**3GPP TSG-RAN WG4 Meeting # 113 *R4-2419356***

**Orlando, US, 18 – 22 November, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **draftCR** | **rev** | **1** | **Current version:** | **18.7.0** |  |
|  | | | | | | | | |
| *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 to 38.133 on accuracy requirements and test cases for RedCap positioning | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh2-Perf | | | | |  | ***Date:*** | | | 2024-11-22 |
|  |  | | | |  | |  | | |  |
| ***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 make corrections to accuracy requirement and test cases for RedCap positioning measurements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Square brackets around the accuracy requirements for RSTD, PRS-RSRP, UE Rx-Tx, and PRS-RSRPP measurements are removed. * Corrections to margin tables are done. * Number of cells provided in DL-TDOA assistance data is aligned with the number of cells in the test setup. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Accuracy requirements and test cases for RedCap positioning are not correct. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 10.1A.16, 10.1A.18, A.16.6.6.1, A.16.6.6.2, A.16.8.1.1, A.16.8.1.2, A.16.10.1.1, A.17.6.5.1, A.17.6.5.2, A.17.8.1.1, A.17.8.1.2, A.17.10.1.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | Changes are based on revised big draftCR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R4-2419356 | | | | | | | | |

## **START OF CHANGE 1**

### 10.1A.16 RSTD Measurements for RedCap Positioning

#### 10.1A.16.1 Introduction

The requirements in clause 10.1A.16 shall apply, provided the UE has received *nr-DL-TDOA-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more DL RSTD measurements defined in TS 38.215 [4].

The requirements in clause 10.1A.16 shall apply,

* When the RedCap UE is in RRC\_CONNECTED state and the RSTD measurement is performed with and without RX FH within measurement gap.
* When RedCap UE is in RRC\_CONNECTED state and the RSTD measurement is performed without RX FH outside of the measurement gap.
* When RedCap UE is in RRC\_CONNECTED state and the RSTD measurement is performed without RX FH when both PPW and measurement gap is configured.
* When RedCap UE is in RRC\_INACTIVE state and the RSTD measurement is performed with and without RX FH.
* When RedCap UE is in RRC\_IDLE state and the RSTD measurement is performed with and without RX FH.

The requirements defined in clause 10.1A.16 are valid under the conditions defined in 10.1.23.

#### 10.1A.16.2 Measurement Accuracy Requirements

The accuracy requirements for RSTD measurement shall be within ±(X+Y+Z+Δ) Tc. The values of Y, Z and Δ and Rx TEG based requirement are as defined in clause 10.1.23.2. For Rx FH, PRS BW in table 10.1.23.2-5, table 10.1.23.2-5a, table 10.1.23.2-6, table 10.1.23.2-6a refer to per hop BW. The requirements for fading channel in this clause are derived based on TDL-A (30 ns delay spread, 5Hz) and TDL-C (60 ns delay spread, 300 Hz) channel models for FR1 and FR2, respectively.

##### 10.1A.16.2.1 Accuracy requirement for RSTD measurement without RX FH

For 4 sample RSTD measurement performed by 2Rx RedCap UE without RX FH, the values of X, corresponding to the PRS bandwidth supported by the RedCap UE for PRS measurement without RX FH, in tables 10.1.23.2-1 in FR1 for AWGN, 10.1.23.2-2 in FR2 for AWGN, 10.1.23.2-3 in FR1 for fading channel, and 10.1.23.2-4 in FR2 for fading channel apply.

For reduced sample RSTD measurement performed by 2Rx RedCap UE without RX FH, the values of X, corresponding to the PRS bandwidth supported by the RedCap UE for PRS measurement without RX FH, in tables 10.1.23.2-7 in FR1 for AWGN, and 10.1.23.2-8 in FR2 for AWGN apply.

The value of X for 4 sample RSTD measurement performed by 1Rx RedCap UE without RX FH is defined in table 10.1A.16.2.1-1 in FR1 for AWGN, and in table 10.1A.16.2.1-2 in FR1 for fading channel.

The value of X for reduced sample RSTD measurement performed by 1Rx RedCap UE without RX FH is defined in table 10.1A.16.2.1-3 in FR1 for AWGN.

Table 10.1A.16.2.1-1: RSTD absolute accuracy for 1Rx RedCap UE in FR1 for AWGN channel (without RX FH)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 137 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -50 |
| 79 | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 45 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 81 | 30 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| NR\_FDD\_FR1\_N | -117.5 | -50 |
| 46 | 30 | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 52 | 60 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -114.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS. | | | | | | | |

Table 10.1A.16.2.1-2: RSTD absolute accuracy for 1Rx RedCap UE in FR1 for fading channel (without RX FH)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 191 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-10dB | 15 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -50 |
| 146 | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 100 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 129 | 30 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| NR\_FDD\_FR1\_N | -117.5 | -50 |
| 110 | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 96 | 60 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -114.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS. | | | | | | | |

Table 10.1A.16.2.1-3: RSTD absolute accuracy for 1Rx RedCap UE in FR1 for AWGN channel with reduced number of samples (without RX FH)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 109 | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 15 | ≥ 52 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -50 |
| 60 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 62 | 30 | ≥ 48 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| NR\_FDD\_FR1\_N | -117.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS. | | | | | | | |

##### 10.1A.16.2.2 Accuracy requirement for RSTD measurement with RX FH

The value of X for 4 sample RSTD measurement performed by 2Rx RedCap UE with RX FH is defined in tables 10.1A.16.2.2-1 in FR1 for AWGN, 10.1A.16.2.2-2 in FR2 for AWGN, 10.1A.16.2.2-3 in FR1 for fading channel, and 10.1.23.2-4 in FR2 for fading channel, respectively.

