**3GPP TSG-RAN4 Meeting # 112 *R4-2412xxx***

**Maastricht, NL, 19th - 23rd August 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **draftCR** | **rev** | **1** | **Current version:** | **18.6.0** |  |
|  | | | | | | | | |
| *For* ***[HE](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)******[LP](http://www.3gpp.org/3G_Specs/CRs.htm" \l "_blank)*** *on using this form: comprehensive instructions can be found at  <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:*** | draftCR 38.133 Phase II LPHAP test cases | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh2-Perf | | | | |  | ***Date:*** | | | 2024-08-xx |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | *Rel-18* |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | To implement the following test cases:   * RSTD measurement reporting delay and accuracy in FR1 in RRC\_IDLE with eDRX > 10.24s. * RSTD without RX FH measurement reporting delay and accuracy in RRC\_IDLE with eDRX > 10.24s. * RSRP measurement reporting delay and accuracy in RRC\_IDLE without eDRX in FR1. * RSRP measurement reporting delay and accuracy in RRC\_IDLE without eDRX in FR2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Following test cases are defined:   * RSTD measurement reporting delay and accuracy in FR1 in RRC\_IDLE with eDRX > 10.24s. * RSTD without RX FH measurement reporting delay and accuracy in RRC\_IDLE with eDRX > 10.24s. * RSRP measurement reporting delay and accuracy in RRC\_IDLE without eDRX in FR1. * RSRP measurement reporting delay and accuracy in RRC\_IDLE without eDRX in FR2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | UE capability to meet the following requirements cannot be verified:   * RSTD measurement reporting delay and accuracy in FR1 in RRC\_IDLE with eDRX > 10.24s. * RSTD without RX FH measurement reporting delay and accuracy in RRC\_IDLE with eDRX > 10.24s. * RSRP measurement reporting delay and accuracy in RRC\_IDLE without eDRX in FR1. * RSRP measurement reporting delay and accuracy in RRC\_IDLE without eDRX in FR2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | New clauses:   * A.6.10.1.2 * A.6.10.2.1 * A.6.11.1.2 * A.6.11.2.1 * A.7.10.2.1 * A.7.11.2.1 * A.16.10.1.2 * A.16.11.1.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | Test cases as agreed in R4-2410191. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

## <START OF CHANGE #1>

##### A.6.10.1.2 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_IDLE state with eDRX cycle > 10.24s for non-RedCap UE

###### A.6.10.1.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement in RRC\_IDLE state meets the requirements specified in Clause 4.5.2.5 when eDRX cycle is longer than 10.24s 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.6.10.1.2.1-1.

Table A.6.10.1.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 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 be in RRC\_CONNECTED state and shall not have any timing information of Cell 2 and Cell 3. During T2 UE shall be in RRC\_IDLE state and all three cells transmit PRS resources within initial DL BWP of the UE and with the same numerology as the initial DL BWP.

***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 6.5.10], shall be provided to the UE during T1. The UE is configured to report positioning measurements every 20s by setting the value of *reportingInterval* to "*ri20*" in *nr-DL-TDOA-RequestLocationInformation.* 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 DL-TDOA assistance data and location information request.

The beginning of the time interval T2 is not limited to PTW.

The UE is configured with eDRX cycle of 40.96s.

The general test parameters are listed in Table A.6.10.1.2.1-2, and cell specific test parameters are listed in Table A.6.10.1.2.1-3 and Table A.6.10.1.2.1-4.

Table A.6.10.1.2.1-2: 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 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| 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.1.2 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2) mod 6 = 0  and  (PCI of Cell 1 – PCI of Cell 3) mod 6 = 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 |  |
| eDRX | | s | 40.96 |  |
| 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 ta specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 4 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to *NR-MutingPattern* 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 | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.6.10.1.2.1-3: 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 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| 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/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 2 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 3 | dBm/  47.88MHz | -52.56 | -52.56 | -52.56 |
| 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.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  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.6.10.1.2.1-4: 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 | |  | 12 Low | 12 Low | 12 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 |
| 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/  19.08MHz | -65.43 | -65.43 | -65.43 |
| Config 2 | dBm/  96.48MHz | -65.43 | -65.43 | -65.43 |
| Config 3 | dBm/  47.88MHz | -61.44 | -61.44 | -61.44 |
| PRS | | dB | -6 | -13 | -13 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T2) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  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. | | | | | |

###### A.6.10.1.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 4.5.2.5. The test is considered complete after the UE reports the first set of positioning measurements based on the configured *reportingInterval.*

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 4.5.2.5 starting from the beginning of time interval T2.

