**3GPP TSG-RAN4 Meeting #104-e *R4-221xxxx***

**Electronic Meeting, August 15 – August 26, 2022**

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| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **-** | **rev** | **-** | **Current version:** | **17.6.0** |  |
|  |
| *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 NR IIoT and URLLC enh (Rel-17) |
|  |  |
| ***Source to WG:*** | MCC, Nokia |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_IIOT\_URLLC\_enh |  | ***Date:*** | 2022-08-30 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | This is a BigCR for NR-IIOT\_URLLC\_enh collecting the CRs agreed in RAN4#104 meeting. |
|  |  |
| ***Summary of change:*** | Change #1 - #3 (R4-2212156):* Correct the TC requirements wording.
* The definition of the reference point for the UE initial transmit timing control requirement is clarified as follows:
* The downlink timing is defined as the time when the first path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at the UE antenna

Change #4 (R4-2213556):* Define gNB Rx-Tx report mapping and accuracy requirements for PDC measurement.
	+ Based on RAN2 agreement, the report mapping is defined only for k=5, i.e. resolution of 32Tc
	+ Based on RAN4#101-bis-e agreement, the accuracy for gNB Rx-Tx is defined for side condition at +3dB.

Change #5 - #6 (R4-2214700):* Test cases for PDC UE Rx-Tx measurement period and accuracy for PRS for FR2

Change #7 (R4-2214727):* Based on the work split in R4-2210618, this CR introduces the following TC for UE Rx-Tx.
	+ #2: UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR1 SA

Change #8 (R4-2214728):* Define test cases for PDC UE Rx-Tx measurement period for PRS in FR1
* Define test cases for PDC UE Rx-Tx measurement accuracy for PRS in FR1
 |
|  |  |
| ***Consequences if not approved:*** | Change #1 - #3 (R4-2212156):* Misinterpretation of the UE initial transmit timing error TC requirements

Change #4 (R4-2213556):* No report mapping and accuracy requirements for gNB Rx-Tx for PDC measurement

Change #5 - #6 (R4-2214700):* Perfromance requirements not verified

Change #7 (R4-2214727):* Delay and accuray performance for UE Rx-Tx measurement for PDC cannot be verified

Change #8 (R4-2214728):* Delay and accuray performance for UE Rx-Tx measurement for PDC cannot be verified
 |
|  |  |
| ***Clauses affected:*** | TS 38.133 –A.6.6.x1(NEW), A.6.7.x1(NEW) |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ... |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

<Start of Change 1>

A.5.4.1.1 NR UE Transmit Timing Test for FR2

A.5.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 5.4.1.1.1-1.

**Table A.5.4.1.1.1-1: Supported test configurations for FR2 PSCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | LTE FDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |
| 2 | LTE TDD, NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

The test consists of E-UTRA PCell and NR PSCell. The configuration for E-UTRA is given in A.3.7.2.1. Tables A.5.4.1.1.1-2 and A.5.4.1.1.1-2A define the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.5.4.1.1.1-3.

**Table A.5.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Test1** | **Test2** | **Band Group** |
| SSB ARFCN |  | 1,2 | Freq1 | Freq1 |  |
| Duplex Mode |  | 1,2 | TDD |  |
| TDD configuration |  | 1,2 | TDDConf.3.1 |  |
| BWchannel | MHz | 1,2 | 100: NRB,c = 66 |  |
| Data RBs allocated |  | 1,2 | 66 |  |
| Initial BWP Configuration |  | 1,2 | DLBWP.0.1ULBWP.0.1 |  |
| Dedicated BWP Configuration |  | 1,2 | DLBWP.1.1ULBWP.1.1 |  |
| TRS Configuration |  | 1,2 | TRS.2.1 TDD |  |
| PDSCH/PDCCH TCI state |  | 1,2 | TCI.State.2 |  |
| DRx Cycle | ms | 1,2 | N/A | DRX.8Note5 |  |
| PDSCH Reference measurement channel |  | 1,2 | SR.3. 3 TDD |  |
| RMSI CORESET Reference Channel |  | 1,2 | CR.3. 2 TDD |  |
| Dedicated CORESET Reference Channel |  | 1,2 | CCR.3.7 TDD |  |
| OCNG Patterns |  | 1,2 | O P. 1 |  |
| SSB Configuration |  | 1,2 | SSB.4 FR2 |  |
| SMTC Configuration |  | 1,2 | SMTC.1 |  |
| PDSCH/PDCCH subcarrier spacing | kHz | 1,2 | 120 |  |
| EPRE ratio of PSS to SSS | dB | 1,2 | 0 | 0 |  |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS  |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH  |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |  |  |
| Propagation condition |  | 1,2 | AWGN |  |
| SRS Config |  | 1,2 | SRSConf.1Note6 | SRSConf.2Note6 |  |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: VoidNote 3: VoidNote 4: VoidNote 5: DRx related parameters are given in Table A.3.3.8-1Note 6: SRS configs are given in Table A.5.4.1.1.1-3 |