The value of X for reduced sample RSTD measurement performed by 2Rx RedCap UE with RX FH is defined in tables 10.1A.16.2.2-5 in FR1 for AWGN, and 10.1A.16.2.2-6 in FR2 for AWGN, respectively.

The value of for 4 sample RSTD measurement performed by 1Rx RedCap UE with RX FH is defined in tables 10.1A.16.2.2-7 in FR1 for AWGN, and 10.1A.16.2.2-8 in FR1 for fading channel, respectively.

The value of for reduced sample RSTD measurement performed by 1Rx RedCap UE with RX FH is defined in table 10.1A.16.2.2-9 in FR1 for AWGN.

Table 10.1A.16.2.2-1: RSTD absolute accuracy for 2Rx RedCap UE in FR1 for AWGN channel (with RX FH)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per hop  Note 1 | Total PRS bandwidth after all hopsNote 7 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 50 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 52 | 268 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 26 | 30 | 48 | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 27 | 60 | 24 | 132 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -114.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 7: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | | |

Table 10.1A.16.2.2-2: RSTD absolute accuracy for 2Rx RedCap UE in FR2 for AWGN channel (with RX FH)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per hop  Note 1 | Total PRS bandwidth after all hopsNote 6 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | PRB | PRB |  | dBm/SCS | dBm/BWChannel |
| 15 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 64 | 264 | ≥ 1 | Note 5 | Note 5 |
| 8 | 120 | 64 | 264 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 6: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | |

Table 10.1A.16.2.2-3: RSTD absolute accuracy for 2Rx RedCap UE in FR1 for fading channel (with RX FH)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per hop  Note 1 | Total PRS bandwidth after all hopsNote 7 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 36 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 52 | 268 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 22 | 30 | 48 | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 29 | 60 | 24 | 132 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -114.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 7: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | | |

Table 10.1A.16.2.2-4: RSTD absolute accuracy for 2Rx RedCap UE in FR2 for fading channel (with RX FH)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per hop  Note 1 | Total PRS bandwidth after all hopsNote 6 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | PRB | PRB |  | dBm/SCS | dBm/BWChannel |
| 37 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 64 | 264 | ≥ 1 | Note 5 | Note 5 |
| 37 | 120 | 64 | 264 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 6: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | |

Table 10.1A.16.2.2-5: RSTD absolute accuracy for 2Rx RedCap UE in FR1 for AWGN channel with reduced number of samples (with RX FH)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | Total PRS bandwidth after all hopsNote 7 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 33 | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 15 | ≥ 52 | 268 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -50 |
| 18 | 30 | 48 | 272 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| NR\_FDD\_FR1\_N | -117.5 | -50 |
| 21 | 60 | 24 | 132 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -114.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 7: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | | |

Table 10.1A.16.2.2-6: RSTD absolute accuracy for 2Rx RedCap UE in FR2 for AWGN channel with reduced number of samples (with RX FH)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | Total PRS bandwidth after all hopsNote 6 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | PRB | PRB |  | dBm/SCS | dBm/BWChannel |
| 12 | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 60 | ≥ 64 | 264 | ≥ 1 | Same value as PRS\_RP in table B.2.14-2, according to UE Power class, operating band and angle of arrival | Note 5 |
| 6 | 120 | 64 | 264 | ≥ 1 | Same value as PRS\_RP in table B.2.14-2, according to UE Power class, operating band and angle of arrival | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 6: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | |

Table 10.1A.16.2.2-7: RSTD absolute accuracy for 1Rx RedCap UE in FR1 for AWGN channel (with RX FH)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per hop  Note 1 | Total PRS bandwidth after all hopsNote 7 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 58 | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 52 | 268 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 30 | 30 | 48 | 272 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| NR\_FDD\_FR1\_N | -117.5 | -50 |
| 27 | 60 | ≥24 | 132 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -114.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 7: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | | |

Table 10.1A.16.2.2-8: RSTD absolute accuracy for 1Rx RedCap UE in FR1 for fading channel (with RX FH)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per hop  Note 1 | Total PRS bandwidth after all hopsNote 7 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 72 |  | 15 | ≥ 52 | 268 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 59 | 30 | 48 | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 31 | 60 | 24 | 132 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -114.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 7: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | | |

Table 10.1A.16.2.2-9: RSTD absolute accuracy for 1Rx RedCap UE in FR1 for AWGN channel with reduced number of samples (with RX FH)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per hop  Note 1 | Total PRS bandwidth after all hopsNote 7 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 42 | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 15 | ≥ 52 | 268 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -50 |
| 21 | 30 | 48 | 272 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| NR\_FDD\_FR1\_N | -117.5 | -50 |
| 24 | 60 | 24 | 132 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -114.5 | -50 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 7: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | | |

#### 10.1A.16.3 Report Mapping

##### 10.1A.16.3.1 Absolute DL RSTD Measurement Reporting

Measurement reporting range and report mapping tables defined in clause 10.1.23.3.1 apply to DL RSTD measurement reporting for both 1Rx and 2Rx RedCap UEs and DL RSTD measurement performed with and without RX FH.

