A.6.6.14.2.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 2 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 3 | PRS.2.2 FR1 | | PRS.2.2 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.1 | | N/A | |
|  | 2 | POS-SRS.1 | | N/A | |
|  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -111 |
|  | 2 | -Infinity | -101 | -Infinity | -111 |
|  | 3 | -Infinity | -98 | -Infinity | -108 |
| Io | dBm/9.36 MHz | 1 | N/A | -68.28 | N/A | -69.84 |
| dBm/9.36 MHz | 2 | -68.28 | -69.84 |
| dBm/38.16 MHz | 3 | -62.19 | -63.74 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

Table A.6.6.14.2.1-4: Void

A.6.6.14.2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

End of Change 19

Start of Change 20

A.6.7.13 RSTD measurements

A.6.7.13.1 RSTD measurement accuracy test case for single positioning frequency layer

A.6.7.13.1.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.7.13.1.1-1.

**Table A.6.7.13.1.1-1: Supported test configurations**

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cells. Both cells are on the same NR RF channel in FR1. GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

**Table A.6.7.13.1.1-2: RSTD accuracy test parameters**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | | | | **Test 2** | | |
| **Cell 1** | | | **Cell 2** | **Cell 1** | | **Cell 2** |
| PRS ARFCN | 1~3 |  | freq1 | | | Freq1 | freq1 | | Freq1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | | | | 10: NRB,c = 52 | | |
| 2 | 10: NRB,c = 52 | | | | 10: NRB,c = 52 | | |
| 3 | 40: NRB,c = 106 | | | | 40: NRB,c = 106 | | |
| Duplex mode | 1 |  | FDD | | | | FDD | | |
| 2 | TDD | | | | TDD | | |
| 3 | TDD | | | | TDD | | |
| TDD configuration | 1 |  | N/A | | | | N/A | | |
| 2 | TDDConf.1.1 | | | | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | | | TDDConf.2.1 | | |
| Measurement gap | 1, 2, 3 |  | GP#24 or GP#0 | | | | GP#24 or GP#0 | | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | | | - | SR.1.1 FDD | | - |
| 2 | SR.1.1 TDD | | |  | SR.1.1 TDD | |  |
| 3 | SR.2.1 FDD | | |  | SR.2.1 FDD | |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | | | - | CR.1.1 FDD | | - |
| 2 | CR.1.1 TDD | | | - | CR.1.1 TDD | | - |
| 3 | CR.2.1 FDD | | | - | CR.2.1 FDD | | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | | | - | CCR.1.1 FDD | | - |
| 2 | CCR.1.1 TDD | | | - | CCR.1.1 TDD | | - |
| 3 | CCR.2.1 TDD | | | - | CCR.2.1 TDD | | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | | | SSB.1 FR1 | | |
| 2 | SSB.1 FR1 | | | | SSB.1 FR1 | | |
| 3 | SSB.2 FR1 | | | | SSB.2 FR1 | | |
| OCNG Patterns | 1~3 |  | OP.1 | | | | OP.1 | | |
| TRS configuration | 1 |  | TRS.1.1 FDD | | - | | TRS.1.1 FDD | |  |
| 2 | TRS.1.1 TDD | |  | | TRS.1.1 TDD | |  |
| 3 | TRS.1.2 TDD | |  | | TRS.1.2 TDD | |  |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | | | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | | | | DLBWP.1.1  ULBWP.1.1 | | |
| Time offset with Cell 1 | 1 | μs | - | 3 | | | - | 3 | |
| 2,3 | - | 3 | | | - | 3 | |
| SMTC configuration | 1 |  | SMTC.2 | | | | SMTC.2 | | |
| 2,3 | SMTC.1 | | | | SMTC.1 | | |
| PRS configuration | 1 |  | PRS.1.1 FR1 | | | | PRS.1.2 FR1 | | |
| 2 | PRS.1.1 FR1 | | | | PRS.1.2 FR1 | | |
| 3 | PRS.2.1 FR1 | | | | PRS.2.2 FR1 | | |
|  |  |  |  |  | | |  |  | |
| PRS Resource slot offset | 1, 2, 3 | slot | 0 | 4 | | | 0 | 4 | |
| Expected RSTD | 1, 2, 3 | μs | N/A | 3 | | | N/A | 3 | |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | 5 | | | N/A | 5 | |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | | | 0 | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS | 1~3 | dB | 0 | | | 0 | 0 | | 0 |
| Note2 | 1,2 | dBm/ SCS | -98 | | | | -98 | | |
| 3 | -95 | | | | -95 | | |
| PRS | 1~3 | dB | -6 | | | -13 | -6 | | -13 |
| PRPNote3 | 1,2 | dBm/SCS | -103.7 | | | -109.9 | -103.7 | | -109.9 |
| 3 | -100.7 | | | -106.9 | -100.7 | | -106.9 |
| IoNote3 | 1,2 | dBm/  9.36MHz | -68.80 | | | -68.80 | -68.80 | | -68.80 |
| 3 | dBm/  38.16MHz | -62.70 | | | -62.70 | -62.70 | | -62.70 |
| PRS | 1~3 | dB | -5.7 | | | -11.9 | -5.7 | | -11.9 |
| SSB | 1~3 | dB | -5.7 | | | -11.9 | -5.7 | | -11.9 |
| Propagation condition | 1~3 | - | AWGN | | | | AWGN | | |
| Antenna configuration | 1~3 |  | 1x2 | | | | 1x2 | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  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: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | | | | |

A.6.7.13.1.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

A.6.7.13.2 RSTD measurement accuracy test case for dual positioning frequency layer

A.6.7.13.2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.7.13.2.1-1.

**Table A.6.7.13.2.1-1: Supported test configurations**

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

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell on NR RF channel #1 in FR1. Cell 2 is a neighbour cell on a different NR RF channel #2 in FR1. GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

**Table A.6.7.13.2.1-2: RSTD accuracy test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Config** | **Unit** | **Test 1** | | **Test 2** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| PRS ARFCN | 1~3 |  | freq1 | freq2 | freq1 | freq2 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| 2 | 10: NRB,c = 52 | | 10: NRB,c = 52 | |
| 3 | 40: NRB,c = 106 | | 40: NRB,c = 106 | |
| Duplex mode | 1 |  | FDD | | FDD | |
| 2 | TDD | | TDD | |
| 3 | TDD | | TDD | |
| TDD configuration | 1 |  | N/A | | N/A | |
| 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| Measurement gap | 1, 2, 3 |  | GP#24 or GP#0 | | GP#24 or GP#0 | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD |  | SR.1.1 TDD |  |
| 3 | SR.2.1 FDD |  | SR.2.1 FDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - | CR.1.1 TDD | - |
| 3 | CR.2.1 FDD | - | CR.2.1 FDD | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
| 2 | CCR.1.1 TDD | - | CCR.1.1 TDD | - |
| 3 | CCR.2.1 TDD | - | CCR.2.1 TDD | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | SSB.1 FR1 | |
| 2 | SSB.1 FR1 | | SSB.1 FR1 | |
| 3 | SSB.2 FR1 | | SSB.2 FR1 | |
| OCNG Patterns | 1~3 |  | OP.1 | | OP.1 | |
| TRS configuration | 1 |  | TRS.1.1 FDD | - | TRS.1.1 FDD |  |
| 2 | TRS.1.1 TDD |  | TRS.1.1 TDD |  |
| 3 | TRS.1.2 TDD |  | TRS.1.2 TDD |  |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | | DLBWP.1.1  ULBWP.1.1 | |
| Time offset with Cell 1 | 1 | μs | - | 3 | - | 3 |
| 2,3 | - | 3 | - | 3 |
| SMTC configuration | 1 |  | SMTC.2 | | SMTC.2 | |
| 2,3 | SMTC.1 | | SMTC.1 | |
| PRS configuration | 1 |  | PRS.1.1 FR1 | | PRS.1.2 FR1 | |
| 2 | PRS.1.1 FR1 | | PRS.1.2 FR1 | |
| 3 | PRS.2.1 FR1 | | PRS.2.2 FR1 | |
| PRS Resource slot offset | 1, 2, 3 | slot | 0 | 4 | 0 | 4 |
| Expected RSTD | 1, 2, 3 | μs | N/A | 3 | N/A | 3 |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | 5 | N/A | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS | 1~3 | dB | 0 | 0 | 0 | 0 |
| Note2 | 1,2 | dBm/ SCS | -98 | | -98 | |
| 3 | -95 | | -95 | |
| PRS | 1~3 | dB | -6 | -13 | -6 | -13 |
| PRPNote3 | 1,2 | dBm/SCS | -104 | -111 | -104 | -111 |
| 3 | -101 | -108 | -101 | -108 |
| IoNote3 | 1,2 | dBm/  9.36MHz | -69.07 | -69.83 | -69.07 | -69.83 |
| 3 | dBm/  38.16MHz | -62.98 | -63.74 | -62.98 | -63.74 |
| PRS | 1~3 | dB | -6 | -13 | -6 | -13 |
| Propagation condition | 1~3 | - | AWGN | | AWGN | |
| Antenna configuration | 1~3 |  | 1x2 | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  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: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | |

A.6.7.13.2.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

A.6.7.14 PRS-RSRP measurements

A.6.7.14.1 SA: measurement accuracy with PRS in FR1

A.6.7.14.1.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.24.2.1 and 10.1.24.2.2.

A.6.7.14.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.7.14.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.6.7.14.1.2-2. In all test cases, Cell 1 is the PCell.

**Table A.6.7.14.1.2-1: PRS-RSRP supported test configurations**

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

**Table A.6.7.14.1.2-2: PRS-RSRP test parameters**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | | **Test 2** | | |
|  | | |  | **Cell 1** | | **Cell 2** | **Cell 1** | **Cell 2** | |
| Cell ID | | |  | 489 | | 0 | 489 | 0 | |
| SSB ARFCN | | |  | freq1 | | | freq1 | | |
| Duplex mode | | Config 1 |  | FDD | | | | | |
|  | | Config 2,3 |  | TDD | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| BWP BW | | Config 1 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | NA | TRS.1.1 FDD | NA | |
|  | | Config 2 |  | TRS.1.1 TDD | | NA | TRS.1.1 TDD | NA | |
|  | | Config 3 |  | TRS.1.2 TDD | | NA | TRS.1.2 TDD | NA | |
| DRX Cycle | | | ms | Not Applicable | | | | | |
| Measurement gap | | |  | GP#24 or GP#0 Note 7 | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | - | SR.1.1 FDD | - | |
|  | | Config 2 |  | SR.1.1 TDD | |  | SR.1.1 TDD |  | |
|  | | Config 3 |  | SR2.1 TDD | |  | SR2.1 TDD |  | |
| RMSI CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | - | CR.1.1 FDD | - | |
|  | | Config 2 |  | CR.1.1 TDD | |  | CR.1.1 TDD |  | |
|  | | Config 3 |  | CR2.1 TDD | |  | CR2.1 TDD |  | |
| Control channel RMC | | Config 1 |  | CCR.1.1 FDD | | - | CCR.1.1 FDD | - | |
|  | | Config 2 |  | CCR.1.1 TDD | |  | CCR.1.1 TDD |  | |
|  | | Config 3 |  | CCR2.1 TDD | |  | CCR2.1 TDD |  | |
| PRS configuration | | Config 1 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.4 FR1 | PRS.1.4 FR1 | |
|  | | Config 2 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.4 FR1 | PRS.1.4 FR1 | |
|  | | Config 3 |  | PRS.2.3 FR1 | | PRS.2.3 FR1 | PRS.2.4 FR1 | PRS.2.4 FR1 | |
| PRS Resource slot offset (slot) | | Config 1,2,3 | slot | 0 | | 4 | 0 | 4 | |
| SSB configuration | | Config 1 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 2 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 3 |  | SSB.2 FR1 | | SSB.2 FR1 | SSB.2 FR1 | SSB.2 FR1 | |
| Time offset with Cell 1 | | Config 1 | μs | - | | 3 | - | 3 | |
|  | | Config 2,3 | - | | 3 | - | 3 | |
| Expected RSTD | | Config 1,2,3 | μs | 3 | | | | | |
| Expected RSTD uncertainty | | Config 1,2,3 | μs | 5 | | | | | |
| SMTC configuration | | Config 1 |  | SMTC.2 | | | | | |
| Config 2,3 |  | SMTC.1 | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | |
| Config 3 | 30 kHz | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  |  |  | |
| EPRE ratio of PRS to SSS | | | dB | 0 | | 0 | 0 | 0 | |
| Note2 | Config 1,2 |  | dBm/15KhZ | -98 | | | -98 | | |
| Config 3 |  | -98 | | | -98 | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | | -98 | | |
| Config 3 |  | -95 | | | -95 | | |
| PRS | | | dB | -2.41 | -12.12 | | -2.41 | | -12.12 |
| PRS | | | dB | -2 | -10 | | -2 | | -10 |
| PRP Note3 | Config 1, 2 |  | dBm/SCS | -100 | | -108 | -100 | | -108 |
|  | Config 3 |  |  | -97 | | -105 | -97 | | -105 |
| IoNote3 | Config 1,2 |  | dBm/9.36MHz | -67.67 | | | -67.67 | | |
| Config 3 |  | dBm/38.16MHz | -61.57 | | | -61.57 | | |
| Propagation condition | | |  | AWGN | | | | | |
| Antenna configuration | | |  | 1x2 | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Void.  Note 6: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 7: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | | | | | | |

A.6.7.14.1.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.24.2.1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1.24.2.2.

A.6.7.15 UE Rx-Tx time difference measurements

A.6.7.15.1 UE Rx-Tx time difference measurement accuracy for single positioning frequency layer in FR1 SA

A.6.7.15.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx time difference measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.25.2. The test is conducted in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.6.7.15.1.1-1.

**Table A.6.7.15.1.1-1: Supported test configurations**

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

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). Both cells are on the same RF channel in FR1.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE before the start of the test.

The UE is configured with measurement gap pattern ID #0 or ID #24 before the test.

The UE is configured to transmit positioning SRS on Cell 1 during the test.

The test equipment measures the transmit timing of the UE using the transmitted SRS and measures the receive timing using the PRS. The test equipment then compares the difference of these two timings to the UE Rx-Tx measurement reported by the UE for each cell.

A.6.7.15.1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.6.7.15.1.2-1.

**Table A.6.7.15.1.2-1: UE Rx-Tx time difference measurement accuracy test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Test 1** | | **Test 2** | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| RF Channel Number |  | 1,2,3 | 1 | 1 | 1 | 1 |
| Measurement gap |  | 1,2,3 | GP#24 or GP#0 Note 4 | | GP#24 or GP#0 Note 4 | |
| DRX |  | 1,2,3 | OFF | | OFF | |
| Time offset with Cell 1 | μs | 1, 2, 3 | N/A | 3 | N/A | 3 |
| TDD configuration |  | 1 | N/A | N/A | N/A | N/A |
|  | 2 | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 | TDDConf.1.1 |
|  |  | 3 | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | N/A | SR.1.1 FDD | N/A |
|  | 2 | SR.1.1 TDD |  | SR.1.1 TDD |
|  | 3 | SR.2.1 TDD |  | SR.2.1 TDD |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | N/A | CR.1.1 FDD | N/A |
|  | 2 | CR.1.1 TDD | CR.1.1 TDD |
|  |  | 3 | CR.2.1 TDD | CR.2.1 TDD |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | N/A | CCR.1.1 FDD | N/A |
|  | 2 | CCR.1.1 TDD | CCR.1.1 TDD |
|  | 3 | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | N/A | TRS.1.1 FDD | N/A |
|  | 2 | TRS.1.1 TDD | TRS.1.1 TDD |
|  | 3 | TRS.1.2 TDD | TRS.1.2 TDD |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | N/A | DLBWP.0.1 ULBWP.0.1 | N/A |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | N/A | DLBWP.1.1 | N/A |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | N/A | ULBWP.1.1 | N/A |
| PRS configuration |  | 1 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.2 FR1 | PRS.1.2 FR1 |
|  |  | 2 | PRS.1.1 FR1 | PRS.1.1 FR1 | PRS.1.2 FR1 | PRS.1.2 FR1 |
|  |  | 3 | PRS.2.1 FR1 | PRS.2.1 FR1 | PRS.2.2 FR1 | PRS.2.2 FR1 |
| PRS Resource slot offset | slot | 1, 2, 3 | 0 | 4 | 0 | 4 |
| SRS configuration |  | 1 | POS-SRS.1 | N/A | POS-SRS.1 | N/A |
|  |  | 2 | POS-SRS.1 | N/A | POS-SRS.1 | N/A |
|  |  | 3 | POS-SRS.2 | N/A | POS-SRS.2 | N/A |
| Note 2 | dBm/SCS | 1 | -98 | | -98 | |
|  | 2 | -98 | | -98 | |
|  | 3 | -95 | | -95 | |
| Note 2 | dBm/15 kHz | 1 | -98 | | -98 | |
|  | 2 |  | |
|  | 3 |  | |
| PRS | dB | 1 | -2.41 | -12.12 | -2.41 | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -2 | -10 | -2 | -10 |
|  | 2 |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -100 | -108 | -100 | -108 |
|  | 2 | -100 | -108 | -100 | -108 |
|  | 3 | -97 | -105 | -97 | -105 |
| Io | dBm/9.36 MHz | 1 | -67.67 | -67.67 | -67.67 | -67.67 |
| dBm/9.36 MHz | 2 | -67.67 | -67.67 | -67.67 | -67.67 |
| dBm/38.16 MHz | 3 | -61.57 | -61.57 | -61.57 | -61.57 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | AWGN | |
| Note 1: Void.  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: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | | | |

**Table A.6.7.15.1.2-2: Void**

A.6.7.15.1.3 Test requirements

The UE Rx-Tx time difference measurement fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.25.2 for both Cell 1 and Cell 2.

End of Change 20

Start of Change 21

A.7.6.9 RSTD measurements

A.7.6.9.1 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA

A.7.6.9.1.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 9.9.2 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

Supported test configurations are shown in table A.7.7.1.1-1. The test parameters are as given in Table 7.6.7.1.1-2, Table A.7.6.9.1.1-3 and Table A.7.6.9.1.1-4.

**Table A.7.6.9.1.1-1: Supported test configurations for NR RSTD**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. All cells are on the same RF channel distributed in single positioning frequency layers.

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during T2.

Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messagesshall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID # 24 or #13 before T2.

**Table A.7.6.9.1.1-2: General test parameters for RSTD measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355[34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.1. FR2 | As specified in clause A.3.31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#13 | GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | 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.7.6.9.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note 3 | Config 1 | dBm/SCS | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  95.04MHz | -57.00 | -57.00 | -57.00 |
| SSB\_RP Note4 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
| SSB | Config 1 | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB\_RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.7.6.9.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
| **T2** | **T2** | **T2** |
| RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| EPRE ratio of PRS to SSS | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS | Config 1 | dB | -5.44 | -11.67 | -11.67 |
| Io Note4 | Config 1 | dBm/  95.04MHz | -58.48 | -58.48 | -58.48 |
| PRS | | dB | -6 | -13 | -13 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.7.6.9.1.-5: Void**

A.7.6.9.1.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.1.5 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in Clause 10.1.23.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

A.7.6.9.2 NR RSTD measurement reporting delay test case for dual positioning frequency layers in FR2 SA

A.7.6.9.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 9.9.2 in an environment with AWGN propagation conditions in FR2 in standalone scenario when dual positioning frequency layer is configured.

Supported test configurations are shown in table A.7.6.9.2.1-1. The test parameters are as given in Table 7.6.7.2.1-2, Table A.7.6.9.2.1-3 and , Table A.7.6.9.2.1-4.

**Table A.7.6.9.2.1-1: Supported test configurations for NR RSTD**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. All cells are on the 2 RF channels distributed in dual positioning frequency layers.

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during T2.Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messagesshall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID # 24 or #13 before T2.

**Table A.7.6.9.2.1-2: General test parameters for RSTD measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.1. FR2 | As specified in clause A.3.31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#13 | GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355[34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | 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.7.6.9.2.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
| NR RF Channel Number | |  | 1 | 1 | 2 |
| Positiong frequency layer | |  | 1 | 1 | 2 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note 3 | Config 1 | dBm/SCS | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/95.04MHz | -57.00 | -57.00 | -60.01 |
| SSB\_RP Note4 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
| SSB |  | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB\_RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.7.6.9.2.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2 and T3**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** | **Cell 3** |
| **T2** | **T2** | **T2** |
| RF Channel Number | |  | 1 | 1 | 2 |
| Positiong frequency layer | |  | 1 | 1 | 2 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PBCH DMRS to SSS | | dB | 0 | 0 | 0 |
| 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) | |
| EPRE ratio of PRS to SSS | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS | Config 1 | dB | -5.44 | -11.67 | -11.67 |
| Io Note4 | Config 1 | dBm/  95.04MHz | -58.70 | -58.70 | -59.73 |
| PRS | | dB | -6 | -13 | -13 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

**Table A.7.6.9.2.1-5: Void**

A.7.6.9.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.1.5 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in Clause 10.1.23.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

A.7.6.10 PRS-RSRP measurements

A.7.6.10.1 PRS-RSRP reporting delay test case for single positioning frequency layer

A.7.6.10.1.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements specified in Clause 9.9.3.5 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.6.10.1.1-1

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the same frequency as the PCell.

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. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is ΔT after slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The test parameters are as given in table A.7.6.10.1.1-2, and table A.7.6.10.1.1-3.

**Table A. 7.6.6.1.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.6.10.1.1-2: General test parameters for PRS RSRP measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| NR RF Channel Number |  | Config 1 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | Config 1 | NR cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| Gap Pattern Id |  | Config 1 | GP#13 or GP#24Note1 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 |  |
| SMTC parameters |  | Config 1 | SMTC.1 | As specified in clause A.3.11 |
| SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -6 |  |
| Hysteresis | dB | Config 1 | 0 |  |
| CP length |  | Config 1 | Normal |  |
| TimeToTrigger | s | Config 1 | 0 |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| DRX |  | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| Expected RSTD | μs | Config 1 | 3 |  |
| Expected RSTD uncertainty | μs | Config 1 | 5 |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 7 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | |

**Table A.7.6.10.1.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | | **Cell 2** | | |
|  | |  | **T1** | **T2** | | **T1** | **T2** | |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | | Rough | | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| Duplex mode | |  | Config 1 | TDD | | | TDD | | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | | N/A | | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | | N/A | | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | | N/A | | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | | N/A | | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | | OP.1 | | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | | - | | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | | - | | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | | - | | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | | - | | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | | 120 | | |
| PRS configuration | |  | Config 1 | PRS.1.1 FR2 | | | PRS.1.1 FR2 | | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | | ‘01’ | | |
| EPRE ratio of PSS to SSS | |  |  |  | | |  | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | | |  | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | | |  | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | | |  | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | | 0 | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | | |  | | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | | |  | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | | |  | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | | |  | | |
| Note2 | | dBm/15kHz Note5 |  | -102 | | | -102 | | |
| Note2 | | dBm/SCS Note4 | Config 1 | -93 | | | -93 | | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -96 | -96 | | -Infinity | -103 | |
| PRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -96 | | -Infinity | -103 | |
| PRS | | dB | Config 1 | -Infinity | -3.41 | | -Infinity | -11.76 | |
| PRS | | dB | Config 1 | -Infinity | -3 | | -Infinity | -10 | |
| SSB | | dB | Config 1 | -3 | -3 | | -Infinity | -10 | |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -62.25 | | -61.97 | -62.25 | | -61.97 |
| Propagation Condition | |  | Config 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: SSB\_RP/PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | | | |

A.7.6.10.1.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 9.9.3.5.The UE shall perform and report the PRS RSRP measurements for Cell 2 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in section 9.9.3.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRP measurement for each correct event shall be within the PRS RSRP reporting range specified in Clause 10.1.24.3, i.e., between PRS RSRP\_0 and PRS RSRP\_126.

A.7.6.10.2 PRS-RSRP reporting delay test case for dual positioning frequency layer

A.7.6.10.2.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements specified in Clause 9.9.3.5 for dual positioning frequency layers under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.6.10.2.1-1

There are two cells in the test, PCell (Cell 1) and a FR2 neighbour cell (Cell 2) on the different frequency from the PCell.

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. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources that is ΔT after slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The test parameters are as given in table A.7.6.10.2.1-2, and table A.7.6.10.2.1-3.