**Table A.5.4.1.1.1-2A: OTA related test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beamsNote 6 |  | Fine |
| Note1 | dBm/15kHzNote4 | -112 |
| Note1 | dBm/SCSNote3 | -100 |
|  | dB | 4 |
| SSB\_RPNote2 | 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: SSB\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: VoidNote 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zoneNote 5: As observed with 0dBi gain antenna at the centre of the quiet zoneNote 6: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

**Table A.5.4.1.1.1-3: SRS Configuration for Timing Accuracy Test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Field** | **SRSConf.1** | **SRSConf.2** | **Comments** |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |  |
|  | srs-ResourceIdList | 0 | 0 |  |
|  | resourceType | Periodic | Periodic |  |
|  | Usage | Codebook | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 | 0 |  |
|  | nrofSRS-Ports | Port1 | Port1 |  |
|  | transmissionComb  | n2 | n2 |  |
|  | combOffset-n2 | 0 | 0 |  |
|  | cyclicShift-n2 | 0 | 0 |  |
|  | resourceMappingstartPosition | 0 | 0 |  |
|  | resourceMappingnrofSymbols  | n1 | n1 |  |
|  | resourceMappingrepetitionFactor | n1 | n1 |  |
|  | freqDomainPosition | 0 | 0 |  |
|  | freqDomainShift | 0 | 0 |  |
|  | freqHoppingc-SRS | 17 | 17 | Matches NRB,c |
|  | freqHoppingb-SRS | 0 | 0 |  |
|  | freqHoppingb-hop | 0 | 0 |  |
|  | groupOrSequenceHopping | Neither | Neither |  |
|  | resourceType | Periodic | Periodic |  |
|  | periodicityAndOffset-p | sl1,0 | sl2560,4 | Offset to align with DRx periodicity  |
|  | sequenceId | 0 | 0 | Any 10 bit number |

**Table A.5.4.1.1.1-4: Void**

A.5.4.1.1.2 Test requirements

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

Following will be the test sequence for this test

1) Set up E-UTRA PCell according to parameters given in Table A.3.7.2.2-1 and setup NR PSCell according to parameters given in Table A.5.4.1.1.1-1.

2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB.

a. The NTA offset value (in Tc units) is 13792

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1

3) The test system shall adjust the timing of the DL path by values given in Table A.5.4.1.1.2-1

**Table A.5.4.1.1.2-1 Adjustment Value for DL Timing**

|  |  |
| --- | --- |
| **SCS of SSB signals (kHz)** | **Adjustment Value** |
|  | Test1 | Test2 |
| 240 | +8\*64Tc | +4\*64Tc |

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within (NTA + NTA\_offset) ×Tc ± Te respective to the first path (in time) of DL SSB used by the UE to determine downlink timing is received from the reference cell at the UE antenna. Skip this step for test 2 with DRX configured.

5) The test system shall verify that the UE transmit timing offset stays within (NTA + NTA\_offset) ×Tc ± Te of the first path (in time) of DL SSB used by the UE to determine downlink timing is received from the reference cell at the UE antenna. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

<Start of Change 2>

A.6.4.1.1 NR UE Transmit Timing Test for FR1

A.6.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table A.6.4.1.1.1-1.

**Table A.6.4.1.1.1-1: Supported test configurations for FR1 PCell**

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

For this test a single NR cell is used. Table A.6.4.1.1.1-2 defines the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.6.4.1.1.1-3.