##### 10.1A.16.3.2 Differential Reporting for DL RSTD Measurement

Measurement reporting range and report mapping tables defined in clause 10.1.23.3.2 apply to DL RSTD measurement reporting for both 1Rx and 2Rx RedCap UEs and DL RSTD measurement performed with and without RX FH.

##### 10.1A.16.3.3 Additional Path Report Mapping for DL RSTD

Measurement reporting range and report mapping tables defined in clause 10.1.23.3.3 apply to DL RSTD measurement reporting for both 1Rx and 2Rx RedCap UEs and DL RSTD measurement performed with and without RX FH.

## **END OF CHANGE 1**

## **START OF CHANGE 2**

10.1A.18 UE Rx-Tx Time Difference Measurements for RedCap Positioning

10.1A.18.1 Introduction

The requirements in clause 10.1A.18 shall apply, provided the RedCap UE has received *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [31] requesting the UE to report one or more UE Rx-Tx time difference measurements defined in TS 38.215 [4]. The requirements in clause 10.1A.18 shall apply:

­ When the RedCap UE is in RRC\_CONNECTED state and the UE Rx-Tx time difference measurement is performed with and without RX FH within measurement gap.

­ When RedCap UE is in RRC\_CONNECTED state and the UE Rx-Tx time difference measurement is performed without RX FH outside of the measurement gap.

­ When RedCap UE is in RRC\_CONNECTED state and the UE Rx-Tx time difference measurement is performed without RX FH when both PPW and measurement gap is configured.

­ When RedCap UE is in RRC\_INACTIVE state and the UE Rx-Tx time difference measurement is performed with and without RX FH.

10.1A.18.2 Measurement Accuracy Requirements

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

- NTA\_offset defined in table 7.1A.2-2 changes during the UE Rx-Tx measurement period or

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

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

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

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

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

- UE Rx-Tx measurement accuracy requirements shall not apply for a cell, which is not the downlink reference cell (defined in section 7.1A.1) for SRS transmission, if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment.

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

The relative accuracy of UE Rx-Tx measurement in this clause is defined as accuracy of the difference between two UE Rx-Tx measurements.

10.1A.18.2.1 UE Rx-Tx Accuracy Requirement for 2RX RedCap UE without FH

For UE Rx-Tx time difference measurement performed by 2RX RedCap UE without RX FH, the accuracy requirements corresponding to the PRS bandwidth supported by the RedCap UE for PRS measurement without RX FH in clause 10.1.25.2 shall apply.

10.1A.18.2.2 UE Rx-Tx Accuracy Requirement for 1RX RedCap UE without FH

The accuracy requirements in table 10.1A.18.2.2-1 for FR1 are valid under the following conditions:

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

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

- AWGN propagation condition.

Table 10.1A.18.2.2-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetition Note 3 | NR operating band groupsNote 2 | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | PRB | kHz |  |  | dBm / SCSPRS | dBm/BW |
| ±89+δ | -3 | ≥24 | 15 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 |
| NR\_TDD\_FR1\_C | -126 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 |
| NR\_FDD\_FR1\_F | -124.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 |
| NR\_FDD\_FR1\_H | -123.5 |
| NR\_FDD\_FR1\_N | -120.5 |
| ±51+δ | ≥52 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±25+δ | 104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±49+δ | ≥24 | 30 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 |
| NR\_TDD\_FR1\_C | -123 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 |
| NR\_FDD\_FR1\_F | -121.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 |
| NR\_FDD\_FR1\_H | -120.5 |
| NR\_FDD\_FR1\_N | -117.5 |
| ±27+δ | 48 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±27+δ | 24 | 60 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 |
| NR\_TDD\_FR1\_C | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |
| NR\_FDD\_FR1\_F | -118.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 |
| NR\_FDD\_FR1\_H | -117.5 |
| NR\_FDD\_FR1\_N | -114.5 |
| ±98+δ | -13 | ≥24 | 15 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±61+δ | ≥52 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±32+δ | 104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±55+δ | ≥24 | 30 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±34+δ | 48 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±31+δ | 24 | 60 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 7: δ is the margin determined from table 10.1A.18.2.2-3. | | | | | | | |

The accuracy requirements in table 10.1A.18.2.2-1a for FR1 for are valid under the following conditions:

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

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

- Number of measurement samples is less than 4.

- AWGN propagation condition.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Table 10.1A.18.2.2-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samplesAccuracy | Conditions | | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetition Note 3 | NR operating band groupsNote 2 | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | PRB | kHz |  |  | dBm / SCSPRS | dBm/BW |
| ±65+δ | 0 | ≥52 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±36+δ | 104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±35+δ | 48 | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±73+δ | -6 | ≥52 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±40+δ | 104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±39+δ | 48 | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols,* and *dl-PRS-CombSizeN* defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.2-1.  NOTE 7: δ is the margin determined from table 10.1A.18.2.2-3. | | | | | | | |

The relative accuracy requirements in table 10.1A.18.2.2-1b for FR1 are valid under the following conditions:

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

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

- AWGN propagation condition.

- the two UE Rx-Tx time difference measurements are associated with the same RxTx TEG.