**Table A.7.6.10.2.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.6.10.2.1-2: General test parameters for PRS RSRP measurement reporting delay**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | Config 1 | NR cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| Gap Pattern Id |  | Config 1 | GP#13 or GP#24Note1 | As specified in clause 9.1.2-1. |
| Measurement gap offset |  | Config 1 | 39 |  |
| SMTC parameters |  | Config 1 | SMTC.1 | As specified in clause A.3.11 |
| SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| A3-Offset | dB | Config 1 | -6 |  |
| Hysteresis | dB | Config 1 | 0 |  |
| CP length |  | Config 1 | Normal |  |
| TimeToTrigger | s | Config 1 | 0 |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| DRX |  | Config 1 | OFF | DRX is not used |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| Expected RSTD | μs | Config 1 | 3 |  |
| Expected RSTD uncertainty | μs | Config 1 | 5 |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 7 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | |

**Table A.7.6.10.2.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  | |  | **T1** | **T2** | **T1** | **T2** |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| NR RF Channel Number | |  | Config 1 | 1 | | 2 | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP BW | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | - | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PRS configuration | |  | Config 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -104.7 | | -104.7 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -95.7 | | -95.7 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | Config 1 | -92.7 | -92.7 | -Infinity | -85.7 |
| PRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -92.7 | -Infinity | -85.7 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | -10 |
| PRS | | dB | Config 1 | -Infinity | -3 | -Infinity | -10 |
| SSB | | dB | Config 1 | -3 | -3 | -Infinity | -10 |
| IoNote3 | | dBm/95.04 MHz Note5 | Config 1 | -64.95 | -64.95 | -66.71 | -66.30 |
| Propagation Condition | |  | Config 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: SSB\_RP/PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

A.7.6.10.2.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 9.9.3.5.The UE shall perform and report the PRS RSRP measurements for Cell 2 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in section 9.9.3.5 starting from the beginning of time interval T2.

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRP measurement for each correct event shall be within the PRS RSRP reporting range specified in Clause 10.1.24.3, i.e., between PRS RSRP\_0 and PRS RSRP\_126.

A.7.6.11 UE Rx-Tx time difference measurements

A.7.6.11.1 UE Rx-Tx time difference measurements for single positioning frequency layer in FR2 SA

A.7.6.11.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.7.6.11.1.1-1.

**Table A.7.6.11.1.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). Both cells are on the same RF channel in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 mute PRS transmission during T1 and transmit PRS during T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID #13 or ID #24 before T2.

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.6.11.1.1-2 and Table A.7.6.11.1.1-3 respectively.

**Table A.7.6.11.1.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |  |
| SSB configuration |  | 1 | SSB.2 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 1 |  |
| CP length |  | 1 | Normal |  |
| DRX |  | 1 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells |
| Expected RSTD | μs | 1 | 3 |  |
| Expected RSTD uncertainty | μs | 1 | 5 |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 20 |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | |

**Table A.7.6.11.1.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 |  | 1 | Rough | | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| OCNG Patterns |  | 1 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting info |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 | -Infinity | -99 |
| Io | dBm/95.04 MHz | 1 | N/A | -57.63 | N/A | -57.63 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

**Table A.7.6.11.1.1-4: Void**

A.7.6.11.1.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

A.7.6.11.2 UE Rx-Tx time difference measurement period for dual positioning frequency layers in FR2 SA

A.7.6.11.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement meets the requirements specified in clause 9.9.4.5 in AWGN propagation condition in FR2 in standalone scenario when dual positioning frequency layers are cnfigured.

The supported test configurations in listed in Table A.7.6.11.2.1-1.

**Table A.7.6.11.2.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). All cells are on different RF channels in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 mute PRS transmission during T1 and transmit PRS during T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

The UE is configured with measurement gap pattern ID #13 or ID #24 before T2.

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.6.11.2.1-2 and Table A.7.6.11.2.1-3 respectively.

**Table A.7.6.11.2.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1 | 1 | For Cell 1 |
| RF Channel Number |  | 1 | 2 | For Cell 2 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |  |
| SSB configuration |  | 1 | SSB.2 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 1 |  |
| CP length |  | 1 | Normal |  |
| DRX |  | 1 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells |
| Expected RSTD | μs | 1 | 3 |  |
| Expected RSTD uncertainty | μs | 1 | 5 |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 20 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | |

**Table A.7.6.11.2.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 |  | 1 | Rough | | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| OCNG Patterns |  | 1 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting info |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 | -Infinity | -99 |
| Io | dBm/95.04 MHz | 1 | N/A | -57.89 | N/A | -59.60 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | |

**Table A.7.6.11.1.1-4: Void**

A.7.6.11.2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

End of Change 21

Start of Change 22

A.7.7.10 RSTD measurements

A.7.7.10.1 RSTD measurement accuracy test case for single positioning frequency layer

A.7.7.10.1.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.7.7.10.1.1-1.

**Table A.7.7.10.1.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cells. Both cells are on the same NR RF channel in FR2. GP#24 is configured if UE supports GP#24, otherwise, GP#13 is configured for the test. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

**Table A.7.7.10.1.1-2: RSTD accuracy test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| PRS ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Measurement gap |  | GP#24 or GP#13 | | GP#24 or GP#13 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| PRS configuration |  | PRS.1.2 FR2 | PRS.1.2 FR2 | PRS.1.2 FR2 | PRS.1.2 FR2 |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| Expected RSTD | μs | N/A | 3 | N/A | 3 |
| Expected RSTD uncertainty | μs | N/A | 5 | N/A | 5 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| EPRE ratio of PRS to SSS | dB | 0 | 0 | 0 | 0 |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS. | | | | | |

**Table A.7.7.10.1.1-3: RSTD accuracy OTA related test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 5 |  | Rough | | Rough | |
| Note1 | dBm/SCSNote3 | -98 | | -98 | |
| PRS | dB | -5.7 | -11.9 | -5.7 | -11.9 |
| PRPNote2 | dBm/SCS | -103.7 | -109.9 | -103.7 | -109.9 |
| PRS | dB | -6 | -13 | -6 | -13 |
| IoNote2 | dBm/95.04 MHz Note3 | -67.76 | -67.76 | -67.76 | -67.76 |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: PRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

A.7.7.10.1.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

A.7.7.10.2 RSTD measurement accuracy test case for dual positioning frequency layer

A.7.7.10.2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the accuracy requirements specified in clause 10.1.23.2 in an environment with AWGN propagation conditions. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

The supported test configurations are specified in Table A.7.7.10.2.1-1.

**Table A.7.7.10.2.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

In the test there are two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell on NR RF channel #1 in FR2. Cell 2 is a neighbour cell on a different NR RF channel #2 in FR2. GP#24 is configured if UE supports GP#24, otherwise, GP#13 is configured for the test.

**Table A.7.7.10.2.1-2: RSTD accuracy test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| PRS ARFCN |  | freq1 | freq2 | freq1 | freq2 |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Measurement gap |  | GP#24 or GP#13 | | GP#24 or GP#13 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| PRS configuration |  | PRS.1.1 FR2 | PRS.1.1 FR2 | PRS.1.2 FR2 | PRS.1.2 FR2 |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| Expected RSTD | μs | N/A | 3 | N/A | 3 |
| Expected RSTD uncertainty | μs | N/A | 5 | N/A | 5 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| EPRE ratio of PRS to SSS | dB | 0 | 0 | 0 | 0 |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS. | | | | | |

**Table A.7.7.10.2.1-3: RSTD accuracy OTA related test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 5 |  | Rough | | Rough | |
| Note1 | dBm/SCSNote3 | -98 | | -98 | |
| PRS | dB | -6 | -13 | -6 | -13 |
| PRPNote2 | dBm/SCS | -104 | -111 | -104 | -111 |
| PRS | dB | -6 | -13 | -6 | -13 |
| IoNote2 | dBm/95.04 MHz Note3 | -68.04 | -68.80 | -68.04 | -68.80 |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: PRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io levels refer to slots with transmitted PRS without OCNG  Note 3: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 4: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

A.7.7.10.2.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

A.7.7.11 PRS-RSRP measurements

A.7.7.11.1 SA measurement accuracy with PRS in FR2

A.7.7.11.1.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRP measurement accuracy is within the specified limits. This test will verify the requirements in clauses 10.1.24.2.1 and 10.1.24.2.2.

A.7.7.11.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.7.11.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in Table A.7.7.11.1.2-2 and A.7.7.11.1.2-3. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

**Table A.7.7.11.1.2-1: PRS-RSRP supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |

**Table A.7.7.11.1.2-2: PRS-RSRP general test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Cell ID |  | 489 | 0 | 489 | 0 |
| SSB ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 24 | | 100: NRB,c = 24 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - |
| Measurement gap |  | GP#13 or GP#24 Note2 | | | |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.1 | OP.1 | OP.1 | OP.1 |
| SSB configuration |  | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 | SSB.3 FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| Expected RSTD | μs | 3 | | | |
| Expected RSTD uncertainty | μs | 5 | | | |
| PRS configuration |  | PRS.1.3 FR2 | PRS.1.3 FR2 | PRS.1.4 FR2 | PRS.1.4 FR2 |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| EPRE ratio of PRS to SSS | dB | 0 | 0 | 0 | 0 |
| Propagation conditions |  | AWGN | AWGN | AWGN | AWGN |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | | |

**Table A.7.7.11.1.2-3: PRS-RSRP OTA related test parameters**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | | **Test 2** | |
|  |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 7 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote4 | -91.6 | | -91.6 | |
| Note1 | dBm/SCSNote4 | -82.6 | | -82.6 | |
| PRS | dB | -3 | -10 | -3 | -10 |
|  |  |  |  |  |  |
| PRPNote2 | dBm/SCS | -85.6 | -92.6 | -85.6 | -92.6 |
| PRS | dB | -3.41 | -11.76 | -3.41 | -11.76 |
| IoNote2 | dBm/95.04 MHz Note4 | -51.57 | | -51.57 | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: PRP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

A.7.7.11.1.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.24.2.1 if the reported PRS-RSRP is in the range shown in table A.7.7.11.1.3-1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1.24.2.2.

**Table A.7.7.11.1.3-1: PRS-RSRP absolute accuracy test requirement**

|  |  |
| --- | --- |
|  | **Test requirement Notes1,2,3** |
| Cell 1 | PRS\_RP1 -δ +Gmin ≤ Reported RSRP(dBm) ≤ PRS\_RP1 +δ +Gmax |
| Cell 2 | PRS\_RP2 -δ +Gmin ≤ Reported RSRP(dBm) ≤ PRS\_RP2 +δ +Gmax |
| Note 1: PRS\_RPn is the equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone configured in the test for the cell n under consideration.  Note 2: δ is the RSRP absolute accuracy requirement from Table 10.1.24.2.1-2, selected according to the Io used in the test.  Note 3: Gmin and Gmax are the minimum and maximum UE gain values from Table B.2.1.6.1-1, selected according to the UE power class | |

A.7.7.12 UE Rx-Tx time difference measurements

A.7.7.12.1 UE Rx-Tx time difference measurement accuracy for single positioning frequency layer in FR2 SA

A.7.7.12.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx time difference measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.25.2. The test is conducted in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configuration is listed in Table A.7.7.12.1.1-1.

**Table A.7.7.12.1.1-1: Supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | 120 kHz SSB and PRS SCS, 100 MHz bandwidth, TDD duplex mode |

There are two cells in the test: PCell (Cell 1) and a neighbour cell (Cell 2). Both cells are on the same RF channel in FR2.

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE before the start of the test.

The UE is configured with measurement gap pattern ID #13 or ID #24 before the test.

The UE is configured to transmit positioning SRS on Cell 1 during the test.

The test equipment measures the transmit timing of the UE using the transmitted SRS and measures the receive timing using the PRS. The test equipment then compares the difference of these two timings to the UE Rx-Tx measurement reported by the UE for each cell.

A.7.7.12.1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.7.7.12.1.2-1.

**Table A.7.7.12.1.2-1: UE Rx-Tx time difference measurement accuracy test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Test 1** | | **Test 2** | |
|  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | Setup 1 as specified in clause A.3.15 | |
| Beam AssumptionNote 7 |  | 1 | Rough | Rough | Rough | Rough |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 8 | | GP#24 or GP#13 Note 8 | |
| DRX |  | 1 | OFF | | OFF | |
| Time offset with Cell 1 | μs | 1 | N/A | 3 | N/A | 3 |
| TDD configuration |  | 1 | TDDConf.3.1 | TDDConf.3.1 | TDDConf.3.1 | TDDConf.3.1 |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | N/A | SR.3.1 TDD | N/A |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | N/A | CR.3.1 TDD | N/A |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | N/A | CCR.3.1 TDD | N/A |
| OCNG Patterns |  | 1 | OP.1 | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | N/A | TRS.2.1 TDD | N/A |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | N/A | DLBWP.0.1 ULBWP.0.1 | N/A |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | N/A | DLBWP.1.1 | N/A |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | N/A | ULBWP.1.1 | N/A |
| PRS configuration |  | 1 | PRS.1.1 FR2 | PRS.1.1 FR2 | PRS.1.2 FR2 | PRS.1.2 FR2 |
| PRS Resource slot offset | slot | 1 | 0 | 4 | 0 | 4 |
| SRS configuration |  | 1 | POS-SRS.3 | N/A | POS-SRS.3 | N/A |
| Note 2 | dBm/SCS | 1 | -89 | | -89 | |
| Note 2 | dBm/15 kHz | 1 | -98 | | -98 | |
| PRS | dB | 1 | -2.41 | -12.12 | -2.41 | -12.12 |
| PRS | dB | 1 | -2 | -10 | -2 | -10 |
| PRP Note 3 | dBm/SCS kHz | 1 | -91 | -99 | -91 | -99 |
| Io | dBm/95.04 MHz | 1 | -57.63 | -57.63 | -57.63 | -57.63 |
| Propagation Condition |  | 1 | AWGN | | AWGN | |
| Note 1: Void.  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: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | | | |

**Table A.7.7.12.1.2-2: Void**

A.7.7.12.1.3 Test requirements

The UE Rx-Tx time difference measurement fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.25.2 for both Cell 1 and Cell 2.

End of Change 22

Start of Change 23

### A.3.1.4 TDD UL/DL configuration

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

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

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

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Value | | |
| Reference channel |  | TDDConf.3.1 | TDDConf.3.2 |  |
| *referenceSubcarrierSpacing* | kHz | 120 | 120 |  |
| TDD UL/DL pattern 1 Note 2 |  | ‘DDDSU’  S=’10DL:2GP:2UL’ | ‘DDDSU’  S=’ 6DL: 2GP: 6UL’ |  |
| *dl-UL-TransmissionPeriodicity* | ms | 0.625 | 0.625 |  |
| *nrofDownlinkSlots* |  | 3 | 3 |  |
| *nrofDownlinkSymbols* |  | 10 | 6 |  |
| *nrofUplinkSlot* |  | 1 | 1 |  |
| *nrofUplinkSymbols* |  | 2 | 6 |  |
| TDD UL/DL pattern 2 Note 2 |  | Not configured | Not configured |  |
| *dl-UL-TransmissionPeriodicity* | ms | Not configured | Not configured |  |
| *nrofDownlinkSlots* |  | Not configured | Not configured |  |
| *nrofDownlinkSymbols* |  | Not configured | Not configured |  |
| *nrofUplinkSlot* |  | Not configured | Not configured |  |
| *nrofUplinkSymbols* |  | Not configured | Not configured |  |
| Note 1: As specified in TS 38.213 [3] and TS 38.331 [2].  Note 2: For information | | | | |

End of Change 23

Start of Change 24

## A.3.24 SRS configuration

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | SRS.1 TDD | POS-SRS.1 |  |
| Field | Value |  | Comment |
| c-SRS | 12 | Same as NRB,c in the test case |  |
| b-SRS | 0 | n.a. |  |
| b-hop | 0 | n.a. | Frequency hopping is disabled |
| groupOrSequenceHopping | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 |  |
| pathlossReferenceRS  ssb-Index | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | n.a. |  |
| startPosition | [5] | 5 | resourceMapping setting |
| nrofSymbols | [4] | 4 |  |
| repetitionFactor | n1 | n.a. | without repetition. |
| transmissionComb | n2 | n4 |  |
| combOffset-n2 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 |  |
| nrofSRS-Ports | port1 | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | Periodic |  |
| periodicityAndOffset-p | sl40, 1 | sl160, 20 | SRS transmission periodicity |

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

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

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

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

End of Change 24

Start of Change 25

A.4.5.2.8 E-UTRAN - NR FR1 interruptions at NR SRS carrier based switching in asynchronous EN-DC

A.4.5.2.8.1 Test Purpose and Environment

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

The general test parameters and NR cell specific test parameters are given in Table A.4.5.2.8.1-2 and A 4.5.2.8.1-3 below. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.1-1. In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is E-UTRAN PCell, Cell2 is NR PSCell in FR1 with PUCCH/PUSCH transmission, Cell3 is an activated NR SCell in FR1 which operates in downlink without PUCCH/PUSCH transmission. The UE is configured with the SRS carrier based switching between PSCell and SCell.

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

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

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

**Table A.4.5.2.8.1-2: General test parameters for E-UTRAN – NR FR1 interruptions at SRS carrier based switching in asynchronous EN-DC**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2, 3 | One is E-UTRAN RF channel and the other two are NR RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | Configured PSCell on NR RF channel number 2. |
| Configured SCell |  | Cell3 | Configured activated secondary cell on NR RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3. |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Filter coefficient |  | 0 | L3 filtering is not used |
| T1 | s | 5 |  |
| T2 | ms | 40 | UE shall perform SRS switching during T2 |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell2** | **Cell3** |
| Frequency Range | |  | FR1 | FR1 |
| Duplex mode | Config 1,4 |  | FDD | TDD |
| Config 2,3,5,6 |  | TDD | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable | [TDDConfig.1.2] |
| Config 2,5 | [TDDConf.1.2] | [TDDConfig.1.2] |
| Config 3,6 | [TDDConf.2.3] | [TDDConfig.2.3] |
| BWchannel | Config 1,2,4,5 | MHz | 10: NRB,c = 52 | 10: NRB,c = 52 |
| Config 3,6 | 40: NRB,c = 106 | 40: NRB,c = 106 |
| DL Initial BWP configuration | Config 1-6 |  | DLBWP.0.1 | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1-6 |  | DLBWP.1.1 | DLBWP.1.1 |
| UL Initial BWP configuration | Config 1-6 |  | ULBWP.0.1 | - |
| UL dedicated BWP configuration | Config 1-6 |  | ULBWP.1.1 | - |
| PDSCH Reference measurement channel | Config 1,4 |  | SR.1.1 FDD | SR.1.1 TDD |
| Config 2,5 | SR.1.1 TDD | SR.1.1 TDD |
| Config 3,6 | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET Reference Channel | Config 1,4 |  | CR.1.1 FDD | CR.1.1 TDD |
| Config 2,5 | CR.1.1 TDD | CR.1.1 TDD |
| Config 3,6 | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET Reference Channel | Config 1,4 |  | CCR.1.1 FDD | CCR.1.1 TDD |
| Config 2,5 |  | CCR.1.1 TDD | CCR.1.1 TDD |
| Config 3,6 |  | CCR.2.1 TDD | CCR.2.1 TDD |
| OCNG Patterns | |  | OP.1 | OP.1 |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | TRS.1.1 TDD |
| Config 2,5 |  | TRS.1.1 TDD | TRS.1.1 TDD |
| Config 3,6 |  | TRS.1.2 TDD | TRS.1.2 TDD |
| SMTC configuration | |  | SMTC.1 | SMTC.1 |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR1 | SSB.1 FR1 |
| Config 3,6 |  | SSB.2 FR1 | SSB.2 FR1 |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | 15 kHz |
| Config 3,6 | 30 kHz | 30 kHz |
| SRS Configuration | Config 1,2,4,5 | kHz | - | SRS.1 TDD |
|  | Config 3,6 |  | - | SRS.2 TDD |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5 | kHz | 15 kHz | - |
| Config 3,6 | 30 kHz | - |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS (Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | | dBm/15kHz | -104 | -104 |
| Note2 | Config 1,2,4,5 | dBm/SCS | -104 | -104 |
| Config 3,6 | -101 | -101 |
| SS-RSRPNote3 | Config 1,2,4,5 | dBm/SCS | -87 | -87 |
| Config 3,6 | -84 | -84 |
|  | | dB | 17 | 17 |
|  | | dB | 17 | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/  9.36MHz | -58.96 | -58.96 |
| Config 3,6 | dBm/  38.16MHz | -52.86 | -52.86 |
| Time offset to Cell1 Note 5 | | μs | - | 3 |
| Propagation condition | | - | AWGN | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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 5: Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells. | | | | |

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

A.4.5.2.8.2 Test Requirements

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

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

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

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

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

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

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

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

A.4.5.2.9.1 Test Purpose and Environment

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

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

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

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD(cell1), LTE TDD (cell3), NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD(cell1), LTE TDD (cell3), NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD(cell1), LTE TDD (cell3), NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.4.5.2.9.1-2: General test parameters for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Activated SCell |  | Cell3 | SCell on E-UTRAN RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 | UE shall perform SRS switching during T2 |

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

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell2** |
| **Frequency Range** | |  | FR1 |
| Duplex mode | Config 1,4 |  | FDD |
|  | Config 2,3,5,6 |  | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
|  | Config 2,5 |  | [TDDConf.1.2] |
|  | Config 3,6 |  | [TDDConf.2.3] |
| BWchannel | Config 1,4 | MHz | 10: NRB,c = 52 |
|  | Config 2,5 |  | 10: NRB,c = 52 |
|  | Config 3,6 |  | 40: NRB,c = 106 |
| Initial DL BWP | Config 1,4 |  | DLBWP.0.1 |
| Configuration | Config 2,5 |  | DLBWP.0.1 |
|  | Config 3,6 |  | DLBWP.0.1 |
| Dedicated DL BWP | Config 1,4 |  | DLBWP.1.1 |
| Configuration | Config 2,5 |  | DLBWP.1.1 |
|  | Config 3,6 |  | DLBWP.1.1 |
| Initial UL BWP | Config 1,4 |  | ULBWP.0.1 |
| Configuration | Config 2,5 |  | ULBWP.0.1 |
|  | Config 3,6 |  | ULBWP.0.1 |
| Dedicated UL BWP | Config 1,4 |  | ULBWP.1.1 |
| Configuration | Config 2,5 |  | ULBWP.1.1 |
|  | Config 3,6 |  | ULBWP.1.1 |
| PDSCH Reference | Config 1,4 |  | SR.1.1 FDD |
| measurement channel | Config 2,5 |  | SR.1.1 TDD |
|  | Config 3,6 |  | SR.2.1 TDD |
| RMSI CORESET | Config 1,4 |  | CR.1.1 FDD |
| parameters | Config 2,5 |  | CR.1.1 TDD |
|  | Config 3,6 |  | CR.2.1 TDD |
| PDCCH CORESET | Config 1,4 |  | CCR.1.1 FDD |
| parameters | Config 2,5 |  | CCR.1.1 TDD |
|  | Config 3,6 |  | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD |
|  | Config 2,5 |  | TRS.1.1 TDD |
|  | Config 3,6 |  | TRS.1.2 TDD |
| OCNG Patterns | |  | OP.1 |
| SMTC Configuration | |  | SMTC.1 |
| TCI state | |  | TCI.State.0 |
| SSB Configuration | Config 1,2,4,5 |  | SSB.1 FR1 |
|  | Config 3,6 |  | SSB.2 FR1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low |
| EPRE ratio of PSS to SSS | |  |  |
| EPRE ratio of PBCH DMRS to SSS | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | dB | 0 |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |
| NocNote 2 | | dBm/15 kHz | -104 |
| SS-RSRP Note 3 | | dBm/15 kHz | -87 |
| Ês/Iot | | dB | 17 |
| Ês/Noc | | dB | 17 |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 |
|  | Config 3,6 | dBm/38.16MHz | -52.86 |
| Time offset to Cell1 Note 4 | | μs | 33 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modeled as AWGN of appropriate power for Noc to be fulfilled.  Note 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselvess.  Note 4: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell at the UE antenna connector including time alignment error between the two cells | | | |

**Table A.4.5.2.9.1-4: Sounding Reference Symbol Configuration for E-UTRAN – NR interruptions at E-UTRA SRS carrier based switching**

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

A.4.5.2.9.2 Test Requirements

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

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

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

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

End of Change 25

Start of Change 26

A.5.5.2.7 E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching

A.5.5.2.7.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS on a PUSCH-less carrier of SCell, the UE can perform carrier based switching to one PUSCH-less SCCs from a CC with PUSCH. The test will verify the interruption requirements on active serving cell in SCG in clause 8.2.1.2.13. Supported test configurations are shown in table A.5.5.2.7.1-1.