**Table A.6.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Test1** | **Test2** |
| SSB ARFCN |  | 1,2,3 | 1 | 1 |
| TDD configuration |  | 1 | Not Applicable |
|  |  | 2 | TDDConf.1.1 |
|  |  | 3 | TDDConf.2.1 |
| BWchannel | MHz | 1 | 10: NRB,c = 52 |
|  |  | 2 | 10: NRB,c = 52 |
|  |  | 3 | 40: NRB,c = 106 |
| Initial BWP Configuration |  | 1,2,3 | DLBWP.0.1ULBWP.0.1 |
| Dedicated BWP Configuration |  | 1,2,3 | DLBWP.1.1ULBWP.1.1 |
| DRx Cycle | ms | 1,2,3 | N/A | DRX.8Note5 |
| PDSCH Reference measurement channel |  | 1 | SR.1.1 FDD |
|  |  | 2 | SR.1.1 TDD |
|  |  | 3 | SR.2.1 TDD |
| RMSI CORESET Reference Channel |  | 1 | CR.1.1 FDD |
|  |  | 2 | CR.1.1 TDD |
|  |  | 3 | CR.2.1 TDD |
| Dedicated CORESET Reference Channel |  | 1 | CCR.1.1 FDD |
|  |  | 2 | CCR.1.1 TDD |
|  |  | 3 | CCR.2.1 TDD |
| OCNG Patterns |  | 1,2,3 | OP.1 |
|  |  |
| SSB configuration |  | 1,2 | SSB.1 FR1 |
|  |  | 3 | SSB.2 FR1 |
| SMTC Configuration |  | 1,2 | SMTC.1 |
|  |  | 3 | SMTC.2 |
| TRS configuration |  | 1 | TRS.1.1 FDD |
|  |  | 2 | TRS.1.1 TDD |
|  |  | 3 | TRS.1.2 TDD |
| EPRE ratio of PSS to SSS | dB | 1,2,3 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |  |
| Note2 | dBm/15 kHz | 1,2,3 | -98 | -98 |
| Note2 | dBm/SCS | 1,2 | -98 | -98 |
|  |  | 3 | -95 | -95 |
|  |  | 1,2,3 | 3 | 3 |
|  |  | 1,2,3 | 3 | 3 |
| SS-RSRPNote3 | dBm/SCS | 1,2 | -95 | -95 |
|  |  | 3 | -92 | -92 |
| IoNote3 | dBm/9.36MHz | 1,2 | -65.2 | -65.2 |
|  | dBm/38.1MHz | 3 | -59.2 | -59.2 |
| Propagation condition |  | 1,2,3 | AWGN |
| SRS Config |  | 1,2 | SRSConf.1Note6 | SRSConf.3Note6 |
|  |  | 3 | SRSConf.1Note6 | SRSConf.2Note6 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 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 Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.Note 5: DRx related parameters are given in Table A.3.3.8-1Note 6: SRS configs are given in Table A.6.4.1.1.1-3 |

**Table A.6.4.1.1.1-3: SRS Configuration for Timing Accuracy Test**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Field** | **SRSConf.1** | **SRSConf.2** | **SRSConf.3** | **Comments** |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 | 0 |  |
|  | srs-ResourceIdList | 0 | 0 | 0 |  |
|  | resourceType | Periodic | Periodic | Periodic |  |
|  | Usage | Codebook | Codebook | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 | 0 | 0 |  |
|  | nrofSRS-Ports | Port1 | Port1 | Port1 |  |
|  | transmissionComb  | n2 | n2 | n2 |  |
|  | combOffset-n2 | 0 | 0 | 0 |  |
|  | cyclicShift-n2 | 0 | 0 | 0 |  |
|  | resourceMappingstartPosition | 0 | 0 | 0 |  |
|  | resourceMappingnrofSymbols  | n1 | n1 | n1 |  |
|  | resourceMappingrepetitionFactor | n1 | n1 | n1 |  |
|  | freqDomainPosition | 0 | 0 | 0 |  |
|  | freqDomainShift | 0 | 0 | 0 |  |
|  | freqHoppingc-SRS | 14 for test configuration 1,225 for test configuration 3 | 25 | 14 | Matches NRB,c |
|  | freqHoppingb-SRS | 0 | 0 | 0 |  |
|  | freqHoppingb-hop | 0 | 0 | 0 |  |
|  | groupOrSequenceHopping | Neither | Neither | Neither |  |
|  | resourceType | Periodic | Periodic | Periodic |  |
|  | periodicityAndOffset-p | sl1, 0 | sl640, 0 | sl320, 0 | Offset to align with DRx periodicity  |
|  | sequenceId | 0 | 0 | 0 | Any 10 bit number |

**Table A.6.4.1.1.1-4: Void**

A.6.4.1.1.2 Test requirements

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

Following will be the test sequence for this test

1) Setup NR PCell according to parameters given in Table A.6.4.1.1.1-1.

2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB.

a. The NTA offset value (in Tc units) is 25600

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1

3) The test system shall adjust the timing of the DL path by values given in Table A.6.4.1.1.2-1

**Table A.6.4.1.1.2-1: Adjustment Value for DL Timing**

|  |  |
| --- | --- |
| **SCS of SSB signals (KHz)** | **Adjustment Value** |
|  | Test1 | Test2 |
| 15 | +64\*64Tc | +32\*64Tc |
| 30 | +32\*64Tc | +16\*64Tc |

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within (NTA + NTA\_offset) ×Tc ± Te respective to the first path (in time) of DL SSB used by the UE to determine downlink timing is received from the reference cell at the UE antenna. Skip this step for test 2 with DRX configured.