Table 10.1A.18.2.2-1b: UE Rx-Tx time difference relative measurement accuracy in FR1 in AWGN with TEG reporting

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| Tc Note 5 | dB | kHz | PRB |  |  | dBm/SCS | dBm/BWChannel |
| 137+Δ | (PRS Ês/Iot)*j*≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 24 | ≥ 4 | Note 6 | Note 6 | Note 6 |
| 79 +Δ | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 45 +Δ | 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 81 +Δ | 30 | ≥ 24 | ≥ 4 | Note 6 | Note 6 | Note 6 |
| 46 +Δ | 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 52 +Δ | 60 | 24 | ≥ 4 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of resource j and resource i.  NOTE 2: Minimum number of PRS resource repetitions among resource j and resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols,* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.2-1.  NOTE 7: Δ is the value of the timing error margin for the RxTx TEG, reported via *nr-UE-RxTxTEG-TimingErrorMargin*. Δ cannot be larger than the sum of the margins in table 10.1A.18.2.2-3 (dependent on PRS/SRS BW) for any pair of individual UE Rx-Tx time difference measurements associated with the RxTx TEG. | | | | | | | |

The accuracy requirements in table 10.1A.18.2.2-2 for FR1 for are valid under the following conditions:

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

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

- Fading propagation condition.

Table 10.1A.18.2.2-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetition Note 3 | NR operating band groupsNote 2 | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | PRB | kHz |  |  | dBm / SCSPRS | dBm/BW |
| ±202+δ | -3 | ≥24 | 15 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±158+δ | ≥52 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±114+δ | 104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±153+δ | ≥24 | 30 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±120+δ | 48 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±72+δ | 24 | 60 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±179+δ | -10 | ≥24 | 15 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±169+δ | ≥52 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±126+δ | 104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±152+δ | ≥24 | 30 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±133+δ | 48 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ±72+δ | 24 | 60 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols*,and *dl-PRS-CombSizeN* defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.2-1.  NOTE 7: δ is the margin determined from table 10.1A.18.2.2-3. | | | | | | | |

Table 10.1A.18.2.2-3: Margin for UE Rx-Tx time difference measurement accuracy in FR1

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

10.1A.18.2.3 UE Rx-Tx Accuracy Requirement for 2RX RedCap UE with FH

The accuracy requirements in table 10.1A.18.2.3-1 for FR1 are valid under the following conditions:

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

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

- AWGN propagation condition.

- The BWtotal as defined in clause 9.9A.4.8 for RRC\_CONNECTED and in clause 5.6A.6.6 for RRC\_INACTIVE is no less than the “Total PRS bandwidth after FH”.

Table 10.1A.18.2.3-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | NR operating band groupsNote 2 | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | PRB | kHz | PRB |  | dBm / SCSPRS | dBm/BW |
| ±23+δ | -3 | ≥52 | 15 | 268 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 |
| NR\_TDD\_FR1\_C | -126 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 |
| NR\_FDD\_FR1\_F | -124.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 |
| NR\_FDD\_FR1\_H | -123.5 |
| NR\_FDD\_FR1\_N | -120.5 |
| ±17+δ | 48 | 30 | 272 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 |
| NR\_TDD\_FR1\_C | -123 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 |
| NR\_FDD\_FR1\_F | -121.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 |
| NR\_FDD\_FR1\_H | -120.5 |
| NR\_FDD\_FR1\_N | -117.5 |
| ±21+δ | 24 | 60 | 132 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 |
| NR\_TDD\_FR1\_C | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |
| NR\_FDD\_FR1\_F | -118.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 |
| NR\_FDD\_FR1\_H | -117.5 |
| NR\_FDD\_FR1\_N | -114.5 |
| ±54+δ | -13 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±38+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±40+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-5. | | | | | | | |

The accuracy requirements in table 10.1A.18.2.3-1a for FR1 for are valid under the following conditions:

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

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

- Number of measurement samples is less than 4.

- AWGN propagation condition.

- The BWtotal as defined in clause 9.9A.4.8 for RRC\_CONNECTED and in clause 5.6A.6.6 for RRC\_INACTIVE is no less than the “Total PRS bandwidth after FH”.

Table 10.1A.18.2.3-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | NR operating band groupsNote 2 | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | PRB | kHz | PRB |  | dBm / SCSPRS | dBm/BW |
| ±17+δ | 0 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±11+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±18+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±32+δ | -6 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±20+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±31+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.3-1.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-5. | | | | | | | |

The accuracy requirements in table 10.1A.18.2.3-2 for FR1 for are valid under the following conditions:

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

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

- Fading propagation condition.

- The BWtotal as defined in clause 9.9A.4.8 for RRC\_CONNECTED and in clause 5.6A.6.6 for RRC\_INACTIVE is no less than the “Total PRS bandwidth after FH”.

Table 10.1A.18.2.3-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| PRS Ês/Iot | PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | NR operating band groupsNote 2 | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | PRB | kHz | PRB |  | dBm / SCSPRS | dBm/BW |
| ±94+δ | -3 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±52+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±52+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±99+δ | -13 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±53+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±63+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.3-1.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-5. | | | | | | | |

The accuracy requirements in table 10.1A.18.2.3-3 for FR2 are valid under the following conditions:

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

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

- AWGN propagation condition.