In the test there are three cells: cell1, cell2 and cell3. Cell1 is E-UTRAN PCell on the primary component carrier. Cell3 is E-UTRAN SCell on the TDD secondary component carrier which operates in downlink without PUCCH/PUSCH. Cell2 is NR FR2 PSCell. The UE is configured with the SRS switching between E-UTRAN PCell and E-UTRAN SCell. The general test parameters and NR cell specific test parameters are given in Table A.5.5.2.8.1-2, A.5.5.2.8.1-3. And the E-UTRAN cell specific test parameters (for cell1 and cell3) can refer to Table A.3.7.2.1-1. The test consists of two successive time periods, with duration of T1 and T2, respectively. During T1 LTE PCell and NR PSCell are continuously scheduled in DL. Immediately at the beginning of T2, a PDCCH with SRS-TPC-RNTI is sent to the UE to initiate SRS switching.

**Table A.5.5.2.7.1-1: E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching supported test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | LTE FDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth,TDD duplex mode |
| 2 | LTE TDD(cell1), LTE TDD (cell3), NR 120 kHz SSB SCS, 100 MHz bandwidth,TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.5.5.2.7.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2, 3 | One is NR RF channel and the other two are E-UTRAN RF channels |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Active PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Activated SCell |  | Cell3 | SCell on E-UTRAN RF channel number 3. |
| CP length |  | Normal | Applicable to Cell1, Cell2 and Cell3 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 0.2 |  |
| T2 | s | 0.2 | UE shall perform SRS switching during T2 |

**Table A.5.5.2.7.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** |
| **Frequency Range** | |  | **FR2** |
| Duplex mode | Config 1,2 |  | TDD |
| TDD configuration | Config 1,2 |  | [TDDConf.3.2] |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 66 |
| Downlink initial BWP Configuration | Config 1,2 |  | DLBWP.0.1 |
| Downlink dedicated BWP Configuration | Config 1,2 |  | DLBWP.1.1 |
| Uplink initial BWP configuration | Config 1,2 |  | ULBWP.0.1 |
| Uplink dedicated BWP configuration | Config 1,2 |  | ULBWP.1.1 |
| TRS configuration | Config 1,2 |  | TRS.2.1 TDD |
| TCI state | Config 1,2 |  | TCI.State.0 |
| PDSCH Reference measurement channel | Config 1,2 |  | SR.3.1 TDD |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD |
| RMC CORESET Reference Channel | Config 1,2 |  | CCR.3.1 TDD |
| OCNG Patterns | |  | OP.1 |
| SSB Configuration | |  | SSB.1 FR2 |
| SMTC Configuration | Config 1,2 |  | SMTC.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |  |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |
| EPRE ratio of PDSCH to PDSCH | |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |
| Ês/Noc | | dB | 17 |
| Propagation Condition | |  | AWGN |
| Time offset to cell1 Note 2 | | ms | 3 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | |

**Table A.5.5.2.7.1-4: NR cell specific OTA related test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Unit** | **Cell2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beamsNote 6 |  | Fine |
| Note1 | dBm/15kHzNote4 | -112 |
| Note1 | dBm/SCSNote3 | -102.97 |
|  | dB | 17 |
| SS-RSRPNote2 | dBm/SCS Note4 | -85.97 |
|  | dB | 17 |
| IoNote2 | dBm/95.04 MHz Note4 | -56.90 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zone  Note 5: As observed with 0dBi gain antenna at the centre of the quiet zone  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | |

**Table** **A.5.5.2.7.1-5: Sounding Reference Symbol Configuration for E-UTRAN – NR FR2 interruptions at E-UTRA SRS carrier based switching**

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

A.5.5.2.7.2 Test Requirements

The UE shall be continuously scheduled in NR FR2 PSCell throughout the test. During T2 two interruption time periods are allowed on Cell2 and Cell1, each interruption due to SRS carrier based switching on Cell2 shall not exceed X defined in Table A.5.5.2.7.2-1.

**Table A.5.5.2.7.2-1: Interruption length X (slot) E-UTRAN – NR at E-UTRA SRS carrier based switching**

|  |  |  |
| --- | --- | --- |
|  | **NR Slot** | **Interruption length X** |
|  | **length (ms)** | **(slots)** |
| 2 | 0.25 | 5 |
| 3 | 0.125 | 9 |

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

A.5.5.2.8 E-UTRAN – NR FR2 interruptions at NR SRS carrier based switching

A.5.5.2.8.1 Test Purpose and Environment

The purpose of the test is to verify interruptions at NR SRS carrier based switching requirements defined in TS38.133 clause 8.2.1.2.12 and TS36.133 clause 7.32.2.13. The general test parameters are given in Table A.5.5.2.8.1-2, and NR cell specific test parameters are given in Table A.5.5.2.8.1-3. And the E-UTRAN cell specific test parameters can refer to Table A.3.7.2.2-1.

In the test there are three cells: Cell1, Cell2 and Cell3. Cell1 is LTE PCell, Cell2 is NR FR2 PSCell and Cell3 is NR FR2 SCell. Cell3 is not configured with PUCCH/PUSCH transmission. The test consists of two time periods, with duration of T1 and T2, respectively. During T1 and T2, Cell1, Cell2 and Cell3 are continuously scheduled in DL. Prior to the start of the time duration T1, Cell1 shall be configured as LTE PCell, Cell2 shall be configured as NR PSCell and Cell3 shall be configured as NR SCell.

At the beginning of T2, TE shall trigger aperiodic SRS transmission on Cell3.

**Table A.5.5.2.8.1-1: Interruption at transitions between active and non-active during DRX supported test configurations**

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

**Table A.5.5.2.8.1-2: General test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2 | One is E-UTRAN RF channel and the other is NR RF channel |
| Active PCell |  | Cell1 | PCell on E-UTRAN RF channel number 1. |
| Configured PSCell |  | Cell2 | PSCell on NR RF channel number 2. |
| Configured SCell |  | Cell3 | SCell on NR RF channel number 3. |
| CP length |  | Normal | Applicable to cell1 and cell 2 |
| DRX |  | OFF |  |
| Measurement gap pattern Id |  | OFF |  |
| T1 | s | 5 |  |
| T2 | s | 0.1 |  |

**Table A.5.5.2.8.1-3: NR cell specific test parameters for E-UTRAN – NR FR2 interruptions at transitions between active and non-active during DRX in asynchronous EN-DC**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** | **Cell 3** |
| Frequency Range | |  | FR2 | |
| Duplex mode | Config 1,2 |  | TDD | |
| TDD configuration | Config 1,2 |  | [TDDConf.3.2] | |
| BWchannel | Config 1,2 | MHz | 100: NRB,c = 66 | |
| Downlink initial BWP Configuration | Config 1,2 |  | DLBWP.0.1 | |
| Downlink dedicated BWP Configuration | Config 1,2 |  | DLBWP.1.1 | |
| Uplink initial BWP configuration | Config 1,2 |  | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | Config 1,2 |  | ULBWP.1.1 | |
| TRS configuration | Config 1,2 |  | TRS.2.1 TDD | |
| SRS configuration | Config 1,2 |  | SRS.3 TDD | |
| TCI state | Config 1,2 |  | TCI.State.0 | |
| PDSCH Reference measurement channel | Config 1,2 |  | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | Config 1,2 |  | CR.3.1 TDD | |
| RMC CORESET Reference Channel | Config 1,2 |  | CCR.3.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| SSB Configuration | |  | SSB.1 FR2 | |
| SMTC Configuration | Config 1,2 |  | SMTC.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |
| Ês/Noc | | dB | 17 | |
| Propagation Condition | |  | AWGN | |
| Time offset to cell1 Note 2 | | μs | 33 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Receive time difference of signals received between subframe timing boundary of E-UTRA PCell and slot timing boundary of PSCell including time alignment error between the two cells | | | | |

**Table A.5.5.2.8.1-3A: OTA related test parameters**

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

**Table A.5.5.2.8.1-4: Void**

A.5.5.2.8.3 Test Requirements

In T2 UE shall transmit SRS on Cell3 as requested. During T2 interruption on Cell2 due to SRS carrier based switching from Cell2 to Cell3 shall not exceed the requirements defined in TS38.133 clause 8.2.1.2.12.

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

End of Change 26

Start of Change 27

A.6.5.2.2 SA interruptions at NR SRS carrier based switching

A.6.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS, the UE can perform carrier based switching to one carrier not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission. The test will partly verify the interruption requirements on PCell in clause 8.2.2.2.9.

A.6.5.2.2.2 Test Parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the FR1 PCell and Cell 2 is activated SCell on the TDD SCC which operats in downlink without PUCCH/PUSCH. The UE is configured with the SRS switching between PCell and SCell.The test parameters for PCell and SCell are given in Table A.6.5.2.2.2-2 and A.6.5.2.2.2-3 below. The test consists of two successive time periods, with duration of T1 and T2, respectively. Immediately at the beginning of T2, the UE is triggered for SRS switching.

The test equipment verifies that potential interruption is carried out correctly by monitoring ACK/NACK sent in PCell.

**Table A.6.5.2.2.2-1: Supported test configurations**

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

**Table A.6.5.2.2.2-2: General test parameters for SA interruptions at NR SRS carrier based switching**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1,2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell |  | Cell 1 | Primary cell on NR RF channel number 1 |
| Configured SCell |  | Cell 2 | Activated secondary cell on NR RF channel number 2 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Cell2 timing offset to cell1 | μs | 0 |  |
| Time alignment error between cell2 and cell1 | μs | ≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1. | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 5 |  |
| T2 | ms | 40 | UE shall perform SRS switching during T2 |

**Table A.6.5.2.2.2-3: Cell specific test parameters for SA interruptions at NR SRS carrier based switching**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | | **Unit** | **T1** | | **T2** | |
| **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Duplex mode | | Config 1 | |  | FDD | TDD | FDD | TDD |
| Config 2,3 | | TDD | | | |
| TDD configuration | | Config 1 | |  | N/A | [TDDConf.1.2] | N/A | [TDDConf.1.2] |
| Config 2 | | [TDDConf.1.2] | | | |
| Config 3 | | [TDDConf.2.3] | | | |
| BWchannel | | Config 1,2 | | MHz | 10: NRB,c = 52 | | | |
| Config 3 | | 40: NRB,c = 106 | | | |
| Downlink initial BWP Configuration | | | |  | DLBWP.0.1 | | | |
| Downlink dedicated BWP Configuration | | | |  | DLBWP.1.1 | | | |
| Uplink initial BWP configuration | | | |  | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | | |  | ULBWP.1.1 | | | |
| TCI state | | | |  | TCI.State.0 | | | |
| TRS Configuration | | | |  | TRS.1.1 TDD | | | |
| PDSCH Reference measurement channel | | Config 1 | |  | SR.1.1 FDD | SR.1.1 TDD | SR.1.1 FDD | SR.1.1 TDD |
| Config 2 | | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD | SR.1.1 TDD |
| Config 3 | | SR2.1 TDD | SR2.1 TDD | SR2.1 TDD | SR2.1 TDD |
| Dedicated CORESET parameters | | Config 1 | |  | CCR.1.1 FDD | CCR.1.1 TDD | CCR.1.1 FDD | CCR.1.1 TDD |
| Config 2 | | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD | CCR.1.1 TDD |
| Config 3 | | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD | CCR.2.1 TDD |
| RMSI CORESET parameters | | Config 1 | |  | CR.1.1 FDD | CR.1.1 TDD | CR.1.1 FDD | CR.1.1 TDD |
| Config 2 | | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD | CR.1.1 TDD |
| Config 3 | | CR2.1 TDD | CR2.1 TDD | CR2.1 TDD | CR2.1 TDD |
| OCNG Patterns | | | |  | OP.1 | | | |
| SRS Configuration | Config 1,2 | | |  | SRS.1 TDD | | | |
|  | Config 3 | | |  | SRS.2 TDD | | | |
| SSB Configuration | Config 1,2 | | |  | SSB.1 FR1 | | | |
| Config 3 | | | SSB.2 FR1 | | | |
| SMTC configuration | | | |  | SMTC.1 | | | |
| EPRE ratio of PSS to SSS | | | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | | | |
| EPRE ratio of PBCH to PBCH DMRS | | | |
| EPRE ratio of PDCCH DMRS to SSS | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | | |
| EPRE ratio of PDSCH DMRS to SSS | | | |
| EPRE ratio of PDSCH to PDSCH | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | | |
| Note2 | | | Config 1,2,4,5 | dBm/15kHz | -104 | | | |
| Config 3,6 | -101 | | | |
|  | | | | dB | 17 | | | |
|  | | | | dB | 17 | | | |
| SS-RSRPNote3 | | | Config 1,2,4,5 | dBm/SCS | -87 | | | |
| Config 3,6 | -84 | | | |
| SCH\_RP Note 3 | | | | dBm/15 kHz | -87 | | | |
| Propagation condition | | | | - | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2. | | | | | | | | |

**Table A.6.5.2.2.2-4: Void**

A.6.5.2.2.3 Test Requirements

The UE shall be scheduled on PCell continuously throughout the test. During the time duration T2, the interruption on PCell shall not be more than the values specified for SA in clause 8.2.2.2.9.

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

End of Change 27

Start of Change 28

A.7.5.2.2 SA interruptions at NR SRS carrier-based switching

A.7.5.2.2.1 Test Purpose and Environment

The purpose of this test is to verify that when a UE needs to transmit aperiodic SRS, the UE can perform SRS carrier-based switching to a carrier not configured for PUCCH/PUSCH transmission from a carrier with PUCCH/PUSCH transmission. The test will partly verify the interruption requirements on PCell in clause 8.2.2.2.9.

A.7.5.2.2.2 Test Parameters

In each test there are two cells: Cell 1 and Cell 2. Cell 1 is the FR2 PCell. Cell 2 is an activated FR2 SCell on the TDD SCC which operats in downlink without PUCCH/PUSCH. The UE is configured with the SRS switching between PCell and SCell.The test parameters for PCell and SCell are given in Tables A.7.5.2.2.2-2, A.7.5.2.2.2-3, and A.7.5.2.2.2-4 below. The test consists of two successive time periods, with duration of T1 and T2, respectively. Immediately at the beginning of T2, the UE is triggered for SRS switching. The UE shall be scheduled on PCell continuously throughout the test.

The test equipment verifies that potential interruption is carried out correctly by monitoring ACK/NACK sent in PCell.

**Table A.7.5.2.2.2-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table A.7.5.2.2.2-2: General test parameters for SA interruptions at NR SRS carrier-based switching**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| RF Channel Number |  | 1, 2 | Two NR radio channel (1, 2) are used for this test |
| Active PCell |  | Cell 1 | Primary cell on NR RF channel number 1 |
| Configured SCell |  | Cell 2 | Activated secondary cell on NR RF channel number 2 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of PCell |
| T1 | s | 5 |  |
| T2 | ms | 100 | UE shall perform SRS switching during T2 |

**Table A.7.5.2.2.2-3: Cell-specific test parameters for SA interruptions at NR SRS carrier-based switching**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | **Cell 2** |
| Frequency Range | |  | FR2 | |
| Duplex mode | Config 1 |  | TDD | |
| TDD configuration | Config 1 |  | [TDDConf.3.2] | |
| BWchannel | Config 1 | MHz | 100: NRB,c = 66 | |
| Downlink initial BWP Configuration | Config 1 |  | DLBWP.0.1 | |
| Downlink dedicated BWP Configuration | Config 1 |  | DLBWP.1.1 | |
| Uplink initial BWP configuration | Config 1 |  | ULBWP.0.1 | |
| Uplink dedicated BWP configuration | Config 1 |  | ULBWP.1.1 | |
| SRS configuration | Config 1 |  | SRS.3 TDD | |
| TRS configuration | Config 1 |  | TRS.2.1 TDD | |
| TCI state | Config 1 |  | TCI.State.0 | |
| PDSCH Reference measurement channel | Config 1 |  | SR.3.1 TDD | |
| RMSI CORESET Reference Channel | Config 1 |  | CR.3.1 TDD | |
| RMC CORESET Reference Channel | Config 1 |  | CCR.3.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| SSB Configuration | |  | SSB.1 FR2 | |
| SMTC Configuration | Config 1 |  | SMTC.1 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |  | |
| Ês/Noc | | dB | 17 | |
| Propagation Condition | |  | AWGN | |
| 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.7.5.2.2.2-4: OTA related test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | |
| **T1** | **T2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | |
| Assumption for UE beams Note 6 |  | Fine | |
| Note 1 | dBm/15kHzNote 4 | -112 | |
| Note 1 | dBm/SCSNote 3 | -103 | |
|  | dB | 4 | |
| SS-RSRP Note 2 | dBm/SCS Note 4 | -99 | |
|  | dB | 4 | |
| IoNote2 | dBm/95.04 MHz Note 4 | -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 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.  NOTE 6: Information about types of UE beam is given in B.2.1.3 and does not limit UE implementation or test system implementation. | | | |

A.7.5.2.2.3 Test Requirements

During T2, interruption on PCell due to SRS carrier-based switching between Cell 1 and Cell 2 shall not exceed the required values specified in clause 8.2.2.2.9.

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

End of Change 28

Start of Change 29

A.13.3.1.1.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.13.3.1.1.2-1 and A.13.3.1.1.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

* In the first test (Test 1), the UE is configured with SS-RSRP as Event A3 measurement quantity.
* In the second test (Test 2), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
* In the third test (Test 3), the UE is configured with SS-SINR as Event A3 measurement quantity.

**Table A.13.3.1.1.2-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table A.13.3.1.1.2-2: General test parameters for intra-frequency event triggered reporting without gaps**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | | **Comment** |
| **Test 1** | **Test 2** | **Test 3** |
| Active PCell |  | 1, 2, 3 | Cell 1 | | |  |
| Active SCell |  | 1, 2, 3 | Cell 2 | | |  |
| Neighbour cell |  | 1, 2, 3 | Cell 3 | | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1  2: Cell 2 and Cell 3 | | |  |
| DL CCA model |  |  | As specified in clause A.3.20.2.1 | | |  |
| UL CCA model |  |  | As specified in clause A.3.20.2.2 | | |  |
| SSB configuration |  | 1 | Cell 1: SSB.1 FR1  Cell 2,3: TBD | | |  |
|  |  | 2 | Cell 1: SSB.1 FR1  Cell 2,3: TBD | | |  |
|  |  | 3 | Cell 1: SSB.2 FR1  Cell 2,3: TBD | | |  |
| SMTC configuration |  | 1 | Cell 1: SMTC.2  Cell 2,3: N/A | | |  |
|  |  | 2 | Cell 1: SMTC.1  Cell 2,3: N/A | | |  |
|  |  | 3 | Cell 1: SMTC.1  Cell 2,3: N/A | | |  |
| DBT window configuration |  | 1, 2, 3 | Cell 1: N/A  Cell 2,3: TBD | | |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | |  |
| Event A3 measurement quantity |  |  | SS-RSRP | SS-RSRQ | SS-SINR |  |
| CP length |  | 1, 2, 3 | Normal | | |  |
| Hysteresis | dB | 1, 2, 3 | 0 | | |  |
| Time To Trigger | s | 1, 2, 3 | 0 | | |  |
| Filter coefficient |  | 1, 2, 3 | 0 | | | L3 filtering is not used |
| DRX |  | 1, 2, 3 |  | | | OFF |
| Time offset between Cell 2 and Cell 3 |  | 1 | 3 ms | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |  | 2 | 3 ms | | | Synchronous cells |
|  |  | 3 | 3 ms | | | Synchronous cells |
| *deriveSSB-IndexFromCell* |  | 1 | *False* | | |  |
| 2 | *True* | | |  |
| 3 | *True* | | |  |
| T1 | s | 1, 2, 3 | TBD | | |  |
| T2 | s | 1, 2, 3 | TBD | | |  |

End of Change 29

Start of Change 30

A.13.3.1.2.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.13.3.1.2.2-1 and A.13.3.1.2.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

* In Test 1 and Test 2, the UE is configured with SS-RSRP as Event A3 measurement quantity.
* In Test 3 and Test 4, the UE is configured with SS-RSRQ as Event A3 measurement quantity.
* In Test 5 and Test 6, the UE is configured with SS-SINR as Event A3 measurement quantity.

**Table A.13.3.1.2.2-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table A.13.3.1.2.2-2: General test parameters for intra-frequency event triggered reporting without gaps with DRX**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | | | | | | | | | **Comment** |
| **Test 1** | | **Test 2** | | **Test 3** | | **Test 4** | | **Test 5** | **Test 6** |  |
| Active PCell |  | 1, 2, 3 | Cell 1 | | | | | | | | | |  |
| Active SCell |  | 1, 2, 3 | Cell 2 | | | | | | | | | |  |
| Neighbour cell |  | 1, 2, 3 | Cell 3 | | | | | | | | | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1  2: Cell 2 and Cell 3 | | | | | | | | | |  |
| DL CCA model |  |  | As specified in clause A.3.20.2.1 | | | | | | | | | |  |
| UL CCA model |  |  | As specified in clause A.3.20.2.2 | | | | | | | | | |  |
| SSB configuration |  | 1 | Cell 1: SSB.1 FR1  Cell 2,3: TBD | | | | | | | | | |  |
|  |  | 2 | Cell 1: SSB.1 FR1  Cell 2,3: TBD | | | | | | | | | |  |
|  |  | 3 | Cell 1: SSB.2 FR1  Cell 2,3: TBD | | | | | | | | | |  |
| SMTC configuration |  | 1 | Cell 1: SMTC.2  Cell 2,3: N/A | | | | | | | | | |  |
|  |  | 2 | Cell 1: SMTC.1  Cell 2,3: N/A | | | | | | | | | |  |
|  |  | 3 | Cell 1: SMTC.1  Cell 2,3: N/A | | | | | | | | | |  |
| DBT window configuration |  | 1, 2, 3 | Cell 1: N/A  Cell 2,3: TBD | | | | | | | | | |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | | | | | | | | |  |
| Event A3 measurement quantity |  |  | SS-RSRP | | | SS-RSRQ | | | | SS-SINR | | |  |
| CP length |  | 1, 2, 3 | Normal | | | | | | | | | |  |
| Hysteresis | dB | 1, 2, 3 | 0 | | | | | | | | | |  |
| Time To Trigger | s | 1, 2, 3 | 0 | | | | | | | | | |  |
| Filter coefficient |  | 1, 2, 3 | 0 | | | | | | | | | | L3 filtering is not used |
| DRX |  | 1, 2, 3 | DRX.1 | DRX.2 | | DRX.1 | | DRX.2 | | DRX.1 | | DRX.2 |  |
| Time offset between Cell 2 and Cell 3 |  | 1 | 3 ms | | | | | | | | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |  | 2 | 3 ms | | | | | | | | | | Synchronous cells |
|  |  | 3 | 3 ms | | | | | | | | | | Synchronous cells |
| *deriveSSB-IndexFromCell* |  | 1 | *False* | | | | | | | | | |  |
| 2 | *True* | | | | | | | | | |  |
| 3 | *True* | | | | | | | | | |  |
| T1 | s | 1, 2, 3 | TBD | | | | | | | | | |  |
| T2 | s | 1, 2, 3 | TBD | TBD | | TBD | | TBD | | TBD | | TBD |  |

End of Change 30

Start of Change 31

A.13.3.1.3.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.13.3.1.3.2-1 and A.13.3.1.3.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

* In the first test (Test 1), the UE is configured with SS-RSRP as Event A3 measurement quantity.
* In the second test (Test 2), the UE is configured with SS-RSRQ as Event A3 measurement quantity.
* In the third test (Test 3), the UE is configured with SS-SINR as Event A3 measurement quantity.