5) The test system shall verify that the UE transmit timing offset stays within (NTA + NTA\_offset) ×Tc ± Te of the first path (in time) of DL SSB used by the UE to determine downlink timing is received from the reference cell at the UE antenna. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment

<Start of Change 3>

A.7.4.1.1 NR UE Transmit Timing Test for FR2

A.7.4.1.1.1 Test Purpose and environment

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in clause 7.1.2.

Supported test configurations are shown in Table 7.4.1.1.1-1.

**Table A.7.4.1.1.1-1: Supported test configurations for FR2 PCell**

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | NR TDD, SSB SCS 240 kHz, data SCS 120 kHz, BW 100 MHz |

For this test a single NR cell is used. Tables A.7.4.1.1.1-2 and A.7.4.1.1.1-2A define the parameters to be configured and strength of the transmitted signals. The transmit timing is verified by the UE transmitting SRS using the configuration defined in Table A.7.4.1.1.1-3.

**Table A.7.4.1.1.1-2: Cell Specific Test Parameters for UL Transmit Timing test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Config** | **Test1** | **Test2** |
| SSB ARFCN |  | 1 | Freq1 | Freq1 |
| TDD configuration |  | 1 | TDDConf.3.1 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |
| Data RBs allocated |  | 1 | 66 |
| Initial BWP Configuration |  | 1 | DLBWP.0.1ULBWP.0.1 |
| Dedicated BWP Configuration |  | 1 | DLBWP.1.1ULBWP.1.1 |
| TRS Configuration |  | 1 | TRS.2.1 TDD |
| PDSCH/PDCCH TCI state |  | 1 | TCI.State.2 |
| DRx Cycle | ms | 1 | N/A | DRX.8Note5 |
| PDSCH Reference measurement channel |  | 1 | SR.3. 3 TDD |
| RMSI CORESET Reference Channel |  | 1 | CR.3. 2 TDD |
| Dedicated CORESET Reference Channel |  | 1 | CCR.3. 7 TDD |
| OCNG Patterns |  | 1 | OP.1 |
| SSB Configuration |  | 1 | SSB.4 FR2 |
| SMTC Configuration |  | 1 | SMTC.1 |

|  |  |  |  |
| --- | --- | --- | --- |
| PDSCH/PDCCH subcarrier spacing | kHz | 1 | 120 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 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  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |  |  |
| Propagation condition |  | 1 | AWGN |
| SRS Config |  | 1 | SRSConf.1Note6 | SRSConf.2Note6 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: VoidNote 3: VoidNote 4: VoidNote 5: DRx related parameters are given in Table A.3.3.8-1Note 6: SRS configs are given in Table A.7.4.1.1.1-3 |

**Table A.7.4.1.1.1-2A: OTA related test parameters**

|  |  |  |  |
| --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test 1** | **Test 2** |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 |
| Assumption for UE beamsNote 6 |  | Fine |
| Note1 | dBm/15kHzNote4 | -112 |
| Note1 | dBm/SCSNote3 | -100 |
|  | dB | 4 |
| SS-RSRPNote2 | dBm/SCS Note4 | -96 |
|  | dB | 4 |
| IoNote2 | dBm/95.04 MHz Note4 | -68.5 |
| Note 1: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.Note 2: SS B\_RP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 3: VoidNote 4: Equivalent power received by an antenna with 0dBi gain at the centre of the quiet zoneNote 5: As observed with 0dBi gain antenna at the centre of the quiet zoneNote 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.7.4.1.1.1-3: SRS Configuration for Timing Accuracy Test**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Field** | **SRSConf.1** | **SRSConf.2** | **Comments** |
| SRS-ResourceSet | srs-ResourceSetId | 0 | 0 |  |
|  | srs-ResourceIdList | 0 | 0 |  |
|  | resourceType | Periodic | Periodic |  |
|  | Usage | Codebook | Codebook |  |
| SRS-Resource | SRS-ResourceId | 0 | 0 |  |
|  | nrofSRS-Ports | Port1 | Port1 |  |
|  | transmissionComb  | n2 | n2 |  |
|  | combOffset-n2 | 0 | 0 |  |
|  | cyclicShift-n2 | 0 | 0 |  |
|  | resourceMappingstartPosition | 0 | 0 |  |
|  | resourceMappingnrofSymbols  | n1 | n1 |  |
|  | resourceMappingrepetitionFactor | n1 | n1 |  |
|  | freqDomainPosition | 0 | 0 |  |
|  | freqDomainShift | 0 | 0 |  |
|  | freqHoppingc-SRS | 17 | 17 | Matches NRB,c |
|  | freqHoppingb-SRS | 0 | 0 |  |
|  | freqHoppingb-hop | 0 | 0 |  |
|  | groupOrSequenceHopping | Neither | Neither |  |
|  | resourceType | Periodic | Periodic |  |
|  | periodicityAndOffset-p | sl1, 0 | sl2560, 4 | Offset to align with DRx periodicity  |
|  | sequenceId | 0 | 0 | Any 10 bit number |