***NOTE****: The actual overall delays measured in the test may be higher than the time duration above because of the uncertainty in acquiring the first available PRACH occasion to transition to RRC\_CONNECTED state to report the measurements.*

The rate of the correct events for each neighbour cell observed during the 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 the Clause 10.1.23.3, i.e., between RSTD\_000000000 and RSTD\_126083073.

## <END OF CHANGE #1>

## <START OF CHANGE #2>

#### A.6.10.2.1 PRS-RSRP reporting delay test case for single positioning frequency layer in RRC\_IDLE state for non-RedCap UE in FR1

##### A.6.10.2.1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement in RRC\_IDLE state meets the delay requirements specified in clause 4.5.3.5 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.10.2.1.1-1.

Table A.6.10.2.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 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.

During T1 UE is in RRC\_CONNECTED, 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. In the next DL slot after slot #n, UE is released into RRC\_IDLE.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the 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.6.10.2.1.1-2, and cell specific test parameters are listed in Table A.6.10.2.1.1-3.

Table A.6.10.2.1.1-2: 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 | 20: NRB,c = 106 |  |
| 2 | 20: NRB,c = 106 |  |
| 3 | 50: NRB,c = 133 |  |
| 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 | 1.28s |  |
| 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 | 6 |  |

Table A.6.10.2.1.1-3: 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 | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | 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 | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -88 | -88 | -Infinity | -88 |
| 2 | -88 | -88 | -Infinity | -88 |
| 3 | -85 | -85 | -Infinity | -85 |
| Io | dBm/19.08 MHz | 1 | N/A | -64.57 | N/A | -64.57 |
|  | dBm/19.08 MHz | 2 | -64.57 | -64.57 |
|  | dBm/47.88 MHz | 3 | -60.59 | -60.59 |
| 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: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.10.2.1.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 4.5.3.5.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 4.5.3.5 starting from the beginning of time interval T2.

***NOTE****: The actual overall delays measured in the test may be higher than the time duration above because of the uncertainty in acquiring the first available PRACH occasion to transition to RRC\_CONNECTED state to report the measurements.*

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.

## <END OF CHANGE #2>

## <START OF CHANGE #3>

#### A.6.11.1.2 RSTD measurement accuracy test case for single positioning frequency layer in FR1 in RRC\_IDLE state with eDRX>10.24s for non-RedCap UE

##### A.6.11.1.2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement performed by UE in RRC\_IDLE state with eDRX > 10.24s 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.6.11.1.2.1-1.

Table A.6.11.1.2.1-1: Supported test configurations.

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 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 UE is configured with eDRX cycle of 40.96s. The UE is configured to report positioning measurements every 20s by setting the value of *reportingInterval* to "*ri20*" in *nr-DL-TDOA-RequestLocationInformation.* 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 4.5.2.5.