- The BWtotal as defined in clause 9.9A.4.8 for RRC\_CONNECTED and in clause 5.6A.6.6 for RRC\_INACTIVE is no less than the “Total PRS bandwidth after FH”.

Table 10.1A.18.2.3-3: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | PRB | kHz | PRB | dBm / SCSPRS | dBm/BWChannel |
| ±11+δ | -3 | ≥64 | 60 | 264 | Same value as PRP in table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±7+δ | 64 | 120 | 264 | Same value as PRP in table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±33+δ | -13 | ≥64 | 60 | 264 | NOTE 5 | NOTE 5 |
| ±27+δ | 64 | 120 | 264 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-6. | | | | | | |

The accuracy requirements in table 10.1A.18.2.3.3-3a for FR2 are valid under the following conditions:

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

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

- Number of measurement samples is less than 4.

- AWGN propagation condition.

- The BWtotal as defined in clause 9.9A.4.8 for RRC\_CONNECTED and in clause 5.6A.6.6 for RRC\_INACTIVE is no less than the “Total PRS bandwidth after FH”.

Table 10.1A.18.2.3-3a: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN with reduced measurement samples

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | PRB | kHz | PRB | dBm / SCSPRS | dBm/BWChannel |
| ±11+δ | 0 | ≥64 | 60 | 264 | NOTE 5 | NOTE 5 |
| ±5+δ | 64 | 120 | 264 | NOTE 5 | NOTE 5 |
| ±17+δ | -6 | ≥64 | 60 | 264 | NOTE 5 | NOTE 5 |
| ±14+δ | 64 | 120 | 264 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.3-3.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-6. | | | | | | |

The accuracy requirements in table 10.1A.18.2.3-4 for FR2 are valid under the following conditions:

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

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

- Fading propagation condition.

- The BWtotal as defined in clause 9.9A.4.8 for RRC\_CONNECTED and in clause 5.6A.6.6 for RRC\_INACTIVE is no less than the “Total PRS bandwidth after FH”.

Table 10.1A.18.2.3-4: UE Rx-Tx time difference measurement accuracy in FR2 in fading

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | PRB | kHz | PRB | dBm / SCSPRS | dBm/BWChannel |
| ±27+δ | -3 | ≥64 | 60 | 264 | NOTE 5 | NOTE 5 |
| ±17+δ | 64 | 120 | 264 | NOTE 5 | NOTE 5 |
| ±41+δ | -13 | ≥64 | 60 | 264 | NOTE 5 | NOTE 5 |
| ±38+δ | 64 | 120 | 264 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.3-3.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-6. | | | | | | |

Table 10.1A.18.2.3-5: Margin for UE Rx-Tx time difference measurement accuracy in FR1 with FH

|  |  |  |  |
| --- | --- | --- | --- |
| Min(PRS BW, SRS BW) (PRB) | | | Margin (Tc Note 1) |
| SCS = 15 kHz | SCS = 30 kHz | SCS = 60 kHz |
| ≥ 52 | N/A | N/A | 80 |
| N/A | 48 | 24 | 56 |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in PRB applies.  NOTE 3: PRS BW and SRS BW refer to BW per hop. | | | |

Table 10.1A.18.2.3-6: Margin for UE Rx-Tx time difference measurement accuracy in FR2 with FH

|  |  |  |
| --- | --- | --- |
| Min(PRS BW, SRS BW) (PRB) | | Margin (Tc Note 1) |
| SCS = 60 kHz | SCS = 120 kHz |
| ≥ 64 | N/A | 32 |
| N/A | 64 | 24 |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in PRB applies.  NOTE 3: PRS BW and SRS BW refer to BW per hop. | | |

10.1A.18.2.4 UE Rx-Tx Accuracy Requirement for 1RX RedCap UE with FH

The accuracy requirements in table 10.1A.18.2.4-1 for FR1 are valid under the following conditions:

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

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

- AWGN propagation condition.

Table 10.1A.18.2.4-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | NR operating band groupsNote 2 | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | PRB | kHz | PRB |  | dBm / SCSPRS | dBm/BW |
| ±23+δ | -3 | ≥52 | 15 | 268 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 |
| NR\_TDD\_FR1\_C | -126 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 |
| NR\_FDD\_FR1\_F | -124.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 |
| NR\_FDD\_FR1\_H | -123.5 |
| NR\_FDD\_FR1\_N | -120.5 |
| ±14+δ | 48 | 30 | 272 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 |
| NR\_TDD\_FR1\_C | -123 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 |
| NR\_FDD\_FR1\_F | -121.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 |
| NR\_FDD\_FR1\_H | -120.5 |
| NR\_FDD\_FR1\_N | -117.5 |
| ±22+δ | 24 | 60 | 132 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 |
| NR\_TDD\_FR1\_C | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |
| NR\_FDD\_FR1\_F | -118.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 |
| NR\_FDD\_FR1\_H | -117.5 |
| NR\_FDD\_FR1\_N | -114.5 |
| ±60+δ | -13 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±42+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±45+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-5. | | | | | | | |

The accuracy requirements in table 10.1A.18.2.4-1a for FR1 for are valid under the following conditions:

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

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

- Number of measurement samples is less than 4.

- AWGN propagation condition.