**Table A.7.4.1.1.1-4: Void**

A.7.4.1.1.2 Test requirements

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

Following will be the test sequence for this test:

1) Setup NR PCell according to parameters given in Table A.7.4.1.1.1-1.

2) After connection set up with the cell, the test equipment will verify that the timing of the NR cell is within (NTA + NTA\_offset) ×Tc ± Te of the first detected path of DL SSB.

a. The NTA offset value (in Tc units) is 13792

b. The Te values depend on the DL and UL SCS for which the test is being run and are given in Table 7.1.2-1

3) The test system shall adjust the timing of the DL path by values given in Table A.7.4.1.1.2-1

**Table A.7.4.1.1.2-1 Adjustment Value for DL Timing**

|  |  |
| --- | --- |
| **SCS of SSB signals (kHz)** | **Adjustment Value** |
|  | **Test1** | **Test2** |
| 240 | +8\*64Tc | +4\*64Tc |

4) The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in clause 7.1.2 Table 7.1.2.1-1 until the UE transmit timing offset is within (NTA + NTA\_offset) ×Tc ± Te respective to the first path (in time) of DL SSB used by the UE to determine downlink timing is received from the reference cell at the UE antenna. Skip this step for test 2 with DRX confiured.

5) The test system shall verify that the UE transmit timing offset stays within (NTA + NTA\_offset) ×Tc ± Te of the first path (in time) of DL SSB used by the UE to determine downlink timing is received from the reference cell at the UE antenna. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

<Start of Change 4>

## 13.X gNB Rx-Tx time difference measurements for RTT-based PDC

### 13.X.1 Report mapping

The reporting range of gNB Rx-Tx time difference, as defined in Clause 5.2.3 of TS 38.215 [4], is defined from -985024Tc to +985024×Tc. The reporting resolution is uniform across the reporting range and is defined as Tc\*32.

Tc is defined in TS 38.211 [6].

The mapping of measured quantity is defined in Table 13.X.1-1.

Table 13.X.1-1: gNB Rx-Tx time difference measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| RX-TX\_0000 | -985024 > RX-TX | Tc |
| RX-TX\_0001 | -985024 ≤ RX-TX < -984992 | Tc |
| RX-TX\_0002 | -984992 ≤ RX-TX < -984960 | Tc |
| … | … | … |
| RX-TX\_30781 | -64 ≤ RX-TX < -32 | Tc |
| RX-TX\_30782 | -32 ≤ RX-TX ≤ 0 | Tc |
| RX-TX\_30783 | 0 < RX-TX ≤ 32 | Tc |
| RX-TX\_30784 | 32 < RX-TX ≤ 64 | Tc |
| RX-TX\_30785 | 64 < RX-TX ≤ 96 | Tc |
| … | … | … |
| RX-TX\_61564 | 984992 < RX-TX ≤ 985024 | Tc |
| RX-TX\_61565 | 985024 < RX-TX | Tc |

### 13.X.2 Measurement Accuracy Requirements

#### 13.X.2.1 Introduction

This clause defines accuracy requirements for gNB Rx-Tx time difference measurement in FR1 and FR2. The requirements are applicable for gNB supporting gNB Rx-Tx time difference measurement for RTT-based PDC.

13.X.2.2 Requirements

The accuracy requirements for gNB Rx-Tx time difference measurement for RTT-based PDC shall be within ±(X+Y) Tc under the following conditions:

- AWGN propagation conditions.

- The measured signals are in the directions covered by RoAoA of OTA reference sensitivity requirements for gNB type 1-O and 2-O BS

where

- X is defined in Table 13.X.2.2-1 for gNB types 1-C, 1-H and 1-O and in Table 13.X.2.2-2 for gNB type 2-O.

- Y is declared by manufacturer and can be different for different gNB types 1-C, 1-H, 1-O and 2-O.