**Table A.13.3.1.3.2-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table A.13.3.1.3.2-2: General test parameters for intra-frequency event triggered reporting with per-UE gaps**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | | **Comment** |
| **Test 1** | **Test 2** | **Test 3** |
| Active PCell |  | 1, 2, 3 | Cell 1 | | |  |
| Active SCell |  | 1, 2, 3 | Cell 2 | | |  |
| Neighbour cell |  | 1, 2, 3 | Cell 3 | | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1  2: Cell 2 and Cell 3 | | |  |
| Measurement gap type |  | 1, 2, 3 | Per-UE gaps | | |  |
| Measurement gap repitition periodicity | ms | 1, 2, 3 | 40 | | |  |
| Measurement gap length | ms | 1, 2, 3 | [6] | | |  |
| Measurement gap offset | ms | 1, 2, 3 | [39] | | |  |
| DL CCA model |  |  | As specified in clause A.3.20.2.1 | | |  |
| UL CCA model |  |  | As specified in clause A.3.20.2.2 | | |  |
| SSB configuration |  | 1 | Cell 1: SSB.1 FR1  Cell 2,3: TBD | | |  |
|  |  | 2 | Cell 1: SSB.1 FR1  Cell 2,3: TBD | | |  |
|  |  | 3 | Cell 1: SSB.2 FR1  Cell 2,3: TBD | | |  |
| SMTC configuration |  | 1 | Cell 1: SMTC.2  Cell 2,3: N/A | | |  |
|  |  | 2 | Cell 1: SMTC.1  Cell 2,3: N/A | | |  |
|  |  | 3 | Cell 1: SMTC.1  Cell 2,3: N/A | | |  |
| DBT window configuration |  | 1, 2, 3 | Cell 1: N/A  Cell 2,3: TBD | | |  |
| CSI-RS parameters in Cell 1 |  | 1 | CSI-RS.1.2 FDD resource #0 | | |  |
|  | 2 | CSI-RS.1.2 TDD resource #0 | | |  |
|  | 3 | CSI-RS.2.2 TDD resource #0 | | |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | |  |
| Event A3 measurement quantity |  |  | SS-RSRP | SS-RSRQ | SS-SINR |  |
| CP length |  | 1, 2, 3 | Normal | | |  |
| Hysteresis | dB | 1, 2, 3 | 0 | | |  |
| Time To Trigger | s | 1, 2, 3 | 0 | | |  |
| Filter coefficient |  | 1, 2, 3 | 0 | | | L3 filtering is not used |
| DRX |  | 1, 2, 3 |  | | | OFF |
| Time offset between Cell 2 and Cell 3 |  | 1 | 3 ms | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |  | 2 | 3 ms | | | Synchronous cells |
|  |  | 3 | 3 ms | | | Synchronous cells |
| *deriveSSB-IndexFromCell* |  | 1 | *False* | | |  |
| 2 | *True* | | |  |
| 3 | *True* | | |  |
| T1 | s | 1, 2, 3 | TBD | | |  |
| T2 | s | 1, 2, 3 | TBD | | |  |

End of Change 31

Start of Change 32

A.13.3.1.4.2 Test parameters

Three cells are deployed in the test, which are FR1 PCell (Cell 1), and two cells on the same carrier frequency with CCA and transmit SSBs in DBT windows according to DL CCA model: SCell (Cell 2) and a neighbour cell (Cell 3). The test parameters for the three cells are given in Table A.13.3.1.4.2-1 and A.13.3.1.4.2-2 below. In the measurement control information, a measurement object is configured for the frequency of the SCell, and it is indicated to the UE that event-triggered reporting with Event A3 is used. The test consists of two successive time periods, with time duration of T1 and T2, respectively. During time duration T1, the UE shall not have any timing information of Cell 3.

FFS: The same test is applicable for UE supporting any one or both semi-static channel access or dynamic channel access and for network configuring any of semi-static channel occupancy or dynamic channel occupancy.

There are two BWPs configured in Cell 1, BWP1 which contains the cell defining SSB, and BWP2 which does not contain any SSB of Cell 1. During the whole test, BWP2 is always scheduled as the active BWP for the UE.

UE needs to be provided at least once every 500ms with new Timing Advance Command MAC control element to restart the Time alignment timer to keep UE uplink time alignment. Furhtermore UE is allocated with PUSCH resource at every DRX cycle.

The test is conducted for SS-RSRP, SS-RSRQ, and SS-SINR:

* In Test 1 and Test 2, the UE is configured with SS-RSRP as Event A3 measurement quantity.
* In Test 3 and Test 4, the UE is configured with SS-RSRQ as Event A3 measurement quantity.
* In Test 5 and Test 6, the UE is configured with SS-SINR as Event A3 measurement quantity.

**Table A.13.3.1.4.2-1: Supported test configurations**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 2 | Without CCA: 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 3 | Without CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  With CCA: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

**Table A.13.3.1.4.2-2: General test parameters for intra-frequency event triggered reporting without gap with DRX**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | | | | | | | | | | **Comment** |
| **Test 1** | | **Test 2** | | **Test 3** | | **Test 4** | | **Test 5** | **Test 6** |  |
| Active PCell |  | 1, 2, 3 | Cell 1 | | | | | | | | | |  |
| Active SCell |  | 1, 2, 3 | Cell 2 | | | | | | | | | |  |
| Neighbour cell |  | 1, 2, 3 | Cell 3 | | | | | | | | | | Cell to be identified. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1  2: Cell 2 and Cell 3 | | | | | | | | | |  |
| Measurement gap type |  | 1, 2, 3 | Per-UE gaps | | | | | | | | | |  |
| Measurement gap repitition periodicity | ms | 1, 2, 3 | 40 | | | | | | | | | |  |
| Measurement gap length | ms | 1, 2, 3 | [6] | | | | | | | | | |  |
| Measurement gap offset | ms | 1, 2, 3 | [39] | | | | | | | | | |  |
| DL CCA model |  |  | As specified in clause A.3.20.2.1 | | | | | | | | | |  |
| UL CCA model |  |  | As specified in clause A.3.20.2.2 | | | | | | | | | |  |
| SSB configuration |  | 1 | Cell 1: SSB.1 FR1  Cell 2,3: TBD | | | | | | | | | |  |
|  |  | 2 | Cell 1: SSB.1 FR1  Cell 2,3: TBD | | | | | | | | | |  |
|  |  | 3 | Cell 1: SSB.2 FR1  Cell 2,3: TBD | | | | | | | | | |  |
| SMTC configuration |  | 1 | Cell 1: SMTC.2  Cell 2,3: N/A | | | | | | | | | |  |
|  |  | 2 | Cell 1: SMTC.1  Cell 2,3: N/A | | | | | | | | | |  |
|  |  | 3 | Cell 1: SMTC.1  Cell 2,3: N/A | | | | | | | | | |  |
| DBT window configuration |  | 1, 2, 3 | Cell 1: N/A  Cell 2,3: TBD | | | | | | | | | |  |
| CSI-RS parameters in Cell 1 |  | 1 | CSI-RS.1.2 FDD resource #0 | | | | | | | | | |  |
|  | 2 | CSI-RS.1.2 TDD resource #0 | | | | | | | | | |  |
|  | 3 | CSI-RS.2.2 TDD resource #0 | | | | | | | | | |  |
| A3-Offset | dB | 1, 2, 3 | -4.5 | | | | | | | | | |  |
| Event A3 measurement quantity |  |  | SS-RSRP | | | SS-RSRQ | | | | SS-SINR | | |  |
| CP length |  | 1, 2, 3 | Normal | | | | | | | | | |  |
| Hysteresis | dB | 1, 2, 3 | 0 | | | | | | | | | |  |
| Time To Trigger | s | 1, 2, 3 | 0 | | | | | | | | | |  |
| Filter coefficient |  | 1, 2, 3 | 0 | | | | | | | | | | L3 filtering is not used |
| DRX |  | 1, 2, 3 | DRX.1 | DRX.2 | | DRX.1 | | DRX.2 | | DRX.1 | | DRX.2 |  |
| Time offset between Cell 2 and Cell 3 |  | 1 | 3 ms | | | | | | | | | | Asynchronous cells.  The timing of Cell 3 is 3ms later than the timing of Cell 2. |
|  |  | 2 | 3 ms | | | | | | | | | | Synchronous cells |
|  |  | 3 | 3 ms | | | | | | | | | | Synchronous cells |
| *deriveSSB-IndexFromCell* |  | 1 | *False* | | | | | | | | | |  |
| 2 | *True* | | | | | | | | | |  |
| 3 | *True* | | | | | | | | | |  |
| T1 | s | 1, 2, 3 | TBD | | | | | | | | | |  |
| T2 | s | 1, 2, 3 | TBD | TBD | | TBD | | TBD | | TBD | | TBD |  |

End of Change 32

Start of Change 33

A.9.1.2.2 Test for SyncRef UE as synchronization reference source

A.9.1.2.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to the evaluation time allowed to initiate and cease S-SSB transmissions defined in clause 12.3.1.4, when the reference timing used for sidelink transmissions is a SyncRef UE.

The test parameters are given in Table A.9.1.2.2.1-1 and Table A.9.1.2.2.1-2 below. There are neither active cells nor GNSS signals in this test. There is one active SyncRef UE (SyncRef UE 1) in this test. The test system shall emulate SyncRef UE 1 to transmit S-SSB every synchronization period.

Prior to start of test, test system is required to ensure that the V2X UE is synchronized to the SyncRef UE 1 and is transmitting S-SSB as derived from the S-SSB of SyncRef UE 1 as per clause 5.8.5.3 of TS 38.331[2]. For the test configuration, the SLSSID used by the V2X UE shall be 30 with *inCoverage* IE in MIB-SL set as FALSE. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively.

During T1, the PSBCH-RSRP of SyncRef UE 1 is above *syncTxThreshOOC* and the UE is not expected to be transmitting S-SSB.

During T2, the PSBCH-RSRP of SyncRef UE 1 is lowered below *syncTxThreshOOC* and the UE is expected to initiate S-SSB transmissions.

During T3, the PSBCH-RSRP of SyncRef UE 1 is increased back to be above *syncTxThreshOOC* and the UE is expected to cease S-SSB transmissions.

**Table A.9.1.2.2.1-1: Test Parameters for Initiation/Cease of S-SSB Transmission Test for SyncRef UE as synchronization reference source**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Value** | **Comment** |
| SCS | kHz | 30 |  |
| Active cell |  | None |  |
| Active SyncRef UE |  | SyncRef UE 1 | Transmitting S-SSB on RF channel number 1(HD carrier in Band n47 or n38) |
| Active V2X UE |  | V2X UE | Transmitting S-SSB on RF channel number 1(HD carrier in Band n47 or n38) |
| V2X sidelink communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test |
| networkControlledSyncTx |  | Not configured |  |
| syncTxThreshOoC | dBm/30kHz | -100 |  |
| T1 | s | 3 |  |
| T2 | s | 5.24 |  |
| T3 | s | 5.24 |  |

**Table A.9.1.2.2.1-2: SyncRef UE Specific Test Parameters for Initiation/Cease of S-SSB Transmission Test for SyncRef UE as synchronization reference source**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **SyncRef UE 1** | | |
| **T1** | **T2** | **T3** |
| NR RF Channel Number |  | 1 | | |
| V2X SL communication resource pool configuration |  | As specified in Table A.3.21.2-2 | | |
| Channel Bandwidth (BWchannel) Note3 | MHz | 20(NRB,c = 50) or 40(NRB,c = 100) | | |
| SLSSID |  | 30 | | |
| inCoverage |  | TRUE | | |
| networkControlledSyncTx |  | ON | | |
| Note1 | dBm/30 kHz | -98 | | |
|  | dB | 5.5 | -3.5 | 5.5 |
| PSBCH | dB | 5.5 | -3.5 | 5.5 |
| PSBCH-RSRPNote2 | dBm/30 kHz | -92.5 | -101.5 | -92.5 |
| IoNote2 | dBm /18MHz | -70.2 | -75.2 | -70.2 |
|  | dBm/36MHz | -70.2 | -75.2 | -70.2 |
| Propagation condition |  | AWGN | | |
| Note 1: Interference from other UEs 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: PSBCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io level is based on the allocated RBs for S-PSS/S-SSS/PSBCH symbols.  Note 3: The UE is only required to be tested in one of the supported test configurations.  Note 4: S-PSS Es/Noc and S-SSS Es/Noc are set the same as PSBCH Es/Noc. | | | | |

A.9.1.2.2.2 Test Requirements

The S-SSB transmission initiation delay is defined as the time from the beginning of time period T2 up to the moment when the UE initiates the S-SSB transmission.

The S-SSB transmission initiation delay shall be less than 0.8 s.

The S-SSB transmission cease delay is defined as the time from the beginning of time period T3 up to the moment when the UE ceases the S-SSB transmission.

The S-SSB transmission cease delay shall be less than 0.8 s.

The rate of correct initiation/cease delay of S-SSB transmissions observed during repeated tests shall be at least 90%.

NOTE: The initiation/cease delay of S-SSB transmissions can be expressed as: Tevaluate,SLSS + S-SSB period,

Where:

- Tevaluate,SLSS = 0.64 sec (as specified in clause 12.3.1.4);

- S-SSB period = 160ms.

End of Change 33

Start of Change 34

A.9.1.3.1 Test for GNSS configured as the highest priority

A.9.1.3.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 12.4, when GNSS is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.3.1.1-1and A.9.1.3.1.1-2 below. There are no GNSS signals in this test. There are three active SyncRef UEs (SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3) in this test. The test system shall emulate SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 to transmit S-SSB every S-SSB period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its S-SSB transmissions. When the V2X UE is not synchronized to any SyncRef UE, then the V2X UE shall use the SLSS ID belonging to set id\_oon. When the V2X UE is synchronized to a SyncRef UE, the V2X UE shall derive its SLSS ID from the SLSS ID of the SyncRef UE as per clause 5.8.5.3 of TS 38.331[2].

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. SyncRef UE 1, SyncRef UE 2 and SyncRef UE 3 are all powered off before starting the test. During T1, SyncRef UE 1 is powered ON and the V2X UE will select SyncRef UE 1 as synchronization source. During T2, SyncRef UE 2 is powered ON and the V2X UE will select SyncRef UE 2 as the synchronization source. During T3, SyncRef UE 3 is powered ON and the V2X UE will reselect to SyncRef UE 3 as the synchronization source.

**Table A.9.1.3.1.1-1: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| SCS | | kHz | 30 |  |
| Initial condition | Active synchronization source |  | Sync Ref UE 1 | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 2 | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 336 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 3 | UE transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 0 and in-coverage set as FALSE in MIB-SL. |
| Active SyncRef UEs | |  | SyncRef UE 1  SyncRef UE 2  SyncRef UE 3 | Transmitting S-SSB on RF channel number 1 (HD carrier in Band n47 or n38) |
| Timing offset among SyncRef UEs | | μs | CP/2 | Synchronous |
| Frequency offset of SyncRef UE 1,2,3 | | ppm | 0 |  |
| V2X sidelink Communication configuration | |  | As specified in Table A. 3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-SyncPriority | |  | gnss |  |
| syncTxThreshOoC | |  | +infinity |  |
| T1 | | s | 24 |  |
| T2 | | s | 16 |  |
| T3 | | s | 3.2 |  |

**Table A.9.1.3.1.1-2: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for GNSS configured as the highest priority**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **SyncRef UE 1** | | | **SyncRef UE 2** | | | **SyncRef UE 3** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| NR RF Channel Number |  | 1(HD carrier in Band n47 or n38) | | | | | | | | |
| Channel Bandwidth (BWchannel) Note 4 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | | | | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.21.2-2 | | | | | | | | |
| networkControlledSyncTx |  | ON | | | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | N/A | | | +infinity | | | N/A | | |
| SLSSID |  | 30 | | | 0 | | | 0 | | |
| inCoverage (in MIB-SL) |  | TRUE | | | FALSE | | | TRUE | | |
| Note1 | dBm/30 kHz | -95 | | | | | | | | |
|  | dB | 0 | 0 | 0 | -infinity | 0 | 0 | -infinity | -infinity | 3 |
| Note2 | dB | 0 | 0 | -4.76 | -infinity | 0 | 0 | -infinity | -infinity | 0 |
| PSBCH-RSRPNote2, Note 3 | dBm/30 kHz | -95 | -95 | -95 | -infinity | -95 | -95 | -infinity | -infinity | -92 |
| Io Note2 | dBm/18 MHz | -70.78 | -70.78 | -67.78 | -73.79 | -70.78 | -70.78 | -70.78 | -70.78 | -67.78 |
|  | dBm/36 MHz | -70.78 | -70.78 | -67.78 | -73.79 | -70.78 | -70.78 | -70.78 | -70.78 | -67.78 |
| Propagation Condition |  | AWGN | | | | | | | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, Io, PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: S-PSS Es/Iot and S-SSS Es/Iot are set the same as PSBCH Es/Iot.  Note 4: The UE is only required to be tested in one of the supported test configurations. | | | | | | | | | | |

A.9.1.3.1.2 Test Requirements

During T1, SyncRef UE selection delay is defined as the time from the beginning of T1 to the time UE is synchronized to SyncRef UE 1, and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T1.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection delay can be expressed as:

SyncRef UE selection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + S-SSB period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 sec (as specified in sub-clause 12.3)

- S-SSB period = 160ms

This gives a total of 8.8 seconds.

2) During T2, SyncRef UE reselection delay is defined as the time from the beginning of T2 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2 and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will be changed to 336 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE reselection delay from start of T2.

The SyncRef UE reselection delay shall be less than 8.8sec. The SyncRef UE reselection delay can be expressed as:

SyncRef UE reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + S-SSB period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 12.3)

- S-SSB period = 160ms

This gives a total of 8.8 seconds.

3) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 2 to SyncRef UE 3, and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 3 as the synchronization source. For the test configuration, the SLSS ID will still be 0 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE reselection delay from start of T3.

The SyncRef UE reselection delay shall be less than 2.4sec. The SyncRef UE reselection delay can be expressed as:

SyncRef UE reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + S-SSB period

Where

- Tdetect,SyncRef UE = 1.6sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 (as specified in sub-clause 12.3)

- S-SSB period = 160 ms

This gives a total of 2.4 seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and S-SSB transmissions during the duration of T2, and does not drop or delay more than 30% of its S-SSB transmissions during the duration of T3.

The rate of correct SyncRef UE selection / reselection observed during repeated tests shall be at least 90%.

End of Change 34

Start of Change 35

A.9.1.3.2 Test for FR1 NR Cell configured as the highest priority

A.9.1.3.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to SyncRef UE selection / reselection defined in clause 12.4, when gNB is configured as the highest priority. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

This test is applicable for V2X sidelink communication capable UEs that support gNB as synchronization source and sidelink operation.

**Table A.9.1.3.2.1-1: Void**

The test parameters are given in Table A.9.1.3.2.1-2 and A.9.1.3.2.1-3 below. There are no active cells and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B.4.1. There are two active SyncRef UEs (SyncRef UE 1 and SyncRef UE 2) in this test. The test system shall emulate SyncRef UE 1 and SyncRef UE 2 to transmit S-SSB every S-SSB period.

The test system can verify the selection / reselection of SyncRef UE by monitoring the SLSS ID used by the V2X UE for its S-SSB transmissions. When the V2X UE is synchronized to a SyncRef UE, the V2X UE shall derive its SLSS ID from the SLSS ID of the SyncRef UE as per clause 5.8.5.3 of TS 38.331[2].

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. During T1, both SyncRef UE 1 and SyncRef UE 2 are powered off and the V2X UE will select GNSS as synchronization source. During T2, SyncRef UE 1 is powered ON and the V2X UE will select SyncRef UE 1 as the synchronization source. During T3, a higher priority SyncRef UE 2 is additionally powered ON and the V2X UE will reselect to the higher priority SyncRef UE 2 as the synchronization source.

**Table A.9.1.3.2.1-2: Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for FR1 NR Cell configured as the highest priority**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| SCS | | kHz | 30 |  |
| Initial condition | Active synchronization source |  | GNSS | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 0 and in-coverage set as TRUE in MIB-SL. |
| T2 end condition | Active synchronization source |  | Sync Ref UE 1 | DUT transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 336+59 and in-coverage set as FALSE in MIB-SL. |
| Final condition | Active synchronization source |  | Sync Ref UE 2 | UE transmits for V2X Sidelink Communication and S-SSB with SLSS ID = 30 and in-coverage set as FALSE in MIB-SL. |
| Active cell | |  | None |  |
| Active SyncRef UEs | |  | SyncRef UE 1  SyncRef UE 2 | Transmitting S-SSB on RF channel number 1 |
| Timing offset between SyncRef UE 1 and SyncRef UE 2 | | ms | 3 | Asynchronous |
| Frequency offset of SyncRef UE 1,2 | | ppm | 0 |  |
| V2X sidelink Communication preconfiguration | |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| syncPriority | |  | *gnb* |  |
| syncTxThreshOoC | |  | 13 (+infinity) |  |
| T1 | | s | 24 |  |
| T2 | | s | 16 |  |
| T3 | | s | 16 |  |

**Table A.9.1.3.2.1-3: SyncRef UE Specific Test Parameters for V2X Synchronization Reference Selection/Reselection Tests for FR1 NR Cell configured as the highest priority**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **SyncRef UE 1** | | | **SyncRef UE 2** | | |
| **T1** | **T2** | **T3** | **T1** | **T2** | **T3** |
| NR RF Channel Number |  | 1(HD carrier in Band n47 or n38) | | | | | |
| Channel Bandwidth (BWchannel) Note 4 | MHz | 20(NRB,c = 50) or 40(NRB,c = 100) | | | | | |
| V2X Sidelink Communication resource pool configuration |  | As specified in Table A.3.21.2-2 | | | As specified in Table A.3.21.2-2 | | |
| networkControlledSyncTx |  | N/A | | | ON | | |
| syncTxThreshOoC | dBm/15 kHz | +infinity | | | N/A | | |
| SLSSID |  | 59 | | | 30 | | |
| inCoverage (in MIB-SL) |  | FALSE | | | TRUE | | |
| Note1 | dBm/30 kHz | -95 | | | | | |
|  | dB | -infinity | 0 | 0 | -infinity | -infinity | 3 |
| Note2, | dB | -infinity | 0 | -4.76 | -infinity | -infinity | 0 |
| Io Note2, | dBm/18MHz | -73.79 | -70.78 | -70.78 | -73.79 | -73.79 | -70.78 |
|  | dBm/36MHz | -73.79 | -70.78 | -70.78 | -73.79 | -73.79 | -70.78 |
| PSBCH-RSRP Note2, Note 3 | dBm/30 kHz | -infinity | -95 | -95 | -infinity | -infinity | -92 |
| Propagation Condition |  | AWGN | | | | | |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, Io, PSBCH-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: S-PSS Es/Iot and S-SSS Es/Iot are set the same as PSBCH Es/Iot.  Note 4: The UE is only required to be tested in one of the supported test configurations. | | | | | | | |

A.9.1.3.2.2 Test Requirements

1) During T2, SyncRef UE selection delay is defined as the time from the beginning of T2 to the time UE is synchronized to SyncRef UE 1 and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 1 as the synchronization source. For the test configuration, the SLSS ID will be changed to 336+59 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T2.

The SyncRef UE selection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + S-SSB period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64sec (as specified in sub-clause 12.3)

- S-SSB period = 160ms

This gives a total of 8.8 seconds.

2) During T3, SyncRef UE reselection delay is defined as the time from the beginning of T3 to the time UE changes its synchronization source from SyncRef UE 1 to SyncRef UE 2, and changes its S-SSB transmissions timing and SLSS ID to follow SyncRef UE 2 as the synchronization source. For the test configuration, the SLSS ID will be changed to 30 (with in-coverage IE in MIB-SL set to FALSE) after SyncRef UE selection delay from start of T3.

The SyncRef UE reselection delay shall be less than 8.8sec. The SyncRef UE selection/reselection delay can be expressed as:

SyncRef UE selection/reselection delay = Tdetect,SyncRef UE + Tevaluate,SLSS + S-SSB period

Where

- Tdetect,SyncRef UE = 8sec (as specified in sub-clause 12.4)

- Tevaluate,SLSS = 0.64 sec (as specified in sub-clause 12.3)

- S-SSB period = 160ms

This gives a total of 8.8 seconds.

The test system will verify that the V2X UE does not drop or delay more than 6% of its V2X data and S-SSB transmissions during the duration of T2 and T3.

End of Change 35

Start of Change 36

A.9.1.4.1 Test for V2X UE Autonomous Resource Selection/Reselection

A.9.1.4.1.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource selection / reselection for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.4.1.1-1and A. 9.1.4.1.1-2 below. There are 50 active V2X sidelink UEs (UE0~UE49) in this test. Both the UE under test and active V2X sidelink UEs select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test parameters for GNSS signals are defined in B.4.1. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH every 5ms. At the beginning of whole test, the test equipment shall send one AT command to trigger the UE under test continuously transmits PSCCH/PSSCH.