Table 10.1A.18.2.4-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | NR operating band groupsNote 2 | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | PRB | kHz | PRB |  | dBm / SCSPRS | dBm/BW |
| ±16+δ | 0 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±9+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±10+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±33+δ | -6 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±16+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±21+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.4-1.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-5. | | | | | | | |

The accuracy requirements in table 10.1A.18.2.4-2 for FR1 for are valid under the following conditions:

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

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

- Fading propagation condition.

Table 10.1A.18.2.4-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS bandwidth per hop | PRS SCS | Total PRS bandwidth after FH | NR operating band groupsNote 2 | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | PRB | kHz | PRB |  | dBm / SCSPRS | dBm/BW |
| ±63+δ | -3 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±43+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±40+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±85+δ | -10 | ≥52 | 15 | 268 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±61+δ | 48 | 30 | 272 | NOTE 5 | NOTE 5 | NOTE 5 |
| ±55+δ | 24 | 60 | 132 | NOTE 5 | NOTE 5 | NOTE 5 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest PRB number for the corresponding SCS as defined in table 10.1A.18.2.4-1.  NOTE 6: δ is the margin determined from table 10.1A.18.2.3-5. | | | | | | | |

10.1A.18.3 Report mapping

10.1A.18.3.1 Absolute UE Rx-Tx Measurement Report Mapping

The report mapping as defined in clause 10.1.25.3.1 shall apply.

10.1A.18.3.2 Differential UE Rx-Tx Measurement Report Mapping

The report mapping as defined in clause 10.1.25.3.2 shall apply.

10.1A.18.3.3 Additional Path Report Mapping for UE Rx-Tx Time Difference

The report mapping as defined in clause 10.1.25.3.3 shall apply.

## **END OF CHANGE 2**

## **START OF CHANGE 3**

#### A.16.6.6.1 NR RSTD measurement reporting delay test case for RedCap UE without FH in FR1 SA

##### A.16.6.6.1.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement for RedCap UE without FH in RRC CONNECTED state meets the requirements specified in clause 9.9A.2 in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in table A.16.6.6.1.1-1.

Table A.16.6.6.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 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 not have any timing information of Cell 2 and Cell 3. All three cells transmit PRS during T2.

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

The *NR-DL-TDOA-ProvideAssistanceData* and *NR-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the RedCap UE during T1. The measurement reporting delay test in this clause is valid for the cases where the RedCap UE is either not configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* or the RedCap UE is configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* but reports the RSTD measurement based on the single hop in *NR-DL-TDOA-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

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 shall be aligned with the beginning of the first MG instance containing the PRS resources.

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

The general test parameters are listed in table A.16.6.6.1.1-2, and cell specific test parameters are listed in table A.16.6.6.1.1-3.

Table A.16.6.6.1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.1 RedCap FR1 |
| Config 4 |  | SSB.1 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| Config 4 |  | SMTC.2 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| Config 4 |  | SR.1.1 FDD |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2 |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Config 4 |  | CR.1.1 FDD |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| Config 4 |  | CCR.1.1 FDD |
| Initial BWP configuration | Config 1,2,3,4 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Config 1,2,3,4 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Config 1,2,3,4 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.1 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Config 4 |  | PRS.1.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#0 | GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance ta specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

Table A.16.6.6.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | N/A | N/A |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| Config 4 | dBm/SCS | -98 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 2 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 3 | dBm/  18.36MHz | -56.71 | -56.71 | -56.71 |
| Config 4 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Config 4 | dBm/SCS | -88 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  NOTE 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

Table A.16.6.6.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| Config 4 | dBm/SCS | -98 | -98 | -98 |
| 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 |
| Config 4 | dB | -5.45 | -11.67 | -11.67 |
| SSB | Config 1,2,3,4 | dB | 10 | 3 | 3 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 2 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 3 | dBm/  18.36MHz | -65.61 | -65.61 | -65.61 |
| Config 4 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -95 | -95 |
| Config 2 | dBm/SCS | -88 | -95 | -95 |
| Config 3 | dBm/SCS | -85 | -92 | -92 |
| Config 4 | dBm/SCS | -88 | -95 | -95 |
| PRS | | dB | -6.00 | -12.98 | -12.98 |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  NOTE 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. The Io is calculated based only on the symbols in which PRS is transmitted. | | | | | |

##### A.16.6.6.1.2 Test Requirements

The RSTD measurement time without FH for RedCap fulfils the requirements specified in clause 9.9A.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.2A.5 starting from the beginning of time interval T2.

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

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD1970049.

## **END OF CHANGE 3**

## **START OF CHANGE 4**

#### A.16.6.6.2 NR RSTD measurement reporting delay test case with PRS frequency hopping

##### A.16.6.6.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in clause 9.9A.2.6 in an environment with AWGN propagation conditions in FR1 in standalone scenario when frequency hopping is configured.

The supported test configurations are specified in table A.16.6.6.2.1-1.

Table A.16.6.6.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, UE per hop bandwidth 10 MHz, cell bandwidth 50 MHz, FDD duplex mode |
| 2 | 15 kHz SSB SCS, UE per hop bandwidth 10 MHz, cell bandwidth 50 MHz, TDD duplex mode |
| 3 | 30 kHz SSB SCS, UE per hop bandwidth 20 MHz, cell bandwidth 100 MHz, TDD duplex mode |
| 4 | 15 kHz SSB SCS, UE per hop bandwidth 10 MHz, cell bandwidth 50 MHz, HD-FDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: UE with 1Rx or 2Rx is required to meet the same requirements specified in this clause. | |

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

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

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

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two 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 test requirements apply when *frequencyHopping* is configured to UE.