Note: The measurement accuracy requirements in Table 13.X.2.2-1 and Table 13.X.2.2-2 are defined under an assumption that gNB is not mandated to perform receive beam sweeping.

Table 13.X.2.2-1: gNB Rx-Tx time difference absolute accuracy in FR1 for gNB type 1-C, 1-H and 1-O

|  |  |  |  |
| --- | --- | --- | --- |
| Accuracy | SRS Ês/Iot | SCS | SRS bandwidth range |
| Unit: Tc | Unit: dB | Unit: kHz | Unit: RB |
| 122 | ≥ +3 | 15 | 24 ≤ BW ≤ 40 |
| 62 |  44 ≤ BW ≤ 84 |
| 32 |  88 ≤ BW ≤ 168 |
| 16 | 176 ≤ BW |
| 32 | 30 |  48 ≤ BW ≤ 84 |
| 17 |  88 ≤ BW ≤ 168 |
| 9 | 176 ≤ BW |
| 16 | 60 |  48 ≤ BW ≤ 84 |
| 9 |  88 ≤ BW  |

Table 13.X.2.2-2: gNB Rx-Tx time difference absolute accuracy in FR2 for gNB type 2-O

|  |  |  |  |
| --- | --- | --- | --- |
| Accuracy | SRS Ês/Iot | SCS | SRS bandwidth range |
| Unit: Tc | Unit: dB | Unit: kHz | Unit: RB |
| 9 | ≥ +3 | 60 | 132 ≤ BW ≤ 168 |
| 8 | 176 ≤ BW |
| 16 | 120 |  32 ≤ BW ≤ 40 |
| 9 |  44 ≤ BW ≤ 84 |
| 8 | 88 ≤ BW |

<Start of Change 5>

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 |   |
| pathlossReferenceRSssb-Index | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | n.a. |  |
| startPosition | 0 | 0 | resourceMapping setting |
| nrofSymbols | 4 | 4 |  |
| repetitionFactor | n1 | n.a. | without repetition. |
| transmissionComb | n2 | n4 |  |
| combOffset-n2 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 |   |
| nrofSRS-Ports | port1 | port1 | Number of antenna ports used for SRS transmission |
| resourceType | Periodic | Periodic |  |
| periodicityAndOffset-p | sl40, 2 | sl160, 20 | SRS transmission periodicity |

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | **SRS.2 TDD** | **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 |   |
| pathlossReferenceRSssb-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, 4 | Sl320, 40 | SRS transmission periodicity  |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **SRS.3 TDD** | **PDC-SRS.3** | **POS-SRS.3** |  |
| **Field** | **Value** |  |  | **Comment** |
| c-SRS | 17 | Same as NRB,c in the test case | Same as NRB,c in the test case |  |
| b-SRS | 0 | 0 | n.a. |  |
| b-hop | 0 | 0 | n.a. | Frequency hopping is disabled  |
| groupOrSequenceHopping | neither | neither | neither | No group or sequence hopping |
| freqDomainPosition | 0 | 0 | 0 | Frequency domain position of SRS |
| freqDomainShift | 0 | 0 | 0 |   |
| pathlossReferenceRSssb-Index | 0 | 0 | 0 | SSB #0 is used for SRS path loss estimation |
| usage | antennaSwitching | usagePDC-r17 | n.a. |  |
| startPosition | 5 | 5 | 5 | resourceMapping setting |
| nrofSymbols | 4 | 4 | 4 | SRS symbols belong to the same SRS resource. |
| repetitionFactor | n1 | n1 | n.a. | without repetition. |
| transmissionComb | n2 | n4 | n4 |  |
| combOffset-n2 | 0 | 0 | 0 | transmissionComb setting |
| cyclicShift-n2 | 0 | 0 | 0 |   |
| nrofSRS-Ports | port1 | port1 | port1 | Number of antenna ports used for SRS resource transmission |
| resourceType | Periodic | Periodic | Periodic |  |
| periodicityAndOffset-p | sl320, 16 | Sl1280, 160 | Sl1280, 160 | SRS transmission periodicity  |

<Start of Change 6>

### A.7.6.X UE Rx-Tx time difference measurements for PDC

#### A.7.6.X.1 UE Rx-Tx time difference measurement for propagation delay compensation using PRS in FR2

##### A.7.6.X.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in clause 9.12.4.1 in AWGN propagation condition in FR2 in standalone scenario.

The supported test configurations in listed in Table A.7.6.X.1.1-1.