Table A.6.11.1.2.1-2: RSTD accuracy test parameters.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | | |
| Cell 1 | Cell 2 | |
| PRS ARFCN | 1~3 |  | freq1 | Freq1 | |
| BWchannel | 1 | MHz | 20: NRB,c = 106 | | |
| 2 | 20: NRB,c = 106 | | |
| 3 | 50: NRB,c = 133 | | |
| Duplex mode | 1 |  | FDD | | |
| 2 | TDD | | |
| 3 | TDD | | |
| TDD configuration | 1 |  | N/A | | |
| 2 | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | |
| 2 | SR.1.1 TDD |  | |
| 3 | SR.2.1 FDD |  | |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | |
| 2 | CR.1.1 TDD | - | |
| 3 | CR.2.1 FDD | - | |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - | |
| 2 | CCR.1.1 TDD | - | |
| 3 | CCR.2.1 TDD | - | |
| SSB configuration | 1 |  | SSB.1 FR1 | | |
| 2 | SSB.1 FR1 | | |
| 3 | SSB.2 FR1 | | |
| OCNG Patterns | 1~3 |  | OP.1 | | |
| TRS configuration | 1 |  | TRS.1.1 FDD | | - |
| 2 | TRS.1.1 TDD | |  |
| 3 | TRS.1.2 TDD | |  |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | |
| Time offset with Cell 1 | 1 | μs | - | 3 | |
| 2,3 | - | 3 | |
| SMTC configuration | 1 |  | SMTC.2 | | |
| 2,3 | SMTC.1 | | |
| PRS configuration | 1 |  | PRS.1.3 FR1 | | |
| 2 | PRS.1.3 FR1 | | |
| 3 | PRS.2.4 FR1 | | |
| PRS muting info | 1~3 |  | ‘10’ | ‘01’ | |
| Expected RSTD | 1, 2, 3 | μs | N/A | 3 | |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | 5 | |
| EPRE ratio of PSS to SSS | 1~3 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note2 | 1,2 | dBm/ SCS | -98 | | |
| 3 | -95 | | |
|  | 1~3 | dB | -6 | -13 | |
| PRS-RSRPNote3 | 1,2 | dBm/SCS | -103.7 | -109.9 | |
| 3 | -100.7 | -106.9 | |
| IoNote3 | 1,2 | dBm/  19.08MHz | -65.70 | -65.70 | |
| 3 | dBm/  47.88MHz | -61.72 | -61.72 | |
|  | 1~3 | dB | -5.7 | -11.9 | |
| Propagation condition | 1~3 | - | AWGN | | |
| Antenna configuration | 1~3 |  | 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 sub-carriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP 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. | | | | | |

##### A.6.11.1.2.2 Test Requirements

The test is considered complete after the UE reports the first set of positioning measurements based on the configured *reportingInterval.* The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.23.2.

## <END OF CHANGE #3>

## <START OF CHANGE #4>

#### A.6.11.2.1 PRS-RSRP measurement accuracy test case for non-RedCap UE in FR1 in RRC\_IDLE state

##### A.6.11.2.1.1 Test Purpose and Environment

The purpose of this test is to verify accuracy of PRS-RSRP measurement performed by UE in RRC\_IDLE mode in FR1.

##### A.6.11.2.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.6.11.2.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.6.11.2.1.2-2. In all test cases, Cell 1 is the PCell.

Table A.6.11.2.1.2-1: PRS-RSRP supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 50 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.6.11.2.1.2-2: 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 | 20: NRB,c = 106 | | | | |
|  | | Config 2 |  | 20: NRB,c = 106 | | | | |
|  | | Config 3 |  | 50: NRB,c = 133 | | | | |
| BWP BW | | Config 1 |  | 20: NRB,c = 106 | | | | |
|  | | Config 2 |  | 20: NRB,c = 106 | | | | |
|  | | Config 3 |  | 50: NRB,c = 133 | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | |
| DRX Cycle | | | s | 1.28 | | | | |
| 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 | ms | - | 3 | - | 3 | |
|  | | Config 2,3 | μs | - | 3 | - | 3 | |
| 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) | | |  |  |  |  |  | |
| Note2 | Config 1,2 |  | dBm/15kHZ | -98 | | -98 | | |
| Config 3 |  | -98 | | -98 | | |
| Note2 | Config 1,2 | | dBm/SCS | -98 | | -98 | | |
| Config 3 |  | -95 | | -95 | | |
|  | | | dB | -2.41 | -12.12 | -2.41 | | -12.12 |
|  | | | dB | -2 | -10 | -2 | | -10 |
| PRS-RSRP Note3 | Config 1, 2 |  | dBm/SCS | -100 | -108 | -100 | | -108 |
|  | Config 3 |  |  | -97 | -105 | -97 | | -105 |
| IoNote3 | Config 1,2 |  | dBm/19.08MHz | -64.57 | | -64.57 | | |
| Config 3 |  | dBm/47.88MHz | -60.59 | | -60.59 | | |
| 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 sub-carriers 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.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | |

##### A.6.11.2.1.3 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.

## <END OF CHANGE #4>

## <START OF CHANGE #5>

#### A.7.10.2.1 PRS-RSRP reporting delay test case for single positioning frequency layer in RRC\_IDLE state for non-RedCap UE in FR2

##### A.7.10.2.1.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements specified in Clause 4.5.3.5 for single positioning frequency layer under AWGN propagation conditions in RRC\_IDLE state. Supported test configurations are shown in table A.7.10.2.1.1-1.