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

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

The general test parameters are listed in table A.16.6.6.2.1-2, and cell specific test parameters are listed in table A.16.6.6.2.1-3.

Table A.16.6.6.2.1-2: 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. |
| CD-SSB configuration | Config 1, 2, 4 |  | SSB.1 FR1 |  |
| Config 3 |  | SSB.1 RedCap FR1 |
| NCD-SSB configuration | Config 1, 2, 4 |  | SSB.6 RedCap FR1 |  |
| Config 3 |  | SSB.7 RedCap FR1 |  |
| SMTC configuration | Config 1, 4 |  | SMTC.4 RedCap |  |
| Config 2 |  | SMTC.2 RedCap |
| Config 3 |  | SMTC.2 RedCap |
| PRS Configuration | Config 1, 4 |  | PRS.1.5 FR1 | PRS configured with frequency hopping as specified in clause A.3.31 |
| Config 2 |  | PRS.1.5 FR1 |
| Config 3 |  | PRS.2.6 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#0 | GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance ta specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

Table A.16.6.6.2.1-3: 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 | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| PDSCH RMC configuration | Config 1, 4 |  | SR.1.1 FDD | N/A | N/A |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| RMSI CORESET RMC configuration | Config 1, 4 |  | CR.1.1 FDD | N/A | N/A |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Dedicated CORESET RMC configuration | Config 1, 4 |  | CCR.1.1 FDD | N/A | N/A |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| OCNG Patterns | Config 1,2,3,4 |  | OP.1 | OP.1 | OP.1 |
| RMSI CORESET RMC configuration | Config 1, 4 |  | CR.1.1 FDD | N/A | N/A |
| 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 | N/A | N/A |
| Active DL BWP configuration | Config 1,2,3,4 |  | DLBWP.1.3 RedCap | N/A | N/A |
| Active UL BWP configuration | Config 1,2,3,4 |  | ULBWP.1.3 RedCap | N/A | N/A |
| Note 3 | Config 1, 4 | 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, 4 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 2 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 3 | dBm/  38.16MHz | -53.54 | -53.54 | -53.54 |
| SSB RP Note4 | Config 1, 4 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  NOTE 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

Table A.16.6.6.2.1-4: 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 | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1, 4 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1, 4 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| SSB | Config 1,2,3,4 | dB | 10 | 3 | 3 |
| Io Note 4 | Config 1, 4 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 2 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 3 | dBm/  38.16MHz | -62.43 | -62.43 | -62.43 |
| SSB RP Note4 | Config 1, 4 | dBm/SCS | -88 | -95 | -95 |
| Config 2 | dBm/SCS | -88 | -95 | -95 |
| Config 3 | dBm/SCS | -85 | -92 | -92 |
| PRS | | dB | -6.00 | -12.98 | -12.98 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. The Io is calculated based only on the symbols in which PRS is transmitted. | | | | | |

##### A.16.6.6.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in clause 9.9A.2.6.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9A.2.6 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD1970049.

## **END OF CHANGE 4**

## **START OF CHANGE 5**

#### A.16.8.1.1 NR RSTD measurement reporting delay test case for for RedCap UE without FH in FR1 SA in RRC\_INACTIVE state

##### A.16.8.1.1.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement for RedCap UE without FH in RRC INACTIVE state meets the requirements specified in clause 5.6A.4.5 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.16.8.1.1.1-1.

Table A.16.8.1.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 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\_INACTIVE 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 6.5.12.1], shall be provided to the RedCap UE during T1. The measurement reporting delay test in this clause is valid for the cases where the RedCap UE is either not configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* or the RedCap UE is configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* but reports the RSTD measurement based on the single hop in *NR-DL-TDOA-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

The last TTI containing the two messages shall be provided to the RedCap UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request. The beginning of the time interval T2 shall be aligned with the first DRX cycle containing a DL PRS resource(s).

The UE is configured with DRX cycle of 1.28s.

The general test parameters are listed in table A.16.8.1.1.1-2, and cell specific test parameters are listed in table A.16.8.1.1.1-3 and table A.16.8.1.1.1-4.

Table A.16.8.1.1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.1 RedCap FR1 |
| Config 4 |  | SSB.1 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| Config 4 |  | SMTC.2 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| Config 4 |  | SR.1.1 FDD |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2 |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Config 4 |  | CR.1.1 FDD |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| Config 4 |  | CCR.1.1 FDD |
| 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 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.1 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Config 4 |  | PRS.1.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 1.28 |  |
| 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 | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.16.8.1.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| Config 4 | dBm/SCS | -98 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 2 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 3 | dBm/  18.36MHz | -56.71 | -56.71 | -56.71 |
| Config 4 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Config 4 | dBm/SCS | -88 | -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.16.8.1.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| Config 4 | dBm/SCS | -98 | -98 | -98 |
| 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 |
| Config 4 | dB | -5.45 | -11.67 | -11.67 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 2 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 3 | dBm/  18.36MHz | -65.61 | -65.61 | -65.61 |
| Config 4 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| 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.16.8.1.1.2 Test Requirements

The RSTD measurement time without FH for RedCap fulfils the requirements specified in clause 5.6A.4.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 5.6A.4.5 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 repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD1970049.