Table A.7.6.X.1.1-1: Supported test configurations

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

The test is considered with one cell (Cell 1) in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. If the test is based on PRS, the Cell 1 mutes PRS transmission during T1 and transmits PRS during T2.

The *MeasObjectRxTxDiff-r17* with *prs-Ref-r17* , *measObject* with *measObjectRxTxDiff-17,* and *NR-DL-PRS-PDC-Info as defined in TS 38.331* shall be provided to the UE during T1.

The last TTI containing the RRC configuration shall be provided to the UE ΔT ms before the start of T2, where ΔT = [TBD] ms.

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

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.7.6.X.1.1-2. The test parameters for PRS are given Table A.7.6.X.1.1-3.

Table A.7.6.X.1.1-2: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value |
| Active cell |  | 1 | Cell 1 |
| RF Channel Number |  | 1 | 1 |
| 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 |
| 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.X.1.1-3: Cell specific test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 |
|  |  | T1 | T2 |
| TDD configuration |  | 1 | TDDConf.3.1 |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD |
| OCNG Patterns |  | 1 | OP.1 |
| TRS Configuration |  | 1 | TRS.2.1 TDD |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 |
| PRS configuration |  | 1 | PRS.1.1 FR2 |
| PRS muting info |  | 1 | ‘10’ |
| SRS configuration |  | 1 | [PDC-SRS.3] |
|  Note 2 | dBm/SCS | 1 | -89 |
|  Note 2 | dBm/15 kHz | 1 | -98 |
| PRS  | dB | 1 | -Infinity | -2.41 |
| PRS  | dB | 1 | -Infinity | -2 |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 |
| Io | dBm/95.04 MHz | 1 | 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: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

##### A.7.6.X.1.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in 9.12.4.1.

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

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, for k=5.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause [TBD] for Cell 1.

<Start of Change 7>

#### A.6.6.X1.2 UE Rx-Tx time difference measurement with TRS for RTT-based PDC in FR1 SA

##### A.6.6.X1.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement with TRS for RTT-based PDC meets the requirements specified in clause 9.12.4.2 for measurement delay and clause 10.1.X.2 for measurement accuracy in AWGN propagation condition in FR1 in standalone scenario.

The supported test configurations in listed in Table A.6.6.X1.2.1-1.

Table A.6.6.X1.2.1-1: 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 is a single cell in the test: PCell (Cell 1) on RF channel 1 in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 does not have TRS transmission during T1 and transmits TRS during T2.

The measurement control information with *MeasObjectRxTxDiff* set to ‘csi-RS-Ref’ as defined in TS 38.331 [2], shall be provided to the UE during T1. The last TTI containing the RRC message shall be provided to the UE ΔT ms before the start of T2, where ΔT = 10 ms is the maximum processing time of the measurement request.

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.X1.2.1-2 and Table A.6.6.X1.2.1-3 respectively. The test consists two sub-tests with different TRS BW.

Table A.6.6.X1.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell  |
| RF Channel Number |  | 1, 2, 3 | 1 |  |
| 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 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | OFF |  |
| T1 | s | 1, 2, 3 | 1 |  |
| T2 | s | 1, 2, 3 | 1 |  |

Table A.6.6.X1.2.1-3: Cell specific test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Values |
|  |  | T1 | T2 |
| TDD configuration |  | 1 | N/A |
|  | 2 | TDDConf.1.1 |
|  |  | 3 | TDDConf.2.1 |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD |
|  | 2 | SR.1.1 TDD |
|  | 3 | SR.2.1 TDD |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD |
|  | 2 | CR.1.1 TDD |
|  |  | 3 | CR.2.1 TDD |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD |
|  | 2 | CCR.1.1 TDD |
|  | 3 | CCR.2.1 TDD |
| OCNG Patterns |  | 1, 2, 3 | OP.1 |
| TRS Configuration |  | 1 | TRS.1.1 FDD |
|  | 2 | TRS.1.1 TDD |
|  |  | 3 | TRS.1.2 TDD |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 |
| SRS configuration |  | 1 | [PDC-SRS.1] |
|  |  | 2 | [PDC-SRS.1] |
|  |  | 3 | [PDC-SRS.2] |
|  Note 2 | dBm/SCS | 1 | -98 |
|  | 2 | -98 |
|  | 3 | -95 |
|  Note 2 | dBm/15 kHz | 1 | -98 |
|  | 2 |  |
|  | 3 |  |
| TRS  | dB | 1 | -Infinity | -3 |
|  | 2 |  |  |
|  |  | 3 |  |  |
| TRS  | dB | 1 | -Infinity | -3 |
|  | 2 |  |  |
|  |  | 3 |  |  |
| TRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 |
|  | 2 | -Infinity | -101 |
|  | 3 | -Infinity | -98 |
| Io | dBm/9.36 MHz | 1 | N/A | -68.28 |
| dBm/9.36 MHz | 2 | -68.28 |
| dBm/38.16 MHz | 3 | -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: TRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

##### A.6.6.X1.2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.12.4.2. The UE shall be able to report the first Rx-Tx time difference measurement results no later than TBD ms from the beginning of T2.