Table A.7.10.2.1.1-1: supported test configurations for PRS RSRP measurement for FR2.

|  |  |
| --- | --- |
| Config | Description |
| 1 | 120 kHz SSB SCS, 200 MHz bandwidth, TDD duplex mode |

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.

During T1 UE is in RRC\_CONNECTED state, 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. In the next DL slot after slot #n, UE is released into RRC\_IDLE state.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the 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.7.10.2.1.1-2 and table A.7.10.2.1.1-3.

Table A.7.10.2.1.1-2: 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. |
| 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 |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | 0.64s |  |
| 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 | 41 |  |

Table A.7.10.2.1.1-3: 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 | 200: NRB,c = 132 | | 200: NRB,c = 132 | |
| BWP BW | | MHz | Config 1 | 200: NRB,c = 132 | | 200: NRB,c = 132 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | 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 | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PRS configuration | |  | Config 1 | PRS.1.2 FR2 | | PRS.1.2 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 |  | -98 | | -98 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -89 | | -89 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -91 | -91 | -Infinity | -99 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -91 | -Infinity | -99 |
| PRS | | dB | Config 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | | dB | Config 1 | -Infinity | -2 | -Infinity | -10 |
| IoNote3 | | dBm/190.08 MHz Note5 | Config 1 | -54.62 | | -54.62 | |
| 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: SS-RSRP/PRS-RSRP 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.7.10.2.1.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 4.5.3.5.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 4.5.3.5 starting from the beginning of time interval T2.

***NOTE****: The actual overall delays measured in the test may be higher than the time duration above because of the uncertainty in acquiring the first available PRACH occasion to transition to RRC\_CONNECTED state to report the measurements.*

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.

## <END OF CHANGE #5>

## <START OF CHANGE #6>

#### A.7.11.2.1 PRS-RSRP measurement accuracy test case for non-RedCap UE in FR2 in RRC\_IDLE state

##### A.7.11.2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the PRS-RSRP measurement accuracy in RRC\_IDLE 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.7.11.2.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.7.11.2.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in Table A.7.11.2.1.2-2 and A.7.11.2.1.2-3. In all test cases, Cell 1 is the PCell.

Table A.7.11.2.1.2-1: PRS-RSRP supported test configurations.

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 120 kHz SSB SCS, 200 MHz bandwidth, TDD duplex mode |

Table A.7.11.2.1.2-2: 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 | 200: NRB,c = 132 | | 200: NRB,c = 132 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| DRX cycle configuration |  | 1.28s | - | 1.28s | - |
| 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.3 | OP.3 | OP.3 | OP.3 |
| 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 |
| 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 |  |  |  |  |  |
| 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. | | | | | |

Table A.7.11.2.1.2-3: 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 6 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote3 | -98 | | Same as Test 1 | |
| Note1 | dBm/SCSNote3 | -89 | | Same as Test 1 | |
|  | dB | -2 | -10 | -2 | -10 |
| Es | dBm/SCSNote3 | - | - | - | - |
| PRS\_RPNote2 | dBm/SCS | -91 | -99 | -91 | -99 |
| BB Note5 | dB | -2.41 | -12.12 | -2.41 | -12.12 |
| IoNote2 | dBm/190.08 MHz Note3 | -54.62 | | -54.62 | |
| 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: PRS\_RP, 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 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [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 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.7.11.2.1.3 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.7.11.2.1.3-1. 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.7.11.2.1.3-1: 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 | |

## <END OF CHANGE #6>

## <START OF CHANGE #7>

##### A.16.10.1.2 NR RSTD measurement reporting delay test case for RedCap UE without RX FH in FR1 SA in RRC\_IDLE state when eDRX > 10.24s

###### A.16.10.1.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement, reported by RedCap UE with 1Rx or 2Rx branches, meets the requirements specified in Clause 4.6.2.5 when the RedCap UE is configured with eDRX cycle longer than 10.24s 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.16.10.1.2.1-1.