The test consists of two duration T1 and T2. During T1, the signal from Test Equipement are configured such that

- the measured PSSCH-RSRP for 10 active V2X sidelink UEs(UE20~UE29) is above the measurement threshold, and the resources occupied by the 10 active V2X sidelink UEs are expected to be excluded in the resource selection procedure and,

- the measured PSSCH-RSRP for other 40 active V2X sidelink UEs(UE0~UE19, UE30~UE49) is below the measurement threshold, and the resources occupied by the 40 active V2X sidelink UEs are expected to be included in the resource selection procedure.

During T2, the signal from Test Equipement are configured such that

- the measured PSSCH-RSRP for the 10 active V2X sidelink UEs(UE20~UE29) is below the measurement threshold, and the resources occupied by the 10 active V2X sidelink UEs are expected to be included in the resource selection procedure and,

- the measured PSSCH-RSRP for other 40 active V2X sidelink UEs(UE0~UE19, UE30~UE49) is above the measurement threshold, and the resources occupied by the 40 active V2X sidelink UEs are expected to be excluded in the resource selection procedure.

**Table A.9.1.4.1.1-1: Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | |  | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel) Note 2 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | |  | 1111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | |  | 5 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool | |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Number of Active Sidelink UEs | |  | 50 | Active Sidelink UE i = 0, .., 49 |
| *SL-Thres-RSRP* | |  | 12 | Corresponding -106 dBm as defined in Section 6.3.5 in TS38.331[2]  Same for all priority level pairs. |
| Active Sidelink UEs (UE i = 0, .., 49) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-1  And A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool |  | floor(i/10)x10 | Indicates the lowest RB index of the subchannel with the lowest index.  UE 0~9 start RB=0;  UE 10~19 start RB=10;  UE 20~29 start RB=20;  UE 30~39 start RB=30;  UE 40~49 start RB=40; |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Timing offset among Active Sidelink UEs | | μs | CP/2 | Synchronous |
| Note 1: {1i}is a sequence of nine 0’s with one 1 in (mod(i,10 )+1’th position.  Note 2: The UE is only required to be tested in one of the supported test configurations. | | | | |

**Table A.9.1.4.1.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Autonomous Resource Selection/Reselection Tests for PSSCH-RSRP measurements**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Active Sidelink UE i**  **(i = 0, .., 49)** | |
| **T1** | **T2** |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth (BWchannel)Note 5 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD | |
| Note1 | dBm/30 kHz | -111 | -121 |
| Note3 | dB | 10 | |
| Note2,3 | dB | 10 | |
| Note4 | dB | 0 | 20 |
| Note2,4 | dB | 0 | 20 |
| PSSCH-RSRP1 Note 2,3 | dBm/SCS | -101 | -111 |
| PSSCH -RSRP2 Note 2,4 | dBm/SCS | -111 | -101 |
| IoNote 2 | dBm/18MHz | -77.42 | -74.03 |
|  | dBm/36MHz | -77.42 | -74.03 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: For UE 20 to 29, occupying subchannel #2  Note 4: For UE 0 to 19 and 30 to 49, occupying subchannel #0/1/3/4  Note 5: The UE is only required to be tested in one of the supported test configurations. | | | |

A.9.1.4.1.2 Test Requirements

The test time T1 and T2 should be long enough. The rate of PSSCH transmissions on the resources on subchannel #2 shall be less than 10% during T1. The rate of PSSCH transmission s on the resources on subchannel #2 shall be more than 90% during T2.

End of Change 36

Start of Change 37

A.9.1.4.2 Test for V2X UE Resource Pre-emption

A.9.1.4.2.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource pre-emption for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A. 9.1.4.2.1-1and A.12. 9.1.4.1-2 below. There is one active V2X sidelink UE in this test. Both the UE under test and the active V2X sidelink UE select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink UEs. The test parameters for GNSS signals are defined in B.4.1. At the beginning of whole test, the test equipment shall send one message with a SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test needs continuously transmit PSCCH/PSSCH.

The test consists of two duration T1 and T2. During T1, the signal from Test Equipement are configured such that the active V2X sidelink UE is not transmitting. The UE under test shall transmit SL data and reserve future resources. The resource reservation is decoded by the active V2X sidelink UE. The point in time at which resource reservation from the UE under test is decoded by the active V2X sidelink UE defines the start of time period T2. During T2, the active V2X sidelink UE reserves the same resource as the UE under test with high priority data no later than slot n- Tpre-empt.

**Table A. 9.1.4.2.1-1: Test Parameters for V2X UE Resource Pre-emption Tests for PSSCH-RSRP measurements**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | |  | 1 | HD carrier in Band n47 and n38 |
| Channel Bandwidth (BWchannel) Note 1 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool in SL-ResourcePool in sl-TxPoolSelectedNormal-r16 | |  | 10000000000000000000 | Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [3]) Note that this is for Tx pool. |
| sl-TimeResource-r16 included in SL-ResourcePool in sl-RxPool-r16 | |  | 11111111111111111111 | Indicates the time resource of resource pool within *sl-Period*. (see TS 38.213 [3]) Note that this is for Rx pool. |
| sl-NumSubchannel-r16 included in SL-ResourcePool | |  | 1 | Indicates the number of subchannels in the corresponding resource pool, which consists of contiguous PRBs only |
| sl-SubchannelSize-r16 included in SL-ResourcePool | |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool | |  | 10 | Indicates the lowest RB index of the subchannel with the lowest index. |
| Number of Active Sidelink UEs | |  | 1 |  |
| *SL-Thres-RSRP* | |  | 12 | Corresponding -106 dBm as defined in Section 6.3.8 in TS38.331[2] |
| Active Sidelink UEs | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | 11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-StartRB-Subchannel-r16 included in SL-ResourcePool |  | 10 | Indicates the lowest RB index of the subchannel with the lowest index. |
| Sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the minimum granularity in frequency domain for the sensing for PSSCH resource selection in the unit of PRB |
| Timing offset among Active Sidelink Ues | | μs | CP/2 | Synchronous |
| Note 1: The UE is only required to be tested in one of the supported test configurations. | | | | |

**Table A.9.1.4.2.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Resource Pre-emption Tests for PSSCH-RSRP measurements**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Active Sidelink UE** | |
| **T1** | **T2** |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth (BWchannel) Note 3 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD | |
| Note1 | dBm/30 kHz | N/A | -100 |
| PSCCH | dB | 5 |
| PSSCH | dB | 5 |
| PSCCH  Note2 | dB | 5 |
| PSSCH  Note2 | dB | 5 |
| PSSCH-RSRP Note 2 | dBm/30kHz | -95 |
| Io Note 2 | dBm/18MHz | -73.01 |
|  | dBm/36MHz | -73.01 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |
| Note 1: Interference from other Ues and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, PSSCH-RSRP and Io have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: The UE is only required to be tested in one of the supported test configurations. | | | |

A.9.1.4.2.2 Test Requirements

The test time T1 and T2 should be long enough. The UE under test is required to trigger resource reselection and not to transmit on the reserved resource at slot n when the high priority reservation is transmitted by the active V2X sidelink UE before n-Tpre-empt, where

Tpre-empt = T3+Tproc,0

T3 = 5 slots and Tproc,0= 1 slot for FR1.

The rate of PSSCH transmissions on the resources at slot n shall be less than 10% during repeated tests.

End of Change 37

Start of Change 38

A.9.1.4.3 Test for V2X UE Resource Re-evaluation

A.9.1.4.3.1 Test Purpose and Environment

The purpose of this test is to verify the requirements related to autonomous resource re-evaluation for V2X UE in mode 2 defined in clause 12.5. For this test, the UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

The test parameters are given in Table A.9.1.4.3.1-1, A.9.1.4.3.1-2 and A.9.1.4.3.1-3 below. There are 130 active V2X sidelink UEs in this test. The first 100 active V2X sidelink UEs are scheduled with 50ms periodicity. The last 30 active V2X sidelink Ues are aperiodic service UE with retransmission reservation period equaling 15ms.

Both the UE under test and active V2X sidelink Ues select GNSS as synchronization reference source. The test system can emulate and send the GNSS signal to the test UE and active V2X sidelink Ues. The test parameters for GNSS signals are defined in B.4.1.

The test consists of three duration T0, T1, T2.

During T0, the signal from Test Equipement are configured. The resource occupied by the active V2X sidelink UEs is expected to be excluded in the resource selection procedure such that the measured PSSCH-RSRP is above the measurement threshold. The test equipment shall just configure the resource pool for the test UE without the MAC PDU for transmission channel configuration.

During T1, the signal from Test Equipement are configured. Some of the resource occupied by the active V2X sidelink Ues is expected to be excluded in the resource selection procedure such that the measured PSSCH-RSRP is above the measurement threshold and some of the resource occupied by the active V2X sidelink Ues is expected to be included in the resource selection procedure such that the measured PSSCH-RSRP is below the measurement threshold. The test system shall emulate the active V2X sidelink Ues to transmit PSCCH/PSSCH every 50ms according to the RSRP level specified in the Table A. 9.1.4.3.1-2, but UE #0~29 will be silent during T2

At the end of T1, where slot index mod 100 = 99, the test equipment shall send one message with a SL-SCH MAC PDU as specified in Clause 6.1.6 in TS 38.321[7], in order to make sure that the UE under test shall be scheduled to periodically transmit PSCCH/PSSCH.

During T2, the additional aperiodic active V2X sidelink UEs from Test Equipement are configured in the beginning 30 slots, and the resource occupied by these active V2X sidelink UEs is expected to be excluded in the resource re-evaluation procedure such that the measured PSSCH-RSRP is above the measurement threshold shown in Table A. 9.1.4.3.1-2. The test system shall emulate the active V2X sidelink UEs to transmit PSCCH/PSSCH with the maximum number of reserved PSCCH/PSSCH resources equalling n2 and time resource assignment interval as 15ms.

During T2, the test UE is expeted to reselect the resources and transmit the PSCCH/PSSCH in the newly re-evaluated resources.

**Table A.9.1.4.3.1-1: Test Parameters for V2X UE Resource Selection Tests for Re-evaluation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | |  | 1 | HD carrier in Band n47 and n38 |
| Channel Bandwidth (BWchannel) Note 2 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| V2X sidelink communication pre-configuration | |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | |  | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool | |  | 10 |  |
| sl-StartRB-Subchannel-r16 | |  | 0 |  |
| Number of Active Sidelink UEs | |  | 130 | Active Sidelink UE i = 0, .., 129 |
| SL-Thres-RSRP-r16 | |  | 17 | Corresponding -96 dBm as defined in Section 6.3.5 in TS38.331[2] |
| Active Sidelink UEs(UE i=0-99) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize-r16 included in SL-ResourcePool |  | 10 | Indicates the size of sub-channels for TX resource pool |
| sl-ResourceReservePeriod2-r16 | ms | 50 |  |
| Active Sidelink UEs(UE i= 100-129) | V2X sidelink Communication preconfiguration |  | As specified in Table A.3.21.2-2 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213 [3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 | Indicates the number of sub-channels for TX resource pool |
| sl-SubchannelSize included in SL-ResourcePool |  | 10 | Indicates the size of sub-channels for TX resource pool |
| sl-MultiReserveResource-r16 |  | enabled |  |
| sl-MaxNumPerReserve-r16 |  | n2 |  |
| sl-ResourceReservePeriod2-r16 |  | 0 | Unit:ms |
| Timing offset among Active Sidelink UEs | | μs | CP/2 | Synchronous |
| T0 | | s | 1 |  |
| T1 | | ms | 50 |  |
| T2 | | ms | 50 |  |
| Note 1: {1i} is a sequence of ninety-nine 0’s with one 1 in (mod(i,100)+1)’th position.  Note 2: The UE is only required to be tested in one of the supported test configurations. | | | | |

**Table A.9.1.4.3.1-2: Active Sidelink UE Specific Test Parameters for V2X UE Resource Selection Tests for Re-evaluation (UE #0...99)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Active Sidelink UE i**  **(i = 0, .., 99)** | |
| **T1** | **T2** |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth (BWchannel) Note 7 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1A HD | |
| Note1 | dBm/SCS | -103 | |
| PSSCH1  Note 3 | dB | 25.5 | 25.5 |
| PSSCH2  Note 4 | dB | 2 | 2 |
| PSSCH3  Note 5 | dB | 12 | -infinity |
| PSSCH4  Note 6 | dB | 12 | 12 |
| PSSCH1  Note2,3,10 | dB | 25.5 | -0.01 |
| PSSCH1  Note2,3,11 | dB | 25.5 | 25.5 |
| PSSCH2  Note2,4 | dB | 2 | -23.51 |
| PSSCH3  Note2,5 | dB | 12 | -infinity |
| PSSCH4  Note2,6 | dB | 12 | 12 |
| PSSCH -RSRP1 Note 2, 3 | dBm/SCS | -77.5 | -77.5 |
| PSSCH -RSRP2 Note 2, 4 | dBm/SCS | -101 | -101 |
| PSSCH -RSRP3 Note 2, 5 | dBm/SCS | -91 | -infinity |
| PSSCH -RSRP4 Note 2, 6 | dBm/SCS | -91 | -91 |
| Io Note 2, 8 | dBm/18 MHz | -69.94 | -56.70 |
|  | dBm/36 MHz | -69.94 | -56.70 |
| Io Note 2, 9 | dBm/18 MHz | -78.08 | -56.68 |
|  | dBm/36 MHz | -78.08 | -56.68 |
| Io Note 2, 10 | dBm/18 MHz | -56.70 | -53.69 |
|  | dBm/36 MHz | -56.70 | -53.69 |
| Io Note 2, 11 | dBm/18 MHz | -56.70 | -56.70 |
|  | dBm/36 MHz | -56.70 | -56.70 |
| Io Note 2, 12 | dBm/18 MHz | -69.94 | -69.94 |
|  | dBm/36 MHz | -69.94 | -69.94 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |
| Note 1: Interference from other UEs 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: , PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: UE #50~64 and UE #85~99 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #50-64 and #85-99.  Note 4: UE #30~49 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #30-49.  Note 5: UE #0~29 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #0-29.  Note 6: UE #65~84 will periodically occupy the subchannels on the slot with “#slot index mod 100” = #65-84.  Note 7: The UE is only required to be tested in one of the supported configurations.  Note 8: Calculated on slot with “#slot index mod 100” = #0~29.  Note 9: Calculated on slot with “#slot index mod 100” = #30~49.  Note 10: Calculated on slot with “#slot index mod 100” = #50~59.  Note 11: Calculated on slot with “#slot index mod 100” = #60~64 and #85~99.  Note 12: Calculated on slot with “#slot index mod 100” = #65~84. | | | |

**Table A.9.1.4.3.1-3: Active Sidelink UE Specific Test Parameters for V2X UE Resource Selection Tests for Re-evaluation (UE #100…129)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Active Sidelink UE i**  **(i = 100, .., 129)** | |
| **T1** | **T2** |
| NR RF Channel Number | - | 1 | |
| Channel Bandwidth (BWchannel) Note 4 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | |
| PSCCH RMC (defined in A.3.21.3) | - | CC.1A HD | |
| PSSCH RMC (defined in A.3.21.3) | - | CD.1 A HD | |
| Note1 | dBm/SCS | -103 | |
| PSSCH | dB | -infinity | 25.5 |
| PSSCH  Note2,5 | dB | -infinity | 25.5 |
| PSSCH  Note2,6 |  | -infinity | 21.38 |
| PSSCH  Note2,7 |  | -infinity | -0.11 |
| PSSCH-RSRP Note 2, Note 3 | dBm/SCS | -infinity | -77.5 |
| Io Note 2, 5 | dBm/18 MHz | -69.94 | -56.70 |
|  | dBm/36 MHz | -69.94 | -56.70 |
| Io Note 2, 6 | dBm/18 MHz | -78.08 | -56.68 |
|  | dBm/36 MHz | -78.08 | -56.68 |
| Io Note 2, 7 | dBm/18 MHz | -56.70 | -53.69 |
|  | dBm/36 MHz | -56.70 | -53.69 |
| Antenna Configuration | - | 1x2 | |
| Propagation Condition | - | AWGN | |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: Es/Iot, PSSCH-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: UE #100~129 will occupy the subchannels on the slots with “#slot index mod 100”= #0-29 during T2.  Note 4: The UE is only required to be tested in one of the supported configurations.  Note 5: Calculated on slot with “#slot index mod 100” = #0~29.  Note 6: Calculated on slot with “#slot index mod 100” = #30~49.  Note 7: Calculated on slot with “#slot index mod 100” = #50~59. | | | |

A.9.1.4.3.2 Test Requirements

The rate of PSSCH transmissions on the resources of the subchannels which are occupied by UE #65-84 shall be more than 90% during T2.

End of Change 38

Start of Change 39

A.9.1.5 Test for Congestion Control Measurement

A.9.1.5.1 Test Purpose and Environment

The purpose of this test is to verify the congestion control measurement requirements in section 12.6. For UE supporting NR Uu and sidelink operation, this test will also verify that V2X UE makes correct reporting of an event.

The test parameters are given in Table A.9.1.5.1-1, Table A.9.1.5.1-2 , A.9.1.5.1-3 and A.9.1.5.1-4 below. There are 4 active V2X sidelink UEs in this test. The test system shall emulate the active sidelink UE to transmit PSCCH/PSSCH every 50ms. Additionally, For UE supporting NR Uu and sidelink operation, there is an active Cell (Cell 1) in this test. For UE only supporting NR sidelink, There are no active cell and GNSS is reliable during the whole test. The test system can emulate and send the GNSS signal to the test UE. The test parameters for GNSS signals are defined in B.4.1.

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During T1, all of active V2X sidelink UEs are configured to transmit PSCCH/PSSCH with lower transmission power every 50ms. During T2, all of active V2X sidelink UEs are configured to transmit PSCCH/PSSCH with higher transmission power every 50ms.

For UE supporting NR Uu and sidelink operation, the UE under test and all active sidelink UEs select PCell as synchonization source In the measurement control information it is indicated to the V2X UE that event-triggered reporting with Event C1 is used.

For UE only supporting NR sidelink, the UE under test and all active sidelink UEs select GNSS as synchonization source. The UE is triggered by the test loop function or the upper layers to transmit for V2X Sidelink Communication.

For UE supporting NR Uu and sidelink operation, Supported test configurations for FR1 NR cell are shown in Table A.9.1.5.1.1-1.

**Table A.9.1.5.1.1-1: Supported Test Configurations for FR1 NR cell (only for UE supporting both NR Uu and sidelink operation)**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR Uu: FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 2 | NR Uu: TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz |
| 3 | NR Uu: TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz |
| Note: The UE is only required to pass in one of the supported test configurations in FR1 | |

**Table A.9.1.5.1-2: General test parameters for Congestion Control Measurement Test for V2X UE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| NR RF Channel Number | |  | 1 | HD carrier in Band n47 or n38 |
| Channel Bandwidth (BWchannel)Note 2 | | MHz | 20 (NRB,c = 50) or  40 (NRB,c = 100) |  |
| SCS | | kHz | 30 |  |
| V2X sidelink communication configuration | |  | As specified in Table A.3.21.2-1 and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool | |  | 11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111  11111111111111111111 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool | |  | 1 | ENUMERATED {n1} |
| sl-SubchannelSize included in SL-ResourcePool | |  | 10 | ENUMERATED {n10} |
| sl-StartRB-Subchannel-r16 | |  | 0 |  |
| *threshS-RSSI-CBR* | |  | 19 | Corresponding -74dBm as defined in Section 6.3.8 in TS38.331[2] |
| Active Cell Note 3 | |  | Cell 1 |  |
| Number of Active Sidelink UEs every 50ms | |  | 4 | Active Sidelink UE i, where i = 0, 1, 2, 3 |
| Active Sidelink UEs (i = 0,1,2,3) | V2X sidelink Communication configuration |  | As specified in Table A.3.21.2-1  and A.3.21.2-3 | IE values unless specified otherwise in this test. |
| sl-TimeResource-r16 included in SL-ResourcePool |  | {1i}Note1 | Indicates the bitmap of the TX and Rx resource pool, which is defined by repeating the bitmap within a SFN cycle (see TS 38.213[3]) |
| sl-NumSubchannel-r16 included in SL-ResourcePool |  | 1 |  |
| sl-SubchannelSize included in SL-ResourcePool |  | 10 |  |
| Timing offset between V2X UE and Active Sidelink UEs | | μs | CP/2 | Synchronous |
| c1-Threshold-r16Note 3 | |  | 2 | Corresponding 0.02 as defined in Section 6.3.2 in TS38.331[2] |
| sl-CBR-RangeConfigList-r16 Note 4 | |  | [2 100] | Two ranges are defined by this list: 0 to 0.02 and 0.02 to 1 |
| sl-CR-Limit-r16 Note 4 | |  | 10000 and 10 | Corresponding to the two CBR ranges: if CBR > 0.02, CR ≤ 0.001, otherwise CR > 0.001 |
| sl-Thres-RSRP-r16 Note 4 | |  | 12 | Configure threshold <-98.64dBm/30kHz to ensure not blocking transmission |
| Hysteresis | |  | 0 |  |
| Time To Trigger | | s | 0 |  |
| Filter coefficient | |  | 0 | L3 filtering is not used |
| T1 | | s | 5 |  |
| T2 | | s | 5 |  |
| Note 1: {1i}is a sequence of ninety nine 0’s with one 1 in i+1’th position.  Note 2: The UE is only required to be tested in one of the channel bandwidths.  Note 3: Only for UE supporting both Uu and sidelink operation.  Note 4: Only for UE supporting sidelink operation but not supporting Uu. | | | | |

**Table A.9.1.5.1-3: Active sidelink UE specific test parameters for Congestion Control Measurement Test for V2X UE**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Active Sidelink UE *i* (*i* = 0, 1, 2, 3)** | | |
| **T1** | **T2** | |
| NR RF Channel Number |  | 1 | | |
| Channel Bandwidth (BWchannel) Note 7 | MHz | 20 (NRB,c = 50) or 40 (NRB,c = 100) | | |
| PSCCH RMC (defined in A.3.21.3) |  | CC.1A HD | | |
| PSSCH RMC (defined in A.3.21.3) |  | CD.1A HD | | |
| Note1 | dBm/30 kHz | -103 | | |
|  | dB | 4.35 | | 10.32 |
| SL-RSSI1 Note 2,3 | dBm/3.6 MHz | -76.5 | | -71.5 |
| SL-RSSI2 Note 2,4 | dBm/3.6 MHz | -82.21 | | -82.21 |
| Io1 Note 2,5 | dBm/18 MHz | -76.5 | | -71.5 |
|  | dBm/36 MHz | -76.5 | | -71.5 |
| Io2 Note 2,6 | dBm/18 MHz | -82.21 | | -82.21 |
|  | dBm/36 MHz | -82.21 | | -82.21 |
| Propagation Condition | - | AWGN | | |
| Note 1: Interference from other UEs 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: SL-RSSI1, SL-RSSI2, Io1 and Io2 levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: SL-RSSI1 is the SL-RSSI level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.  Note 4: SL-RSSI2 is the SL-RSSI level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.  Note 5: Io1 is the Io level measured on the slot# 0 - 3 with “SFN mod 5 = 0”.  Note 6: Io2 is the Io level measured on the slot# 4-9 with “SFN mod 5 = 0” and the slot# 0-9 with “SFN mod 5 = 1,…, 4”.  Note 7: The UE is only required to be tested in one of the supported test configurations. | | | | |

**Table A.9.1.5.1-4: Cell Test Parameters for Congestion Control Measurement Test for V2X UE (only for UE supporting both NR Uu and sidelink operation)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** |
| RF Channel Number | |  | 2 |
| Duplex Mode | Config 1 |  | FDD |
| Config 2,3 |  | TDD |
| TDD configuration | Config 1 |  | Not Applicable |
| Config 2 |  | TDDConf.1.1 |
| Config 3 |  | TDDConf.2.1 |
| Channel Bandwidth (BWchannel) | Config 1,2 | MHz | 10: NRB,c = 52 |
| Config 3 | 40: NRB,c = 106 |
| Initial BWP Configuration | |  | DLBWP.0.1  ULBWP.0.1 |
| Dedicated BWP Configuration | |  | DLBWP.1.1  ULBWP.1.1 |
| DRX Cycle | |  | N/A |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET Reference Channel | Config 1 |  | CCR.1.1 FDD |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| SSB configuration | Config 1,2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC Configuration | |  | SMTC.2 |
| OCNG Patterns | |  | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note2 | Config 1,2,3 | dBm/15 kHz | -98 |
| Note2 | Config 1,2 | dBm/SCS | -98 |
| Config 3 | -95 |
|  | | dB | 3 |
| SS-RSRP Note3 | Config 1,2 | dBm/SCS | -95 |
| Config 3 | -92 |
| Io Note 3 | Config 1,2 | dBm/9.36 MHz | -65.2 |
| Config 3 | dBm/38.1 MHz | -59.2 |
| Propagation Condition | |  | AWGN |
| Note 1: OCNG shall be used such that cell is 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.9.1.5.2 Test Requirements

For UEs that support NR Uu and sidelink operation, the UEs shall not send event C1 triggered measurement reports during T1 and shall send event C1 triggered measurement reports during T2.