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause 10.1.X.2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%.

<Start of Change 8>

### A.6.6.x1 UE Rx-Tx time difference measurement for propagation delay compensation

#### A.6.6.x1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement for RTT-based PDC meets the requirements specified in clause 9.12.4.1 for measurement delay and clause 10.1.X for measurement accuracy in AWGN propagation condition in FR1 in standalone scenario.

The supported test configurations in listed in Table A.6.6.x1.1-1.

Table A.6.6.x1.1-1: 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. |

The test is considered with one cell (Cell 1) in FR1.

The test consists of two consecutive time intervals, with duration of T1 and T2. If the test is based on PRS, the Cell 1 mutes PRS transmission during T1 and transmits PRS during T2.

If the test is based on PRS, the *MeasObjectRxTxDiff-r17* with *prs-Ref-r17* , *measObject* with *measObjectRxTxDiff-17,* and *NR-DL-PRS-PDC-Info as defined in TS 38.331* shall be provided to the UE during T1.

The last TTI containing the RRC configuration shall be provided to the UE ΔT ms before the start of T2, where ΔT = [TBD] ms.

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

The UE is configured to transmit SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.6.6.x1.1-2. The test parameters for PRS are given Table A.6.6.x1.1-3.

Table A.6.6.16.4.1-2: General test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value |
| Active cell |  | 1, 2, 3 | Cell 1 |
| RF Channel Number |  | 1, 2, 3 | 1 |
| 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 |
| CP length |  | 1, 2, 3 | Normal |
| DRX |  | 1, 2, 3 | OFF |
| T1 | s | 1, 2, 3 | 5 |
| T2 | s | 1, 2, 3 | 10 |

Table A.6.6.16.4.1-3: Cell specific test parameters

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 |
|  |  | T1 | T2 |
| TDD configuration |  | 1 | N/A |
|  | 2 | TDDConf.1.1 |
|  |  | 3 | TDDConf.2.1 |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD |
|  | 2 | SR.1.1 TDD |
|  | 3 | SR.2.1 TDD |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD |
|  | 2 | CR.1.1 TDD |
|  |  | 3 | CR.2.1 TDD |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD |
|  | 2 | CCR.1.1 TDD |
|  | 3 | CCR.2.1 TDD |
| OCNG Patterns |  | 1, 2, 3 | OP.1 |
| TRS Configuration |  | 1 | TRS.1.1 FDD |
|  | 2 | TRS.1.1 TDD |
|  |  | 3 | TRS.1.2 TDD |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 |
| PRS configuration |  | 1 | PRS.1.2 FR1 |
|  | 2 | PRS.1.2 FR1 |
|  | 3 | PRS.2.2 FR1 |
| PRS muting info |  | 1, 2, 3 | ‘10’ |
| SRS configuration |  | 1 | [PDC-SRS.1] |
|  |  | 2 | [PDC-SRS.1] |
|  |  | 3 | [PDC-SRS.2] |
|  Note 2 | dBm/SCS | 1 | -98 |
|  | 2 | -98 |
|  | 3 | -95 |
|  Note 2 | dBm/15 kHz | 1 | -98 |
|  | 2 | -98 |
|  | 3 | -98 |
| PRS  | dB | 1 | -Infinity | -2.41 |
|  | 2 |  |  |
|  |  | 3 |  |  |
| PRS  | dB | 1 | -Infinity | -2 |
|  | 2 |  |  |
|  |  | 3 |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 |
|  | 2 | -Infinity | -100 |
|  | 3 | -Infinity | -97 |
| Io | dBm/9.36 MHz | 1 | N/A | -67.67 |
| dBm/9.36 MHz | 2 | -67.67 |
| dBm/38.16 MHz | 3 | -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: The 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: PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. |

##### A.6.6.x1.2 Test requirements

If the test is based on PRS, the UE Rx-Tx time difference measurement time fulfils the requirements specified in 9.12.4.1.

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

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].

The UE Rx-Tx time difference measurement time fulfils the UE Rx-Tx measurement accuracy requirements specified in clause [TBD] for Cell 1.

<End of Change 8>