Table A.16.10.1.2.1-1: 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, 20 MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD 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 be in RRC\_CONNECTED state and shall not have any timing information of Cell 2 and Cell 3. During T2 UE shall be in RRC\_IDLE state and all three cells transmit PRS resources within initial DL BWP of the UE and with the same numerology as the initial DL BWP.

***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 6.5.10], shall be provided to the UE during T1. The UE is configured to report positioning measurements every 20s by setting the value of *reportingInterval* to "*ri20*" in *nr-DL-TDOA-RequestLocationInformation.* The UE is not configured by the LMF to perform RSTD measurement with RX FH in *NR-DL-TDOA-RequestLocationInformation*. 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 DL-TDOA assistance data and location information request.

The beginning of the time interval T2 is not limited to PTW.

The UE is configured with eDRX cycle of 40.96s.

The general test parameters are listed in Table A.16.10.1.2.1-2, and cell specific test parameters are listed in Table A.16.10.1.2.1-3 and Table A.16.10.1.2.1-4.

Table A.16.10.1.2.1-2: 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 1,4 |  | SSB.4 RedCap FR1 |  |
| Config 2 |  | SSB.4 RedCap FR1 |
| Config 3 |  | SSB.5 RedCap FR1 |
| SMTC configuration | Config 1,4 |  | SMTC.1 RedCap |  |
| Config 2 |  | SMTC.1 RedCap |
| Config 3 |  | SMTC.1 RedCap |
| PDSCH RMC configuration | Config 1,4 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1,4 |  | 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 1,4 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3,4 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active UL BWP configuration | Config 1,2,3,4 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1,4 |  | 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) mod 6 = 0  and  (PCI of Cell 1 – PCI of Cell 3) mod 6 = 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 |  |
| eDRX | | s | 40.96 |  |
| CN and RAN eDRX configuration | | s | eDRX length = 40.96  PTW length = 10.24 |  |
| 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 ta specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 4 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to *NR-MutingPattern* 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 | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.16.10.1.2.1-3: 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 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| 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/  9.36 MHz | -56.54 | -56.54 | -56.54 |
| Config 2 | dBm/  9.36 MHz | -56.54 | -56.54 | -56.54 |
| Config 3 | dBm/  18.72 MHz | -56.54 | -56.54 | -56.54 |
| SSB RP Note4 | Config 1 | dBm/SCS | -82 | -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.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over sub-carriers 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.16.10.1.2.1-4: 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 | |  | 12 Low | 12 Low | 12 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 |
| 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 | -11 | -11 |
| Config 2 | dB | -5 | -11 | -11 |
| Config 3 | dB | -5 | -11 | -11 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -69.26 | -69.26 | -69.26 |
| Config 2 | dBm/  9.36MHz | -69.26 | -69.26 | -69.26 |
| Config 3 | dBm/  18.72MHz | -66.63 | -66.63 | -66.63 |
| PRS | | dB | -5.33 | -12.19 | -12.19 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T2) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the sub-frames with transmitted PRS.  Note 2: The resources for uplink transmission are assigned after the end of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over sub-carriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled. | | | | | |

###### A.16.10.1.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 4.6.2.5. The test is considered complete after the UE reports the first set of positioning measurements based on the configured *reportingInterval.*

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 4.6.2.5 starting from the beginning of time interval T2.

***NOTE****: The actual overall delays measured in the test may be higher than the time duration above because of the uncertainty in acquiring the first available PRACH occasion to transition to RRC\_CONNECTED state to report the measurements.*

The rate of the correct events for each neighbour cell observed during the 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 the Clause 10.1.23.3, i.e., between RSTD\_000000000 and RSTD\_126083073.