For UEs that support sidelink operation only, the UE channel occupancy ratio shall be larger than 0.001 during T1, and the UE channel occupancy ratio shall be no larger than 0.001 during T2.

The rate of correct events observed during repeated tests shall be at least 98%.

End of Change 39

Start of Change 40

A.6.3.1.7 Intra-frequency synchronous DAPS handover in FR1

A.6.3.1.7.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency DAPS handover requirements in synchronous scenario specified in clause 6.1.3.2.

A.6.3.1.7.2 Test Parameters

Supported test configurations are shown in Table A.6.3.1.7.2-1. Both handover delay and interruption length are tested by using the parameters in Table A.6.3.1.7.2-2, and A.6.3.1.7.2-3.The test consists of five successive time periods, with time durations of T1, T2, T3, T4, and T5 respectively.

Before the start of T1, the UE is connected to the cell1 and not aware of the cell2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE does not have any timing information of the cell2.

Starting T2, the cell2 becomes detectable. During T2, the UE performs cell detection and measurements on the cell2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the last TTI containing DAPS handover command is sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the cell2 while the DL scheduling and UL feedback in the cell1 shall be avoided. After successful RACH procedure of the cell2, UE is scheduled with PDSCH from cell1 and cell2 in alternative TTIs where both cell1 and cell2 belong to the same TAG. In the end the network sends a RRC message implying cell1 release to the UE. During T3, the handover delay Dhandover1 for target cell addition need to be verified.

The start of T4 is the instant when the last TTI containing cell1 release command is sent to the UE. During T4, the UE shall accomplish the release actions within Dhandover2.

Starting T5, the UE stops sending the periodical CSI report to the cell1.

**Table A.6.3.1.7.2-1: Intra-frequency DAPS handover in FR1 test configurations**

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

**Table A.6.3.1.7.2-2: General test parameters synchronous Intra-frequency DAPS handover in FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| 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 |  |
| T4 | | ms | Dhandover2 | DHandover2­ is defined in clause 6.1.3.2.1 |
| T5 | | ms | 100 |  |

**Table A.6.3.1.7.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency DAPS handover test case**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | |
|  | |  | **T1** | **T2 - T5** | **T1** | **T2 - T5** |
| NR RF Channel Number | |  | 1 | | 1 | |
| Duplex mode | Config 1 |  | FDD | | | |
| Config 2,3 |  | TDD | | | |
| TDD configuration | Config 1 |  | Not Applicable | | | |
| Config 2 |  | TDDConf.1.1 | | | |
| Config 3 |  | TDDConf.2.1 | | | |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 | | | |
| Config 2 |  | 10: NRB,c = 52 | | | |
| Config 3 |  | 40: NRB,c = 106 | | | |
| BWP BW | Config 1 | MHz | 10: NRB,c = 52 | | | |
| Config 2 |  | 10: NRB,c = 52 | | | |
| Config 3 |  | 40: NRB,c = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | | | |
| Config 2 |  | SR.1.1 TDD | | | |
| Config 3 |  | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | | | |
| Config 2 |  | CR.1.1 TDD | | | |
| Config 3 |  | CR.2.1 TDD | | | |
| TRS configuration | Config 1 |  | TRS.1.1 FDD | | | |
| Config 2 |  | TRS.1.1 TDD | | | |
| Config 3 |  | TRS.1.2 TDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 FDD | | | |
| Config 2 |  | CSI-RS.1.1 TDD | | | |
| Config 3 |  | CSI-RS.2.1 TDD | | | |
| reportConfigType | |  | periodic | | N/A | |
| reportQuantity | |  | cri-RI-PMI-CQI | | N/A | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | N/A | |
| Config 3 |  | 10 | | N/A | |
| CSI reporting offset | Config 1,2 | slot | 3 | | N/A | |
| Config 3 |  | 5 | | N/A | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | Config 1,2 |  | SSB.1 FR1 | | | |
| Config 3 | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| Config 3 | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| Config 3 | 30 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDSCH to PDSCH | |  |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | | | |
| Note2 | | dBm/15kHz | -98 | | | |
| Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| Config 3 | -95 | | | |
|  | | dB | 8 | -1.5 | -Infinity | 0.36 |
|  | | dB | 8 | 8 | -Infinity | 9 |
| SSB\_RP | Config 1,2 | dBm/SCS | -90 | -90 | -Infinity | -89 |
| Config 3 | dBm/SCS | -87 | -87 | -Infinity | -86 |
| IoNote3 | Config 1,2 | dBm/  9.36MHz | -61.41 | -58.21 | -61.41 | -58.21 |
| Config 3 | dBm/  38.16MHz | -55.31 | -52.11 | -55.31 | -52.11 |
| 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.6.3.1.7.3 Test Requirements

The UE shall start to transmit the PRACH to cell 2 less than 72 ms from the beginning of time period T3.

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

NOTE: The target cell add delay Dhandover1 can be expressed as: TRRC\_procedure + Tsearch + TIU + Tprocessing + T∆ + Tmargin, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

Tsearch, TIU, Tprocessing, T∆ and Tmargin are defined in clause 6.1.1.2.2.

If the target cell is known, then Tsearch = 0 ms

TIU = 20 ms in the test. TIU is defined in clause 6.1.1.2.2.

T∆ = 20 ms in the test. T∆ is defined in clause 6.1.1.2.2.

Tprocessing = 20 ms in the test. Tprocessing is defined in clause 6.1.1.2.2.

Tmargin = 2 ms in the test. Tmargin is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

After successful RACH to cell 2and until the start of time period T4, UE shall be able to receive PDSCH alternatively from cell 1 and cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release cell 1 less than Dhandover2 = (TRRC\_procedure + Tinterrupt2) from the beginning of time period T4.

NOTE: Dhandover2 is defined in clause 6.1.3.2.1.

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

Tinterrupt2 is defined in clause 6.1.3.2.2.

UE shall not report CSI to cell 1 during T5.

A.6.3.1.8 Intra-frequency asynchronous DAPS handover in FR1

A.6.3.1.8.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra frequency DAPS handover requirements in asynchronous scenario specified in clause 6.1.3.2.

A.6.3.1.8.2 Test Parameters

Supported test configurations are shown in Table A.6.3.1.8.2-1. Both handover delay and interruption length are tested by using the parameters in Table A.6.3.1.8.2-2, and A.6.3.1.8.2-3.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4, and T5 respectively.

Before the start of T1, the UE is connected to the cell1 and not aware of the cell2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE does not have any timing information of the cell2.

Starting T2, the cell2 becomes detectable. During T2, the UE performs cell detection and measurements on the cell2 and shall send event report to the network. After receiving the event report A3, the network sends a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the last TTI containing DAPS handover command is sent to the UE. During T3, UE shall be able to perform random access, DL reception or UL transmission in the cell2 while the DL scheduling and UL feedback in the cell1 shall be avoided. After successful RACH procedure of the cell2, UE is scheduled with PDSCH from cell1 and cell2 in alternative TTIs where both cell1 and cell2 belong to the same TAG. In the end the network sends a RRC message implying cell1 release to the UE. During T3, the handover delay Dhandover1 for target cell addition needs to be verified.

The start of T4 is the instant when the last TTI containing cell1 release command is sent to the UE by cell2. During T4, the UE shall accomplish the release actions within Dhandover2.

Starting T5, the UE stops sending the periodical CSI report to the cell1.

**Table A.6.3.1.8.2-1: Intra-frequency DAPS handover in FR1 test configurations**

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

**Table A.6.3.1.8.2-2: General test parameters Intra-frequency asynchronous DAPS handover in FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| 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 | |  | 7 μs | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |
| T4 | | ms | Dhandover2 | DHandover2­ is defined in clause 6.1.3.2.1 |
| T5 | | ms | 100 |  |

**Table A.6.3.1.8.2-3: Cell specific test parameters for NR FR1-FR1 Intra frequency DAPS handover test case**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | |
|  | |  | **T1** | **T2 - T5** | **T1** | **T2 - T5** |
| NR RF Channel Number | |  | 1 | | 1 | |
| Duplex mode | Config 1 |  | FDD | | | |
|  | Config 2,3 |  | TDD | | | |
| TDD configuration | Config 1 |  | Not Applicable | | | |
|  | Config 2 |  | TDDConf.1.1 | | | |
|  | Config 3 |  | TDDConf.2.1 | | | |
| BWchannel | Config 1,2 | MHz | 10: NRB,c = 52 | | | |
|  | Config 3 |  | 40: NRB,c = 106 | | | |
| BWP BW | Config 1,2 | MHz | 10: NRB,c = 52 | | | |
|  | Config 3 |  | 40: NRB,c = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference | Config 1 |  | SR.1.1 FDD | | | |
| measurement channel | Config 2 |  | SR.1.1 TDD | | | |
|  | Config 3 |  | SR.2.1 TDD | | | |
| CORESET Reference | Config 1 |  | CR.1.1 FDD | | | |
| Channel | Config 2 |  | CR.1.1 TDD | | | |
|  | Config 3 |  | CR.2.1 FDD | | | |
| TRS configuration | Config 1 |  | TRS.1.1 FDD | | | |
|  | Config 2 |  | TRS.1.1 TDD | | | |
|  | Config 3 |  | TRS.1.2 TDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| CSI-RS configuration for | Config 1 |  | CSI-RS.1.1 FDD | | | |
| CSI reporting | Config 2 |  | CSI-RS.1.1 TDD | | | |
|  | Config 3 |  | CSI-RS.2.1 TDD | | | |
| reportConfigType | |  | periodic | | N/A | |
| reportQuantity | |  | cri-RI-PMI-CQI | | N/A | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | N/A | |
|  | Config 3 |  | 10 | | N/A | |
| CSI reporting offset | Config 1,2 | slot | 3 | | N/A | |
|  | Config 3 |  | 5 | | N/A | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | Config 1,2 |  | SSB.1 FR1 | | | |
|  | Config 3 |  | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier | Config 1,2 | kHz | 15 | | | |
| spacing | Config 3 |  | 30 | | | |
| PUCCH/PUSCH subcarrier | Config 1,2 | kHz | 15 | | | |
| spacing | Config 3 |  | 30 | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDSCH to PDSCH | |  |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | | | |
| Note2 | | dBm/15kHz | -98 | | | |
| Note2 | Config 1,2 | dBm/SCS | -98 | | | |
|  | Config 3 |  | -95 | | | |
|  | | dB | 8 | -1.5 | -Infinity | 0.36 |
|  | | dB | 8 | 8 | -Infinity | 9 |
| SSB\_RP | Config 1,2 | dBm/SCS | -90 | -90 | -Infinity | -89 |
|  | Config 3 |  | -87 | -87 | -Infinity | -86 |
| IoNote3 | Config 1,2 | dBm/  9.36MHz | -61.41 | -58.21 | -61.41 | -58.21 |
|  | Config 3 | dBm/  38.16MHz | -55.31 | -52.11 | -55.31 | -52.11 |
| 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.6.3.1.8.3 Test Requirements

The UE shall start to transmit the PRACH to cell 2 less than 72 ms from the beginning of time period T3.

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

NOTE: The target cell add delay Dhandover1 can be expressed as: TRRC\_procedure + Tsearch + TIU + Tprocessing + T∆ + Tmargin, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

Tsearch, TIU, Tprocessing, T∆ and Tmargin are defined in clause 6.1.1.2.2.

If the target cell is known, then Tsearch = 0 ms

TIU = 20 ms in the test. TIU is defined in clause 6.1.1.2.2.

T∆ = 20 ms in the test. T∆ is defined in clause 6.1.1.2.2.

Tprocessing = 20 ms in the test. Tprocessing is defined in clause 6.1.1.2.2.

Tmargin = 2 ms in the test. Tmargin is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

After successful RACH to cell 2and until the start of time period T4, UE shall be able to receive PDSCH alternatively from cell 1 and cell 2. UE is not expected to transmit UL to both cell 1 and cell 2 in the same TTI.

The UE shall release cell 1 less than Dhandover2 = (TRRC\_procedure + Tinterrupt2) from the beginning of time period T4.

NOTE: Dhandover2 is defined in clause 6.1.3.2.1.

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

Tinterrupt2 is defined in clause 6.1.3.2.2.

UE shall not report CSI to cell 1 during T5.

A.6.3.1.9 Intra-band inter-frequency synchronous DAPS handover test in SA for FR1

A.6.3.1.9.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency synchronous DAPS handover requirements specified in clause 6.1.3.2.

A.6.3.1.9.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.9.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.9.2-2, and A.6.3.1.9.2-3.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. The UE shall be configured with periodic CSI reporting for cell1. The test scenario comprises of two carriers and one cell on each carrier. Gap pattern ID gp0 as specified in Table 9.1.2-1 is configured before T2 in the test case.

Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A3. After receiving the Event A3, the test system shall send a RRC message implying DAPS handover to the UE.

T3 is defined as the end of the last TTI containing the RRC message implying DAPS handover. During T3 UE shall be able to perform random access to cell 2. Cell 1 is continuously scheduled in DL during T3. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perfrom DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. At the end of T3 cell 2 shall send an RRC message implying cell 1 release command.

T4 is defined as the end of the last TTI containing the RRC message implying DAPS handover. Cell 2 is continuously scheduled in DL during T4. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

**Table A.6.3.1.9.2-1: Intra-band inter-frequency synchronous DAPS handover in SA for FR1 test configurations**

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

**Table A.6.3.1.9.2-2: General test parameters for intra-band inter-frequency synchronous DAPS handover test in SA for FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| 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 |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |
| T4 | | ms | 10 + Tinterrupt2 | Tinterrupt2­ is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-5 |
| T5 | | ms | 100 |  |

**Table A.6.3.1.9.2-3: Cell specific test parameters for intra-band inter-frequency synchronous DAPS handover test in SA for FR1**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | |
|  | |  | **T1** | **T2 - T5** | **T1** | **T2 - T5** |
| NR RF Channel Number | |  | 1 | | 2 | |
| Duplex mode | Config 1 |  | FDD | | | |
| Config 2,3 |  | TDD | | | |
| TDD configuration | Config 1 |  | Not Applicable | | | |
| Config 2 |  | TDDConf.1.1 | | | |
| Config 3 |  | TDDConf.2.1 | | | |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 | | | |
| Config 2 |  | 10: NRB,c = 52 | | | |
| Config 3 |  | 40: NRB,c = 106 | | | |
| BWP BW | Config 1 | MHz | 10: NRB,c = 52 | | | |
| Config 2 |  | 10: NRB,c = 52 | | | |
| Config 3 |  | 40: NRB,c = 106 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | | | |
| Config 2 |  | SR.1.1 TDD | | | |
| Config 3 |  | SR.2.1 TDD | | | |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | | | |
| Config 2 |  | CR.1.1 TDD | | | |
| Config 3 |  | CR.2.1 TDD | | | |
| TRS configuration | Config 1 |  | TRS.1.1 FDD | | | |
| Config 2 |  | TRS.1.1 TDD | | | |
| Config 3 |  | TRS.1.2 TDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 FDD | | | |
| Config 2 |  | CSI-RS.1.1 TDD | | | |
| Config 3 |  | CSI-RS.2.1 TDD | | | |
| reportConfigType | |  | periodic | | N/A | |
| reportQuantity | |  | cri-RI-PMI-CQI | | N/A | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | N/A | |
| Config 3 |  | 10 | | N/A | |
| CSI reporting offset | Config 1,2 | slot | 3 | | N/A | |
| Config 3 |  | 5 | | N/A | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | Config 1,2 |  | SSB.1 FR1 | | | |
| Config 3 | SSB.2 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| Config 3 | 30 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | |
| Config 3 | 30 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDSCH to PDSCH | |  |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | | | |
| Note2 | | dBm/15kHz | -98 | | | |
| Note2 | Config 1,2 | dBm/SCS | -98 | | | |
| Config 3 | -95 | | | |
|  | | dB | 8 | 8 | -Infinity | 8 |
|  | | dB | 8 | 8 | -Infinity | 8 |
| SSB\_RP | Config 1,2 | dBm/SCS | -90 | -90 | -Infinity | -90 |
| Config 3 | dBm/SCS | -87 | -87 | -Infinity | -87 |
| IoNote3 | Config 1,2 | dBm/  9.36MHz | -61.41 | -61.41 | -70.05 | -61.41 |
| Config 3 | dBm/  38.16MHz | -55.31 | -55.31 | -63.94 | -55.31 |
| 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.6.3.1.9.3 Test Requirements

The UE shall start to transmit the PRACH to cell 2 less than 72 ms from the beginning of time period T3.

During T3 UE is allowed to cause Tinterrupt1 interruption to cell 1. Tinterrupt1 is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause Tinterrupt2 interruption to cell 1. Tinterrupt2 is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-5.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

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

A.6.3.1.10 Intra-band inter-frequency asynchronous DAPS handover test in SA for FR1

A.6.3.1.10.1 Test Purpose and Environment

This test is to verify the requirement for the NR FR1-NR FR1 intra-band inter-frequency asynchronous DAPS handover requirements specified in clause 6.1.3.2.

A.6.3.1.10.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.10.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.10.2-2, and A.6.3.1.10.2-3.

The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively. At the start of time duration T1, the UE may not have any timing information of cell 2. The UE shall be configured with periodic CSI reporting for cell1. The test scenario comprises of two carriers and one cell on each carrier. Gap pattern ID gp0 as specified in Table 9.1.2-1 is configured before T2 in the test case.

Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A3. After receiving the Event A3, the test system shall send a RRC message implying DAPS handover to the UE.

T3 is defined as the end of the last TTI containing the RRC message implying DAPS handover. During T3 UE shall be able to perform random access to cell 2. Cell 1 is continuously scheduled in DL during T3. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perfrom DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. At the end of T3 cell 2 shall send an RRC message implying cell 1 release command.

T4 is defined as the end of the last TTI containing the RRC message implying DAPS handover. Cell 2 is continuously scheduled in DL during T4. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell. And the test system shall observe the periodic reporting of CSI for cell 1 during T5.

**Table A.6.3.1.10.2-1: Intra-band inter-frequency asynchronous DAPS handover in SA for FR1 test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.6.3.1.10.2-2: General test parameters for intra-band inter-frequency asynchronous DAPS handover test in SA for FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| 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 | |  | 10 μs | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | ≤5 |  |
| T3 | | s | 1 |  |
| T4 | | ms | 10 + Tinterrupt2 | Tinterrupt2­ is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-5 |
| T5 | | ms | 100 |  |

**Table A.6.3.1.10.2-3: Cell specific test parameters for intra-band inter-frequency asynchronous DAPS handover test in SA for FR1**



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | **Cell 2** | |
|  | |  | **T1** | **T2 - T5** | **T1** | **T2 - T5** |
| NR RF Channel Number | |  | 1 | | 2 | |
| Duplex mode | Config 1 |  | FDD | | | |
| TDD configuration | Config 1 |  | Not Applicable | | | |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 | | | |
| BWP BW | Config 1 | MHz | 10: NRB,c = 52 | | | |
| DRX Cycle | | ms | Not Applicable | | | |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | | | |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | | | |
| TRS configuration | Config 1 |  | TRS.1.1 FDD | | | |
| OCNG Patterns | |  | OP.1 | | | |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 FDD | | | |
| reportConfigType | |  | periodic | | N/A | |
| reportQuantity | |  | cri-RI-PMI-CQI | | N/A | |
| CSI reporting periodicity | Config 1 | slot | 5 | | N/A | |
| CSI reporting offset | Config 1 | slot | 3 | | N/A | |
| SMTC Configuration | |  | SMTC.1 | | | |
| SSB Configuration | Config 1 |  | SSB.1 FR1 | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1 | kHz | 15 kHz | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1 | kHz | 15 kHz | | | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | | | |
| BWP configuration | Initial DL BWP |  | DLBWP.0.1 | | | |
| Dedicated DL BWP |  | DLBWP.1.1 | | | |
| Initial UL BWP |  | ULBWP.0.1 | | | |
| Dedicated UL BWP |  | ULBWP.1.1 | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | | | |
| EPRE ratio of PDSCH to PDSCH | |  |  | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | | | |
| Note2 | | dBm/15kHz | -98 | | | |
| Note2 | Config 1 | dBm/SCS | -98 | | | |
|  | | dB | 8 | 8 | -Infinity | 8 |
|  | | dB | 8 | 8 | -Infinity | 8 |
| SSB\_RP | Config 1 | dBm/SCS | -90 | -90 | -Infinity | -90 |
| IoNote3 | Config 1 | dBm/  9.36MHz | -61.41 | -61.41 | -70.05 | -61.41 |
| 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.6.3.1.10.3 Test Requirements

The UE shall start to transmit the PRACH to cell 2 less than 72 ms from the beginning of time period T3.

During T3 UE is allowed to cause Tinterrupt1 interruption to cell 1. Tinterrupt1 is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-2. When UE is transmitting PRACH preamble to cell 2, interruption to cell 1 is allowed.

During T4 UE is allowed to cause Tinterrupt2 interruption to cell 1. Tinterrupt2 is defined in clause 6.1.3.2.2 Table 6.1.3.2.2-5.

UE shall finish cell 1 release in T4 and shall not send any CSI reports to cell 1 during T5.

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

A.6.3.1.11 Inter-band inter-frequency synchronous DAPS handover from FR1 to FR1

A.6.3.1.11.1 Test Purpose and Environment

This test is to verify the requirement for the FR1-to-FR1 inter-band inter-frequency synchronous DAPS handover requirements specified in clause 6.1.3.2.

A.6.3.1.11.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.11.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.11.2-2, A.6.3.1.11.2-3 and A.6.3.1.11.2-4.

The test scenario comprises of two bands each with one cell. The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to Cell 1 (source PCell) on radio channel 1 but is not aware of Cell 2 (neighbour cell) on radio channel 2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE shall not have any timing information of Cell 2.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A3 is configured for neighbour cell (Cell 2), and the UE is configured with the measurement gaps (gap pattern ID # 0). Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A3. After receiving the Event A3, the test system shall send a RRC m`essage implying DAPS handover to the UE.

The start of T3 is the instant when the last TTI containing the RRC message implying DAPS handover to Cell 2 (target PCell) is sent to the UE. During T3, the UE shall be able to perform random access to Cell 2. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After the RACH procedure is completed, the test system shall send a RRC message to the UE to release Cell 1 (source cell) on radio channel 1.

The start of T4 is the instant when the last TTI containing the RRC message implying source cell release is sent to the UE. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell.

**Table A.6.3.1.11.2-1: Inter-band inter-frequency synchronous DAPS handover from FR1 to FR1 test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 5 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 7 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 9 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.6.3.1.11.2-2: General test parameters for inter-band inter-frequency synchronous DAPS handover from FR1 to FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 | PCell on RF channel number 1 |
|  | Neighbouring cell |  | Cell 2 | Neighbour cell on RF channel number 2 |
| Final condition | Active cell |  | Cell 2 | PCell on RF channel number 2 |
|  | Neighbouring cell |  | Cell 1 | Neighbour cell on RF channel number 1 |
| A3-Offset | | dB | -6 |  |
| 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 | | μs | 33 | Synchronous cells |
| DRX | |  | OFF |  |
| Measurement gap pattern Id | |  | #0 | Gaps are configured before T2. |
| T1 | | s | 5 |  |
| T2 | | s | <5 |  |
| T3 | | s | <0.5 |  |
| T4 | | ms | 10+Tinterrupt2 | Tinterrupt2 as defined in Table 6.1.3.2.2-6 for synchronous DAPS HO |
| T5 | | ms | 100 |  |

**Table A.6.3.1.11.2-3: Cell specific test parameters for inter-band inter-frequency synchronous** **DAPS handover from FR1 to FR1 (Cell 1)**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | |
|  | |  | **T1** | **T2 – T5** |
| NR RF Channel Number | |  | 1 | |
| Duplex mode | Config 1,4,7 |  | FDD | |
|  | Config 2,3,5,6,8,9 |  | TDD | |
| TDD configuration | Config 1,4,7 |  | Not Applicable | |
|  | Config 2,5,8 |  | TDDConf.1.1 | |
|  | Config 3,6,9 |  | TDDConf.2.1 | |
| BWchannel | Config 1,4,7 | MHz | 10: NRB,c = 52 | |
|  | Config 2,5,8 |  | 10: NRB,c = 52 | |
|  | Config 3,6,9 |  | 40: NRB,c = 106 | |
| BWP BW | Config 1,4,7 | MHz | 10: NRB,c = 52 | |
|  | Config 2,5,8 |  | 10: NRB,c = 52 | |
|  | Config 3,6,9 |  | 40: NRB,c = 106 | |
| TRS configuration | Config 1,4,7 |  | TRS.1.1 FDD | |
|  | Config 2,5,8 |  | TRS.1.1 TDD | |
|  | Config 3,6,9 |  | TRS.1.2 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4,7 |  | SR.1.1 FDD | |
| Config 2,5,8 |  | SR.1.1 TDD | |
| Config 3,6,9 |  | SR.2.1 TDD | |
| CORESET Reference Channel | Config 1,4,7 |  | CR.1.1 FDD | |
| Config 2,5,8 |  | CR.1.1 TDD | |
| Config 3,6,9 |  | CR.2.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| CSI-RS configuration for CSI reporting | Config 1,4,7 |  | CSI-RS.1.1 FDD | |
| Config 2,5,8 |  | CSI-RS.1.1 TDD | |
| Config 3,6,9 |  | CSI-RS.2.1 TDD | |
| reportConfigType | |  | periodic | |
| reportQuantity | |  | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5,7,8 | slot | 5 | |
| Config 3,6,9 |  | 10 | |
| CSI reporting offset | Config 1,2,4,5,7,8 | slot | 3 | |
| Config 3,6,9 |  | 5 | |
| SMTC Configuration | |  | SMTC.1 | |
| SSB Configuration | Config 1,2,4,5,7,8 |  | SSB.1 FR1 | |
| Config 3,6,9 | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| Config 3,6,9 | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| Config 3,6,9 | 30 kHz | |
| PRACH configuration | |  | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | |
|  | Initial UL BWP |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |
| Note2 | | dBm/15kHz | -98 | -98 |
| Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | -98 |
| Config 3,6,9 |  | -95 | -95 |
|  | | dB | 4 | 4 |
|  | | dB | 4 | 4 |
| SSB\_RP | Config 1,2,4,5,7,8 | dBm/SCS | -94 | -94 |
| Config 3,6,9 | dBm/SCS | -91 | -91 |
| IoNote3 | Config 1,2,4,5,7,8 | dBm/  9.36MHz | -64.59 | -64.59 |
| Config 3,6,9 | dBm/  38.16MHz | -58.49 | -58.49 |
| Propagation condition | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

**Table A.6.3.1.11.2-4: Cell specific test parameters for inter-band inter-frequency synchronous DAPS handover from FR1 to FR1 (Cell 2)**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** | |
|  | |  | **T1** | **T2-T5** |
| NR RF Channel Number | |  | 2 | |
| Duplex mode | Config 1,2,3 |  | FDD | |
|  | Config 4,5,6,7,8,9 |  | TDD | |
| TDD configuration | Config 1,2,3 |  | Not Applicable | |
|  | Config 4,5,6 |  | TDDConf.1.1 | |
|  | Config 7,8,9 |  | TDDConf.2.1 | |
| BWchannel | Config 1,2,3 | MHz | 10: NRB,c = 52 | |
|  | Config 4,5,6 |  | 10: NRB,c = 52 | |
|  | Config 7,8,9 |  | 40: NRB,c = 106 | |
| BWP BW | Config 1,2,3 | MHz | 10: NRB,c = 52 | |
|  | Config 4,5,6 |  | 10: NRB,c = 52 | |
|  | Config 7,8,9 |  | 40: NRB,c = 106 | |
| TRS configuration | Config 1,2,3 |  | TRS.1.1 FDD | |
|  | Config 4,5,6 |  | TRS.1.1 TDD | |
|  | Config 7,8,9 |  | TRS.1.2 TDD | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 |  | SR.1.1 FDD | |
|  | Config 4,5,6 |  | SR.1.1 TDD | |
|  | Config 7,8,9 |  | SR2.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 |  | CR.1.1 FDD | |
|  | Config 4,5,6 |  | CR.1.1 TDD | |
|  | Config 7,8,9 |  | CR2.1 TDD | |
| OCNG Patterns | |  | OCNG pattern 1 | |
| CSI-RS configuration for CSI reporting | Config 1,2,3 |  | CSI-RS.1.1 FDD | |
|  | Config 4,5,6 |  | CSI-RS.1.1 TDD | |
|  | Config 7,8,9 |  | CSI-RS.2.1 TDD | |
| SMTC Configuration | |  | SMTC pattern 1 | |
| SSB Configuration | Config 1,2,3,4,5,6 |  | SSB.1 FR1 | |
| Config 7,8,9 | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3,4,5,6 | kHz | 15 kHz | |
| Config 7,8,9 | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3,4,5,6 | kHz | 15 kHz | |
| Config 7,8,9 | 30 kHz | |
| PRACH configuration | |  | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | |
|  | Initial UL BWP |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |
| Note2 | | dBm/15kHz | -98 | -98 |
| Note2 | Config 1,2,3,4,5,6 | dBm/SCS | -98 | -98 |
|  | Config 7,8,9 |  | -95 | -95 |
|  | | dB | -Infinity | 4 |
|  | | dB | -Infinity | 4 |
| SSB\_RP | Config 1,2,3,4,5,6 | dBm/SCS | -Infinity | -94 |
|  | Config 7,8,9 | dBm/SCS | -Infinity | -91 |
| IoNote3 | Config 1,2,3,4,5,6 | dBm/  9.36MHz | -70.05 | -64.59 |
|  | Config 7,8,9 | dBm/  38.16MHz | -63.94 | -58.49 |
| Propagation condition | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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.6.3.1.11.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3. During Dhandover1, the interruption on Cell 1 shall not exceed Tinterrupt1 as defined in Table 6.1.3.2.2-3 for synchronous DAPS HO.

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

NOTE: The handover delay Dhandover1 can be expressed as: TRRC\_procedure + TIU + Tprocessing + T∆ + Tmargin, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

TIU = 20 ms in the test. TIU is defined in clause 6.1.1.2.2.

T∆ = 20 ms in the test. T∆ is defined in clause 6.1.1.2.2.

Tprocessing = 20 ms in the test. Tprocessing is defined in clause 6.1.1.2.2.

Tmargin = 2 ms in the test. Tmargin is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than (10 ms + Tinterrupt2) from the beginning of time period T4. During Dhandover2, the interruptionon Cell 2 shall not exceed Tinterrupt2 as defined in Table 6.1.3.2.2-6 for synchronous DAPS HO.

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

NOTE: The handover delay Dhandover2 can be expressed as: TRRC\_procedure + Tinterrupt2, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

A.6.3.1.12 Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1

A.6.3.1.12.1 Test Purpose and Environment

This test is to verify the requirement for the FR1-to-FR1 inter-band inter-frequency asynchronous DAPS handover requirements specified in clause 6.1.3.2.

A.6.3.1.12.2 Test Parameters

Supported test configurations are shown in table A.6.3.1.12.2-1. Both handover delay and interruption length are tested by using the parameters in table A.6.3.1.12.2-2, A.6.3.1.12.2-3 and A.6.3.1.12.2-4.

The test scenario comprises of two bands each with one cell. The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to Cell 1 (source PCell) on radio channel 1 but is not aware of Cell 2 (neighbour cell) on radio channel 2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE shall not have any timing information of Cell 2.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A3 is configured for neighbour cell (Cell 2), and the UE is configured with the measurement gaps (gap pattern ID # 0). Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A3. After receiving the Event A3, the test system shall send a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the last TTI containing the RRC message implying DAPS handover to Cell 2 (target PCell) is sent to the UE. During T3, the UE shall be able to perform random access to Cell 2. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After the RACH procedure is completed, the test system shall send a RRC message to the UE to release Cell 1 (source cell) on radio channel 1.

The start of T4 is the instant when the last TTI containing the RRC message implying source cell release is sent to the UE. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell.

**Table A.6.3.1.12.2-1: Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1 test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 5 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 6 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 7 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 8 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| 9 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.6.3.1.12.2-2: General test parameters for inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell | |  | Cell 1 |  |
|  | Neighbouring cell | |  | Cell 2 |  |
| Final condition | Active cell | |  | Cell 2 |  |
| A3-Offset | | | dB | -4 |  |
| 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 | | Config 1,2,4,5 | ms | 0.5 | Asynchronous cells |
|  | | Config3,6,7,8,9 | ms | 0.25 |
| DRX | | |  | OFF |  |
| Measurement gap pattern Id | | |  | #0 | Gaps are configured before T2. |
| T1 | | | s | 5 |  |
| T2 | | | s | <5 |  |
| T3 | | | s | <0.5 |  |
| T4 | | | ms | 10+Tinterrupt2 | Tinterrupt2 as defined in Table 6.1.3.2.2-6 for asynchronous DAPS HO. |
| T5 | | | ms | 100 |  |

**Table A.6.3.1.12.2-3: Cell specific test parameters for inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1 (Cell 1)**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | |
|  | |  | **T1** | **T2 – T5** |
| NR RF Channel Number | |  | 1 | |
| Duplex mode | Config 1,4,7 |  | FDD | |
|  | Config 2,3,5,6,8,9 |  | TDD | |
| TDD configuration | Config 1,4,7 |  | Not Applicable | |
|  | Config 2,5,8 |  | TDDConf.1.1 | |
|  | Config 3,6,9 |  | TDDConf.2.1 | |
| BWchannel | Config 1,4,7 | MHz | 10: NRB,c = 52 | |
|  | Config 2,5,8 |  | 10: NRB,c = 52 | |
|  | Config 3,6,9 |  | 40: NRB,c = 106 | |
| BWP BW | Config 1,4,7 | MHz | 10: NRB,c = 52 | |
|  | Config 2,5,8 |  | 10: NRB,c = 52 | |
|  | Config 3,6,9 |  | 40: NRB,c = 106 | |
| TRS configuration | Config 1,4,7 |  | TRS.1.1 FDD | |
|  | Config 2,5,8 |  | TRS.1.1 TDD | |
|  | Config 3,6,9 |  | TRS.1.2 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,4,7 |  | SR.1.1 FDD | |
| Config 2,5,8 |  | SR.1.1 TDD | |
| Config 3,6,9 |  | SR.2.1 TDD | |
| CORESET Reference Channel | Config 1,4,7 |  | CR.1.1 FDD | |
| Config 2,5,8 |  | CR.1.1 TDD | |
| Config 3,6,9 |  | CR.2.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| CSI-RS configuration for CSI reporting | Config 1,4,7 |  | CSI-RS.1.1 FDD | |
| Config 2,5,8 |  | CSI-RS.1.1 TDD | |
| Config 3,6,9 |  | CSI-RS.2.1 TDD | |
| reportConfigType | |  | periodic | |
| reportQuantity | |  | cri-RI-PMI-CQI | |
| CSI reporting periodicity | Config 1,2,4,5,7,8 | slot | 5 | |
| Config 3,6,9 |  | 10 | |
| CSI reporting offset | Config 1,2,4,5,7,8 | slot | 3 | |
| Config 3,6,9 |  | 5 | |
| SMTC Configuration | |  | SMTC.1 | |
| SSB Configuration | Config 1,2,4,5,7,8 |  | SSB.1 FR1 | |
| Config 3,6,9 | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| Config 3,6,9 | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,4,5,7,8 | kHz | 15 kHz | |
| Config 3,6,9 | 30 kHz | |
| PRACH configuration | |  | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | |
|  | Initial UL BWP |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |
| Note2 | | dBm/15kHz | -98 | -98 |
| Note2 | Config 1,2,4,5,7,8 | dBm/SCS | -98 | -98 |
| Config 3,6,9 |  | -95 | -95 |
|  | | dB | 4 | 4 |
|  | | dB | 4 | 4 |
| SSB\_RP | Config 1,2,4,5,7,8 | dBm/SCS | -94 | -94 |
| Config 3,6,9 | dBm/SCS | -91 | -91 |
| IoNote3 | Config 1,2,4,5,7,8 | dBm/  9.36MHz | -64.59 | -64.59 |
| Config 3,6,9 | dBm/  38.16MHz | -58.49 | -58.49 |
| Propagation condition | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | |

**Table A.6.3.1.12.2-4: Cell specific test parameters for inter-band inter-frequency asynchronous DAPS handover from FR1 to FR1 (Cell 2)**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** | |
|  | |  | **T1** | **T2-T5** |
| NR RF Channel Number | |  | 2 | |
| Duplex mode | Config 1,2,3 |  | FDD | |
|  | Config 4,5,6,7,8,9 |  | TDD | |
| TDD configuration | Config 1,2,3 |  | Not Applicable | |
|  | Config 4,5,6 |  | TDDConf.1.1 | |
|  | Config 7,8,9 |  | TDDConf.2.1 | |
| BWchannel | Config 1,2,3 | MHz | 10: NRB,c = 52 | |
|  | Config 4,5,6 |  | 10: NRB,c = 52 | |
|  | Config 7,8,9 |  | 40: NRB,c = 106 | |
| BWP BW | Config 1,2,3 | MHz | 10: NRB,c = 52 | |
|  | Config 4,5,6 |  | 10: NRB,c = 52 | |
|  | Config 7,8,9 |  | 40: NRB,c = 106 | |
| TRS configuration | Config 1,2,3 |  | TRS.1.1 FDD | |
|  | Config 4,5,6 |  | TRS.1.1 TDD | |
|  | Config 7,8,9 |  | TRS.1.2 TDD | |
| DRx Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 |  | SR.1.1 FDD | |
|  | Config 4,5,6 |  | SR.1.1 TDD | |
|  | Config 7,8,9 |  | SR2.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 |  | CR.1.1 FDD | |
|  | Config 4,5,6 |  | CR.1.1 TDD | |
|  | Config 7,8,9 |  | CR2.1 TDD | |
| OCNG Patterns | |  | OCNG pattern 1 | |
| CSI-RS configuration for CSI reporting | Config 1,2,3 |  | CSI-RS.1.1 FDD | |
|  | Config 4,5,6 |  | CSI-RS.1.1 TDD | |
|  | Config 7,8,9 |  | CSI-RS.2.1 TDD | |
| SMTC Configuration | |  | SMTC pattern 1 | |
| SSB Configuration | Config 1,2,3,4,5,6 |  | SSB.1 FR1 | |
| Config 7,8,9 | SSB.2 FR1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3,4,5,6 | kHz | 15 kHz | |
| Config 7,8,9 | 30 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3,4,5,6 | kHz | 15 kHz | |
| Config 7,8,9 | 30 kHz | |
| PRACH configuration | |  | FR1 PRACH configuration 2 | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | |
|  | Initial UL BWP |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |
| Note2 | | dBm/15kHz | -98 | -98 |
| Note2 | Config 1,2,3,4,5,6 | dBm/SCS | -98 | -98 |
|  | Config 7,8,9 |  | -95 | -95 |
|  | | dB | -Infinity | 4 |
|  | | dB | -Infinity | 4 |
| SSB\_RP | Config 1,2,3,4,5,6 | dBm/SCS | -Infinity | -94 |
|  | Config 7,8,9 | dBm/SCS | -Infinity | -91 |
| IoNote3 | Config 1,2,3,4,5,6 | dBm/  9.36MHz | -70.05 | -64.59 |
|  | Config 7,8,9 | dBm/  38.16MHz | -63.94 | -58.49 |
| Propagation condition | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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.6.3.1.12.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 72 ms from the beginning of time period T3. During Dhandover1, the interruption on Cell 1 shall not exceed Tinterrupt1 as defined in Table 6.1.3.2.2-3 for asynchronous DAPS HO.

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

NOTE: The handover delay Dhandover1 can be expressed as: TRRC\_procedure + TIU + Tprocessing + T∆ + Tmargin, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

TIU = 20 ms in the test. TIU is defined in clause 6.1.1.2.2.

T∆ = 20 ms in the test. T∆ is defined in clause 6.1.1.2.2.

Tprocessing = 20 ms in the test. Tprocessing is defined in clause 6.1.1.2.2.

Tmargin = 2 ms in the test. Tmargin is defined in clause 6.1.1.2.2.

This gives a total of 72 ms.

The UE shall complete to release Cell 1 less than (10 ms + Tinterrupt2) from the beginning of time period T4. During Dhandover2, the interruptionon Cell 2 shall not exceed Tinterrupt2 as defined in Table 6.1.3.2.2-6 for asynchronous DAPS HO.

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

NOTE: The handover delay Dhandover2 can be expressed as: TRRC\_procedure + Tinterrupt2, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

End of Change 40

Start of Change 41

A.7.3.1.4 Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2

A.7.3.1.4.1 Test Purpose and Environment

This test is to verify the requirement for the FR1-to-FR2 Inter-band inter-frequency synchronous DAPS handover requirements specified in clause 6.1.3.4.

A.7.3.1.4.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.4.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.4.2-2, A.7.3.1.4.2-3 and A.7.3.1.4.2-4.

The test scenario comprises of two bands each with one cell. The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to Cell 1 (source PCell) on radio channel 1 but is not aware of Cell 2 (neighbour cell) on radio channel 2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE shall not have any timing information of Cell 2.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A4 is configured for neighbour cell (Cell 2), and the UE is configured with the measurement gaps (gap pattern ID # 0). Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A4. After receiving the Event A4, the test system shall send a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing the RRC message implying DAPS handover to Cell 2 (target PCell) sent to the UE. During T3, the UE shall be able to perform random access to Cell 2. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After the RACH procedure is completed, the test system shall send a RRC message to the UE to release Cell 1 (source cell) on radio channel 1.

The start of T4 is the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing the RRC message implying source cell release sent to the UE. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell.

**Table A.7.3.1.4.2-1: Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2 test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.7.3.1.4.2-2: General test parameters for Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A4-Threshold | | dBm | -120 |  |
| 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 | | μs | 33 | Synchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | <5 |  |
| T3 | | s | <0.5 |  |
| T4 | | ms | 10+Tinterrupt2 | Tinterrupt2 as defined in Table 6.1.3.4.2-2 for synchronous DAPS HO |
| T5 | | ms | 100 |  |

**Table A.7.3.1.4.2-3: Cell specific test parameters** **for Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2 (Cell 1 in FR1)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 1** | | | | | |
|  | |  | **T1** | | | **T2 - T5** | | |
| NR RF Channel Number | |  | 1 | | | | | |
| Duplex mode | Config 1 |  | FDD | | | | | |
|  | Config 2,3 |  | TDD | | | | | |
| TDD configuration | Config 1 |  | Not Applicable | | | | | |
|  | Config 2 |  | TDDConf.1.1 | | | | | |
|  | Config 3 |  | TDDConf.2.1 | | | | | |
| BWchannel | Config 1 | MHz | 10: NRB,c = 52 | | | | | |
|  | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | Config 3 |  | 40: NRB,c = 106 | | | | | |
| BWP BW | Config 1 | MHz | 10: NRB,c = 52 | | | | | |
|  | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | Config 3 |  | 40: NRB,c = 106 | | | | | |
| TRS configuration | Config 1 |  | TRS.1.1 FDD | | | | | |
|  | Config 2 |  | TRS.1.1 TDD | | | | | |
|  | Config 3 |  | TRS.1.2 TDD | | | | | |
| DRx Cycle | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | Config 1 |  | SR.1.1 FDD | | | | | |
| Config 2 |  | SR.1.1 TDD | | | | | |
| Config 3 |  | SR.2.1 TDD | | | | | |
| CORESET Reference Channel | Config 1 |  | CR.1.1 FDD | | | | | |
| Config 2 |  | CR.1.1 TDD | | | | | |
| Config 3 |  | CR.2.1 TDD | | | | | |
| OCNG Patterns | |  | OP.1 | | | | | |
| CSI-RS configuration for CSI reporting | Config 1 |  | CSI-RS.1.1 FDD | | | | | |
| Config 2 |  | CSI-RS.1.1 TDD | | | | | |
| Config 3 |  | CSI-RS.2.1 TDD | | | | | |
| reportConfigType | |  | periodic | | | | | |
| reportQuantity | |  | cri-RI-PMI-CQI | | | | | |
| CSI reporting periodicity | Config 1,2 | slot | 5 | | | | | |
| Config 3 | 10 | | | | | |
| CSI reporting offset | Config 1,2 | slot | 3 | | | | | |
| Config 3 | 5 | | | | | |
| SSB Configuration | Config 1,2 |  | SSB.1 FR1 | | | | | |
|  | Config 3 |  | SSB.2 FR1 | | | | | |
| SMTC Configuration | Config 1,2 |  | SMTC.1 | | | | | |
|  | Config 3 |  | SMTC.2 | | | | | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| Config 3 | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2 | kHz | 15 kHz | | | | | |
| Config 3 | 30 kHz | | | | | |
| PRACH configuration | |  | FR1 PRACH configuration 2 | | | | | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | | | | | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | | | | | |
|  | Initial UL BWP |  | ULBWP.0.1 | | | | | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | | | | | |
| EPRE ratio of PSS to SSS | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | | | | | |
| EPRE ratio of PDSCH to PDSCH | |  |  | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | | | | | |
| Note2 | | dBm/15kHz | NA  Link only, see clause A.3.7A | | | | | |
| Note2 | Config 1,2 | dBm/SCS |  | | | | | |
|  | Config 3 |  |  | | | | | |
|  | | dB |  | | | | | |
|  | | dB |  | | | | | |
| IoNote3 | Config 1,2 | dBm/  9.36MHz |  | | | | | |
|  | Config 3 | dBm/  38.16MHz |  | | | | | |
| Propagation condition | | - | AWGN | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | |

**Table A.7.3.1.4.2-4: Cell specific test parameters for Inter-band inter-frequency synchronous DAPS handover from FR1 to FR2 (Cell 2 in FR2)**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** | |
|  | |  | **T1** | **T2 - T5** |
| Assumption for UE beamsNote 6 | |  | Rough | |
| AoA setup | |  | Setup 1 as defined in A.3.15 | |
| NR RF Channel Number | |  | 2 | |
| Duplex mode | Config 1,2,3 |  | TDD | |
| TDD configuration | Config 1,2,3 |  | TDDConf.3.1 | |
| BWchannel | Config 1,2,3 | MHz | 100: NRB,c = 66 | |
| BWP BW | Config 1,2,3 | MHz | 100: NRB,c = 66 | |
| TRS configuration | Config 1,2,3 |  | TRS.2.1 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 |  | SR3.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 |  | CR3.1 TDD | |
| OCNG Patterns | |  | OCNG pattern 1 | |
| CSI-RS configuration for CSI reporting | Config 1,2,3 |  | CSI-RS.3.1 TDD | |
| SSB Configuration | Config 1,2,3 |  | SSB.1 FR2 | |
| SMTC Configuration | |  | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PRACH configuration | |  | FR2 PRACH configuration 2 | |
| TCI configuration | |  | CSI-RS.Config.0 | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | |
|  | Initial UL BWP |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |
| Note2 | | dBm/15kHz | -104.7 | -104.7 |
| Note2 | | dBm/SCS | -95.7 | -95.7 |
|  | | dB | -Infinity | 10 |
|  | | dB | -Infinity | 10 |
| IoNote3 | | dBm/  95.04MHz | -66.7 | -55.4 |
| Propagation condition | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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.  Note 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation. | | | | |

A.7.3.1.4.3 Test Requirements

The UE shall start to transmit the PRACH to Cell 2 less than 92 ms from the beginning of time period T3. During Dhandover1, the interruption on Cell 1 shall not exceed Tinterrupt1 as defined in Table 6.1.3.4.2-1 for synchronous DAPS HO.