## <END OF CHANGE #7>

## <START OF CHANGE #8>

#### A.16.11.1.2 RSTD measurement accuracy test case for RedCap UE without FH in FR1 in RRC\_IDLE state with eDRX > 10.24s

##### A.16.11.1.2.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement for RedCap UE without FH in RRC\_IDLE state with eDRX > 10.24s meets the accuracy requirements specified in clause 10.1A.16.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.16.11.1.2.1-1.

Table A.16.11.1.2.1-1: 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, 20 MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD 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 UE is configured with eDRX cycle of 40.96s. The UE is configured to report positioning measurements every 20s by setting the value of *reportingInterval* to "*ri20*" in *nr-DL-TDOA-RequestLocationInformation.* The *NR-DL-TDOA-ProvideAssistanceData* and *NR-DL-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the RedCap UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 4.6.2.5.

The RSTD measurement accuracy in this clause is valid for the cases where the RedCap UE is not configured by the LMF to perform RSTD measurement with RX FH in *NR-DL-TDOA-RequestLocationInformation*.

Table A.16.11.1.2.1-2: RSTD accuracy test parameters.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Cell 1 | Cell 2 | |
| PRS ARFCN | 1~4 |  | freq1 | | freq1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | | |
| 2 | 10: NRB,c = 52 | | |
| 3 | 20: NRB,c = 51 | | |
| 4 | 10: NRB,c = 52 | | |
| Duplex mode | 1 |  | FDD | | |
| 2 | TDD | | |
| 3 | TDD | | |
| 4 | HD-FDD | | |
| TDD configuration | 1 |  | N/A | | |
| 2 | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | |
| 4 | N/A | | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | | - |
| 2 | SR.1.1 TDD | |  |
| 3 | SR.2.1 TDD | |  |
| 4 | SR.1.1 FDD | |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | | - |
| 2 | CR.1.1 TDD | | - |
| 3 | CR.2.1 TDD | | - |
| 4 | CR.1.1 FDD | |  |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | | - |
| 2 | CCR.1.1 TDD | | - |
| 3 | CCR.2.1 TDD | | - |
| 4 | CCR.1.1 FDD | | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | |
| 2 | SSB.1 FR1 | | |
| 3 | SSB.1 RedCap FR1 | | |
| 4 | SSB.1 FR1 | | |
| OCNG Patterns | 1~4 |  | OP.1 | | |
| TRS configuration | 1 |  | TRS.1.1 FDD | | - |
| 2 | TRS.1.1 TDD | |  |
| 3 | TRS.1.2 TDD | |  |
| 4 | TRS.1.1 FDD | |  |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 | | |
| Time offset with Cell 1 | 1,4 | μs | - | | 3 |
| 2,3 | - | | 3 |
| SMTC configuration | 1,4 |  | SMTC.2 | | |
| 2,3 | SMTC.1 | | |
| PRS configuration | 1 |  | PRS.1.3 FR1 | | |
| 2 | PRS.1.3 FR1 | | |
| 3 | PRS.2.3 FR1 | | |
| 4 | PRS.1.3 FR1 | | |
| PRS muting info | 1~4 |  | ‘10’ | | ‘01’ |
| Expected RSTD | 1, 2, 3, 4 | μs | N/A | | 3 |
| Expected RSTD uncertainty | 1, 2, 3, 4 | μs | N/A | | 5 |
| EPRE ratio of PSS to SSS | 1~4 | 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 DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note2 | 1,2,4 | dBm/ SCS | -98 | | |
| 3 | -95 | | |
|  | 1~4 | dB | -6 | | -13 |
| PRS-RSRPNote3 | 1,2,4 | dBm/SCS | -103.7 | | -109.9 |
| 3 | -100.7 | | -106.9 |
| IoNote3 | 1,2,4 | dBm/  9.36MHz | -68.8 | | -68.8 |
| 3 | dBm/  18.36MHz | -65.88 | | -65.88 |
|  | 1~4 | dB | -5.7 | | -11.9 |
| Propagation condition | 1~4 | - | AWGN | | |
| Antenna configuration | 1~4 |  | 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: RSRP 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. | | | | | |

##### A.16.11.1.2.2 Test Requirements

The test is considered complete after the UE reports the first set of positioning measurements based on the configured *reportingInterval.* The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1A.16.2.

## <END OF CHANGE #8>