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

NOTE: The handover delay Dhandover1 can be expressed as: TRRC\_procedure + TIU + Tprocessing + T∆ + Tmargin, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

TIU = 20 ms in the test. TIU is defined in clause 6.1.1.2.2.

T∆ = 20 ms in the test. T∆ is defined in clause 6.1.1.2.2.

Tprocessing = 40 ms in the test. Tprocessing is defined in clause 6.1.1.2.2.

Tmargin = 2 ms in the test. Tmargin is defined in clause 6.1.1.2.2.

This gives a total of 92 ms.

The UE shall complete to release Cell 1 less than (10 ms + Tinterrupt2) from the beginning of time period T4. During Dhandover2, the interruptionon Cell 2 shall not exceed Tinterrupt2 as defined in Table 6.1.3.4.2-2 for synchronous DAPS HO.

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

NOTE: The handover delay Dhandover2 can be expressed as: TRRC\_procedure + Tinterrupt2, where:

TRRC\_procedure = 10 ms and is specified in clause 12 in TS 38.331 [2].

A.7.3.1.5 Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2

A.7.3.1.5.1 Test Purpose and Environment

This test is to verify the requirement for the FR1-to-FR2 Inter-band inter-frequency asynchronous DAPS handover requirements specified in clause 6.1.3.4.

A.7.3.1.5.2 Test Parameters

Supported test configurations are shown in table A.7.3.1.5.2-1. Both handover delay and interruption length are tested by using the parameters in table A.7.3.1.5.2-2, A.7.3.1.5.2-3 and A.7.3.1.5.2-4.

The test scenario comprises of two bands each with one cell. The test consists of five successive time periods, with time durations of T1, T2, T3, T4 and T5 respectively.

Before the start of T1, the UE is connected to Cell 1 (source PCell) on radio channel 1 but is not aware of Cell 2 (neighbour cell) on radio channel 2. The UE shall be configured with periodic CSI reporting for cell1. During T1, the UE shall not have any timing information of Cell 2.

Before the start of T2, the UE in the measurement control information that event-triggered reporting with Event A4 is configured for neighbour cell (Cell 2), and the UE is configured with the measurement gaps (gap pattern ID # 0). Starting T2, Cell 2 becomes known to the UE. During T2, the UE shall report Event A4. After receiving the Event A4, the test system shall send a RRC message implying DAPS handover to the UE.

The start of T3 is the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing the RRC message implying DAPS handover to Cell 2 (target PCell) sent to the UE. During T3, the UE shall be able to perform random access to Cell 2. DL schedule and UL feedback to cell 1 shall be avoided when UE is required to perform DL reception or UL transmission in PRACH procedure in cell 2, except preamble transmission. After the RACH procedure is completed, the test system shall send a RRC message to the UE to release Cell 1 (source cell) on radio channel 1.

The start of T4 is the instant when the test system receives the ACK of the PDSCH corresponding to the last TTI containing the RRC message implying source cell release sent to the UE. During T4, the UE shall perform source cell release.

Starting T5, the UE shall stop sending CSI report to the source cell.

**Table A.7.3.1.5.2-1: Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2 test configurations**

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode  Target cell: NR 120 kHz SSB SCS, 100 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations | |

**Table A.7.3.1.5.2-2: General test parameters for Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Value** | **Comment** |
| Initial conditions | Active cell |  | Cell 1 |  |
|  | Neighbouring cell |  | Cell 2 |  |
| Final condition | Active cell |  | Cell 2 |  |
| A4-Threshold | | dBm | -120 |  |
| 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 | | μs | 62.5 | Asynchronous cells |
| T1 | | s | 5 |  |
| T2 | | s | <5 |  |
| T3 | | s | <0.5 |  |
| T4 | | ms | 10+Tinterrupt2 | Tinterrupt2 as defined in Table 6.1.3.4.2-2 for asynchronous DAPS HO. |
| T5 | | ms | 100 |  |

**Table A.7.3.1.5.2-3: Cell specific test parameters for Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2 (Cell 1 in FR1)**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Cell 1** | | | | | |
|  | | |  | **T1** | | | **T2 - T5** | | |
| NR RF Channel Number | | |  | 1 | | | | | |
| Duplex mode | | Config 1 |  | FDD | | | | | |
|  | | Config 2,3 |  | TDD | | | | | |
| TDD configuration | | Config 1 |  | Not Applicable | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | |
| BWchannel | | Config 1 | MHz | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| BWP BW | | Config 1 | MHz | 10: NRB,c = 52 | | | | | |
|  | | Config 2 |  | 10: NRB,c = 52 | | | | | |
|  | | Config 3 |  | 40: NRB,c = 106 | | | | | |
| TRS configuration | | Config 1 |  | TRS.1.1 FDD | | | | | |
|  | | Config 2 |  | TRS.1.1 TDD | | | | | |
|  | | Config 3 |  | TRS.1.2 TDD | | | | | |
| DRx Cycle | | | ms | Not Applicable | | | | | |
| PDSCH Reference measurement channel | | Config 1 |  | SR.1.1 FDD | | | | | |
|  | | Config 2 |  | SR.1.1 TDD | | | | | |
|  | | Config 3 |  | SR.2.1 TDD | | | | | |
| CORESET Reference Channel | | Config 1 |  | CR.1.1 FDD | | | | | |
|  | | Config 2 |  | CR.1.1 TDD | | | | | |
|  | | Config 3 |  | CR.2.1 TDD | | | | | |
| OCNG Patterns | | |  | OP.1 | | | | | |
| CSI-RS configuration for CSI reporting | | Config 1 |  | CSI-RS.1.1 FDD | | | | | |
|  | | Config 2 |  | CSI-RS.1.1 TDD | | | | | |
|  | | Config 3 |  | CSI-RS.2.1 TDD | | | | | |
| reportConfigType | | |  | periodic | | | | | |
| reportQuantity | | |  | cri-RI-PMI-CQI | | | | | |
| CSI reporting periodicity | | Config 1,2 | slot | 5 | | | | | |
| Config 3 | 10 | | | | | |
| CSI reporting offset | | Config 1,2 | slot | 3 | | | | | |
| Config 3 | 5 | | | | | |
| SSB Configuration | | Config 1,2 |  | SSB.1 FR1 | | | | | |
|  | | Config 3 |  | SSB.2 FR1 | | | | | |
| SMTC Configuration | | Config 1,2 |  | SMTC.1 | | | | | |
|  | | Config 3 |  | SMTC.2 | | | | | |
| PDSCH/PDCCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | |
|  | | Config 3 |  | 30 kHz | | | | | |
| PUCCH/PUSCH subcarrier spacing | | Config 1,2 | kHz | 15 kHz | | | | | |
|  | | Config 3 |  | 30 kHz | | | | | |
| PRACH configuration | | |  | FR1 PRACH configuration 2 | | | | | |
| BWP | | Initial DL BWP |  | DLBWP.0.1 | | | | | |
|  | | Dedicated DL BWP |  | DLBWP.1.3 | | | | | |
|  | | Initial UL BWP |  | ULBWP.0.1 | | | | | |
|  | | Dedicated UL BWP |  | ULBWP.1.3 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | | | | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | | | | | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | | | | | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | | | | | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | | | | | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | | | | | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | | | | | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | | | | | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | | | | | |
| Note2 | | | dBm/15kHz | NA  Link only, see clause A.3.7A | | | | | |
| Note2 | Config 1,2 | | dBm/SCS |  | | | | | |
|  | Config 3 | |  |  | | | | | |
|  | | | dB |  | | | | | |
|  | | | dB |  | | | | | |
| IoNote3 | Config 1,2 | | dBm/  9.36MHz |  | | | | | |
|  | Config 3 | | dBm/  38.16MHz |  | | | | | |
| Propagation condition | | | - | AWGN | | | | | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | | | | |

**Table A.7.3.1.5.2-4: Cell specific test parameters for Inter-band inter-frequency asynchronous DAPS handover from FR1 to FR2 (Cell 2 in FR2)**



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Cell 2** | |
|  | |  | **T1** | **T2 - T5** |
| Assumption for UE beamsNote 6 | |  | Rough | |
| AoA setup | |  | Setup 1 as defined in A.3.15 | |
| NR RF Channel Number | |  | 2 | |
| Duplex mode | Config 1,2,3 |  | TDD | |
| TDD configuration | Config 1,2,3 |  | TDDConf.3.1 | |
| BWchannel | Config 1,2,3 | MHz | 100: NRB,c = 66 | |
| BWP BW | Config 1,2,3 | MHz | 100: NRB,c = 66 | |
| TRS configuration | Config 1,2,3 |  | TRS.2.1 TDD | |
| DRX Cycle | | ms | Not Applicable | |
| PDSCH Reference measurement channel | Config 1,2,3 |  | SR.3.1 TDD | |
| CORESET Reference Channel | Config 1,2,3 |  | CR.3.1 TDD | |
| OCNG Patterns | |  | OP.1 | |
| CSI-RS configuration for CSI reporting | Config 1,2,3 |  | CSI-RS.3.1 TDD | |
| SSB Configuration | Config 1,2,3 |  | SSB.1 FR2 | |
| SMTC Configuration | |  | SMTC.1 | |
| PDSCH/PDCCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PUCCH/PUSCH subcarrier spacing | Config 1,2,3 | kHz | 120 kHz | |
| PRACH configuration | |  | FR2 PRACH configuration 2 | |
| TCI configuration | |  | CSI-RS.Config.0 | |
| BWP | Initial DL BWP |  | DLBWP.0.1 | |
|  | Dedicated DL BWP |  | DLBWP.1.3 | |
|  | Initial UL BWP |  | ULBWP.0.1 | |
|  | Dedicated UL BWP |  | ULBWP.1.3 | |
| EPRE ratio of PSS to SSS | | dB | 0 | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |
| Note2 | | dBm/15kHz | -104.7 | -104.7 |
| Note2 | | dBm/SCS | -95.7 | -95.7 |
|  | | dB | -Infinity | 10 |
|  | | dB | -Infinity | 10 |
| IoNote3 | | dBm/  95.04MHz | -66.7 | -55.4 |
| Propagation condition | | - | AWGN | |
| Note 1: OCNG shall be used such that the cell is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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.  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. | | | | |

End of Change 41

Start of Change 42

9.9.4 UE Rx-Tx time difference measurements

9.9.4.1 Introduction

The requirements in this clause shall apply, provided the UE has received *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to measure and report one or more UE Rx-Tx time difference measurements defined in TS 38.215 [4].

9.9.4.2 Requirements Applicability

The requirements in clause 9.9.4 apply for periodic and triggered UE Rx-Tx time difference measurements, provided:

- UE Rx-Tx time difference measurement related side conditions given in clause 10.1.25 are met for a corresponding band.

- SRS is configured on at least one of the PCell, PSCell and SCell.

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

9.9.4.3 Measurement Capability

UE Rx-Tx time difference measurement capability is as indicated by the UE in *NR-Multi-RTT-ProvideCapabilities,* according to TS 37.355 [34].

9.9.4.4 Measurement Reporting Requirements

This requirement assumes that the measurement report is not delayed by other LPP signalling on the DCCH. This measurement reporting delay excludes a delay uncertainty resulted when inserting the measurement report to the TTI of the uplink DCCH. The delay uncertainty is: 2 x TTIDCCH where TTIDCCH is the duration of subframe or slot or subslot when the measurement report is transmitted on the PUSCH with subframe or slot or subslot duration. This measurement reporting delay excludes any delay caused by no UL resources for UE to send the measurement report.

The UE Rx-Tx time difference measurement values contained in measurement reports shall be based on the measurement report mapping requirements specified in clause 10.1.25.

The UE Rx-Tx time difference measurement accuracy for all measured DL PRS resourcesshall be fulfilled according to the accuracy requirements specified in clause 10.1.25.

9.9.4.5 Measurement Period Requirements

When physical layer receives last of *NR-Multi-RTT-ProvideAssistanceData* message and *NR-Multi-RTT-RequestLocationInformation* message from LMF via LPP [34]*,* UE shall be able to measure multiple (up to the UE capability specified in clause 9.9.4.3) UE Rx-Tx time difference measurements as defined in TS 38.215 [4] in configured positioning frequency layers within the measurement period ms.

*.*

where is the index of positioning frequency layer,

is the measurement period for UE Rx-Tx time difference measurements in positioning frequency layer *i* as further defined in this clause,

L is total number of positioning frequency layers, and

is the periodicity of the UE Rx-Tx time difference measurement in positioning frequency layer *i* as defined further in this clause.

Where

is the carrier-specific scaling factor for NR PRS-based measurement in the positioning frequency layer *i* as defined in clause 9.1.5.2,

is the scaling factor for Rx beam sweeping, and =1 if positioning frequency layer *i* is in FR1 and =8 if positioning frequency layer *i* is in FR2,

is the time duration of available PRS resources in the positioning frequency layer *i*, to be measured during , and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26]. For calculation of , only the PRS resources unmuted and fully or partially overlapped with MG are considered.

is the maximum number of DL PRS resources of positioning frequency layer i configured in a slot,

is UE capability combination per band where N is a duration of DL PRS symbols in ms corresponding to *durationOfPRS-ProcessingSysmbols* in TS 37.355 [34] processed every T ms corresponding to *durationOfPRS-ProcessingSymbolsInEveryTms* in TS 37.355 [34] for a given maximum bandwidth supported by UE corresponding to *supportedBandwidthPRS* in clause 4.2.7.2 of TS 37.355 [34],

is UE capability for number of DL PRS resources that it can process in a slot corresponding to *maxNumOfDL-PRS-ResProcessedPerSlot* as specified in clause 6.4.3 of TS 37.355 [34],

is the number of UE Rx-Tx time difference measurement samples and = 4,

is the measurement duration for the last UE Rx-Tx time difference measurement sample in the positioning layer i, including the sampling time and processing time,  *= +*  ,

is periodicity of UE Rx-Tx time difference measurement in positioning frequency layer *i*:

where

corresponds to durationOfPRS-ProcessingSymbolsInEveryTms in TS 37.355 [34],

, the least common multiple between and

is the measurement gap repetition periodicity in positioning frequency layer i.

is the PRS resource periodicity in positioning frequency layer *i*. If the positioning frequency layer *i* has more than one DL PRS resource sets with different PRS periodicities with muting, , the least common multiple of among DL PRS resource sets is used to derive , where

is the periodicity of PRS resource sets given by the higher-layer parameter *DL-PRS-Periodicity*.

is the scaling factor considering PRS resource muting. , where is the muting repetition factor given by the higher-layer parameter *DL-PRS-MutingBitRepetitionFactor*, and is the size of the bitmap .

Note: For the purpose of calculating TPRS,i, only the PRS resources fully or partially covered by the MG are considered.

Except for deferred MT-LR as defined in clause 4.1a.5 [TS 23.273], the time starts from the first MG instance aligned with DL PRS resources in the assistance data after both the *NR-Multi-RTT-RequestLocationInformation* message and *NR-Multi-RTT-ProvideAssistanceData* message from LMF via LPP [34] are delivered to the physical layer of UE.

For deferred MT-LR with other event than “Periodic Location” as defined in clause 4.1a.5.1 [TS 23.273], the timestarts from the first MG instance aligned with a DL PRS resource(s) in the assistance data after the associated event(s) occurs.

*Editor’s Note: FFS the start of measurement period for deferred MT-LR with “Periodic Location”.*

Note: No per-positioning frequency layer requirement is applied in scenarios when multiple positioning frequency layers are configured.

The UE Rx-Tx time difference measurement period is restarted if HO occurs during the measurement period and after SRS reconfiguration on the target cell is complete.

The measurement requirements do not apply for a PRS resource:

- if the PRS resource is across two sampling duration of N within duration or

- if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability N.

If during the measurement period of one or more positioning frequency layers, the MG pattern is reconfigured either per UE request or not per UE request, the measurement period can be longer.

The requirements in this section apply, provided no PRS symbols are dropped during the measurement period TUERxTx,Total within measurement gaps due to collisions with other signals; otherwise, a longer measurement period may be used.

When PRS-RSRP is configured for multi-RTT, the UE Rx-Tx time difference measurements and PRS-RSRP measurements are performed over the same measurement period.

The requirements in clause 9.9.4 do not apply if the PRS configuration given by higher layer paramters *NR-DL-PRS-AssistanceData* exceeds any of the UE measurement capabilities given by *NR-DL-PRS-ResourcesCapability* in *NR-Multi-RTT-ProvideCapabilities*, and it is up to UE implementation which PRS resources are measured, subject to UE measurement capabilities*.*

When PSCell or SCell addition or release does not cause SRS reconfiguration during the measurement period, UE continues the UE Rx-Tx time difference measurement, and the measurement period requirements apply.

When PSCell or SCell addition or release causes SRS reconfiguration during the measurement period, UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration on the target cell is complete.

When SRS is reconfigured without serving cell change during the measurement period, UE shall restart the UE Rx-Tx time difference measurement after the SRS reconfiguration is complete.

When a serving cell change occurs during the measurement period, the UE shall continue and complete the UE Rx-Tx time difference measurement provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx time difference measurement.

If UE uplink transmission timing changes due to the network-configured Timing Advance command during the UE Rx-Tx measurement period, then the UE Rx-Tx time difference measurement period is restarted after uplink transmission timing changes, and the UE Rx-Tx time difference measurement period requirements in this clause shall not apply.

If UE uplink transmission timing changes due to the change in the NTA\_offset defined in Table 7.1.2-2 during the UE Rx-Tx measurement period, then the UE Rx-Tx time difference measurement period is restarted after uplink transmission timing changes, and the UE Rx-Tx time difference measurement period requirements in this clause shall not apply.

If UE uplink transmission timing changes due to the UE autonomous timing adjustment defined in clause 7.1.2 during the UE Rx-Tx measurement period, then:

- UE Rx-Tx measurement period requirements in this clause shall apply for a cell, which is also the downlink reference cell (defined in section 7.1.1) for SRS transmission.

- UE Rx-Tx measurement period requirements in this clause shall not apply for a cell, which is not the downlink reference cell (defined in section 7.1.1) for SRS transmission. The UE Rx-Tx time difference measurement period may be restarted in such case.

End of Change 42

Start of Change 43

10.1.23.2 Measurement Accuracy Requirements

The accuracy requirements for RSTD measurement shall be within ±(X+Y+Z) Tc.

X is defined in Table 10.1.23.2-1 for AWGN channel and Table 10.1.23.2-3 for fading channel for FR1, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

X is defined in Table 10.1.23.2-2 for AWGN channel and Table 10.1.23.2-4 for fading channel for FR2, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

Note: The requriements for fading channel in this clause are derived based on TDL-A (30 ns delay spread, 5Hz) and TDL-C (60 ns delay spread, 300 Hz) channel models for FR1 and FR2 respectively.

When UE measures RSTD on PRS resources belonging to different PFLs, then the RSTD accuracy is defined as the accuracy corresponding to the largest accuracy value among different PFLs.

When UE measures RSTD on PRS resources belonging to same PFL, Y=32 Tc, provided that the time offset between the two PRS resource instances from the reference cell and the neighbor cell, which are used for a single RSTD estimate, is no greater than 160 ms.

When UE measures RSTD on PRS resources belonging different PFLs, Y=256 Tc, provided that the time offset between the two PRS resource instances from the reference cell and the neighbor cell, which are used for a single RSTD estimate, is no greater than 1280 ms.

Z is defined in Table 10.1.23.2-5 for FR1 and Table 10.1.23.2-6 for FR2, respectively.

*[Editor notes: Δin Table 10.1.23.2-1 to Table 10.1.23.2-4 is the margins for measurements on different PFLs]*

**Table 10.1.23.2-1: RSTD absolute accuracy in FR1 for AWGN channel**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| 132 +ΔNote 7 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥24 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| 98 +Δ | ≥52 | ≥1 | Note 6 | Note 6 | Note 6 |
| 42 +Δ | ≥104 | ≥1 | Note 6 | Note 6 | Note 6 |
| 75 +Δ | 30 | ≥24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
| NR\_FDD\_FR1\_B | -117.5 | -50 |
| NR\_TDD\_FR1\_C | -117 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 | -50 |
| NR\_FDD\_FR1\_F | -115.5 | -50 |
| NR\_FDD\_FR1\_G | -115 | -50 |
| NR\_FDD\_FR1\_H | -114.5 | -50 |
| 48 +Δ | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 24 +Δ | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 50 +Δ | 60 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
| NR\_FDD\_FR1\_B | -114.5 | -50 |
| NR\_TDD\_FR1\_C | -114 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | -50 |
| NR\_FDD\_FR1\_F | -113.5 | -50 |
| NR\_FDD\_FR1\_G | -113 | -50 |
| NR\_FDD\_FR1\_H | -111.5 | -50 |
| 24 +Δ | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 10 +Δ | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  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= 0 for single PFL, Δ= TBD for dual PFL. | | | | | | | |

**Table 10.1.23.2-2: RSTD absolute accuracy in FR2 for AWGN channel**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition**  **() Note 2** | **Io Note 3 range** | |
| **Minimum Io** | **Maximum Io** |
| **Tc Note 4** | **dB** | **kHz** | **RB** |  | **dBm/SCS** | **dBm/BWChannel** |
| 35 +ΔNote 6 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 24 | ≥ 4 | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| 24 +Δ | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 11 +Δ | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| 24 +Δ | 120 | ≥ 32 | ≥ 4 | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| 13 +Δ | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 6 +Δ | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: 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 6: Δ= 0 for single PFL, Δ= TBD for dual PFL. | | | | | | |

**Table 10.1.23.2-3: RSTD absolute accuracy in FR1 for fading channel**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| 247 +ΔNote 7 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| 140 +Δ | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 86 +Δ | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 118 +Δ | 30 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -118 | -50 |
| NR\_FDD\_FR1\_B | -117.5 | -50 |
| NR\_TDD\_FR1\_C | -117 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -116.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -116 | -50 |
| NR\_FDD\_FR1\_F | -115.5 | -50 |
| NR\_FDD\_FR1\_G | -115 | -50 |
| NR\_FDD\_FR1\_H | -114.5 | -50 |
| 109 +Δ | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 28 +Δ | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 147 +Δ | 60 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -115 | -50 |
| NR\_FDD\_FR1\_B | -114.5 | -50 |
| NR\_TDD\_FR1\_C | -114 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -113.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -113 | -50 |
| NR\_FDD\_FR1\_F | -113.5 | -50 |
| NR\_FDD\_FR1\_G | -113 | -50 |
| NR\_FDD\_FR1\_H | -111.5 | -50 |
| 27 +Δ | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 21 +Δ | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  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= 0 for single PFL, Δ= TBD for dual PFL. | | | | | | | |

**Table 10.1.23.2-4: RSTD absolute accuracy in FR2 for fading channel**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth**  **Note 1** | **PRS resource repetition**  **() Note 2** | **Io Note 3 range** | |
| **Minimum Io** | **Maximum Io** |
| **Tc Note 4** | **dB** | **kHz** | **RB** |  | **dBm/SCS** | **dBm/BWChannel** |
| 83 +ΔNote 6 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 24 | ≥ 4 | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| 64 +Δ | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 46 +Δ | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| 48 +Δ | 120 | ≥ 32 | ≥ 4 | Same value as PRS\_RP in Table B.2.z-2, according to UE Power class, operating band and angle of arrival | -50 |
| 54 +Δ | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 36 +Δ | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: 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 6: Δ= 0 for single PFL, Δ= TBD for dual PFL. | | | | | | |

**Table 10.1.23.2-5: Margin for RSTD measurement accuracy in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **PRS BW (RB number)** | | | **Margin (Tc)** |
| **SCS=15kHz** | **SCS=30kHz** | **SCS=60kHz** |
| ≥ 24 | N/A | N/A | 120 |
| ≥ 52 | ≥ 24 | N/A | 72 |
| ≥ 104 | ≥ 48 | ≥ 24 | 36 |
| N/A | ≥ 132 | ≥ 64 | 16 |
| N/A | N/A | ≥ 132 | 12 |

**Table 10.1.23.2-6: Margin for RSTD measurement accuracy in FR2**

|  |  |  |
| --- | --- | --- |
| **PRS BW (RB number)** | | **Margin (Tc)** |
| **SCS=60kHz** | **SCS=120kHz** |
| ≥ 24 | N/A | 72 |
| ≥ 64 | ≥ 32 | 32 |
| ≥ 132 | ≥ 64 | 16 |
| N/A | ≥ 128 | 12 |

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