## **END OF CHANGE 5**

## **START OF CHANGE 6**

#### A.16.8.1.2 NR RSTD measurement reporting delay test case with PRS frequency hopping

##### A.16.8.1.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in clause 5.6A.4.6 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.16.8.1.2.1-1.

Table A.16.8.1.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, UE per hop bandwidth 10 MHz, cell bandwidth 50 MHz, FDD duplex mode |
| 2 | 15 kHz SSB SCS, UE per hop bandwidth 10 MHz, cell bandwidth 50 MHz, TDD duplex mode |
| 3 | 30 kHz SSB SCS, UE per hop bandwidth 20 MHz, cell bandwidth 100 MHz, TDD duplex mode |
| 4 | 15 kHz SSB SCS, UE per hop bandwidth 10 MHz, cell bandwidth 50 MHz, HD-FDD duplex mode |
| NOTE 1: The UE is only required to be tested in one of the supported test configurations.  NOTE 2: UE with 1Rx or 2Rx is required to meet the same requirements specified in this clause. | |

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\_INACTIVE 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 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The test requirements apply when *frequencyHopping* is configured to UE.

The beginning of the time interval T2 shall be aligned with the first DRX cycle containing a DL PRS resource(s).

The UE is configured with DRX cycle of 1.28s.

The general test parameters are listed in table A.16.8.1.2.1-2, and cell specific test parameters are listed in table A.16.8.1.2.1-3 and table A.16.8.1.2.1-4.

Table A.16.8.1.2.1-2: 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. |
| CD-SSB configuration | Config 1, 4 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.1 RedCap FR1 |
| NCD-SSB configuration | Config 1, 4 |  | SSB.6 RedCap FR1 | NCD-SSB is configured within dedicated RedCap DL BWP. |
| Config 2 |  | SSB.6 RedCap FR1 |
| Config 3 |  | SSB.7 RedCap FR1 |
| SMTC configuration | Config 1, 4 |  | SMTC.4 RedCap |  |
| Config 2 |  | SMTC.2 RedCap |
| Config 3 |  | SMTC.2 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 |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1, 4 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.1.1 TDD |  |
| Config 3 |  | CCR.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.1.5 FR1 | PRS configured with frequency hopping as specified in clause A.3.31 |
| Config 2 |  | PRS.1.5 FR1 |
| Config 3 |  | PRS.2.6 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 1.28 |  |
| 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 | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.16.8.1.2.1-3: 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 | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| Note 3 | Config 1, 4 | 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, 4 | dBm/  9.36MHz | -68.63 | -70.05 | -70.05 |
| Config 2 | dBm/  9.36MHz | -68.63 | -70.05 | -70.05 |
| Config 3 | dBm/  38.16MHz | -63.20 | -63.96 | -63.96 |
| SSB RP Note4 | Config 1, 4 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -88 | -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.16.8.1.2.1-4: 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 | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1, 4 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1, 4 | 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, 4 | dBm/  9.36MHz | -69.59 | -69.93 | -69.93 |
| Config 2 | dBm/  96.48MHz | -69.59 | -69.93 | -69.93 |
| Config 3 | dBm/  38.16MHz | -63.72 | -63.89 | -63.89 |
| 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.16.8.1.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in clause 5.6A.4.6.

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 5.6A.4.6 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD1970049.

## **END OF CHANGE 6**

## **START OF CHANGE 7**

#### A.16.10.1.1 NR RSTD measurement reporting delay test case for RedCap UE without FH in FR1 SA in RRC\_IDLE state without eDRX

##### A.16.10.1.1.1 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 and without eDRX meets the requirements specified in clause 4.6.2.5 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.16.10.1.1.1-1.

Table A.16.10.1.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 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 6.5.12.1], shall be provided to the RedCap UE during T1. The measurement reporting delay test in this clause is valid for the cases where the RedCap UE is either not configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* or the RedCap UE is configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* but reports the RSTD measurement based on the single hop in *NR-DL-TDOA-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

The last TTI containing the two messages shall be provided to the RedCap UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request. The beginning of the time interval T2 shall be aligned with the first DRX cycle containing a DL PRS resource(s).

The UE is configured with DRX cycle of 1.28 s.

The general test parameters are listed in table A.16.10.1.1.1-2, and cell specific test parameters are listed in table A.16.10.1.1.1-3 and table A.16.10.1.1.1-4.

Table A.16.10.1.1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.1 RedCap FR1 |
| Config 4 |  | SSB.1 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| Config 4 |  | SMTC.2 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |
| Config 3 |  | SR.2.1 TDD |
| Config 4 |  | SR.1.1 FDD |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2 |
| Config 2 |  | CR.1.1 TDD |
| Config 3 |  | CR.2.1 TDD |
| Config 4 |  | CR.1.1 FDD |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.1.1 TDD |
| Config 3 |  | CCR.2.1 TDD |
| Config 4 |  | CCR.1.1 FDD |
| 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 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.1 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Config 4 |  | PRS.1.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 1.28 |  |
| 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 | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.16.10.1.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| Config 4 | dBm/SCS | -98 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 2 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| Config 3 | dBm/  18.36MHz | -56.71 | -56.71 | -56.71 |
| Config 4 | dBm/  9.36MHz | -59.63 | -59.63 | -59.63 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Config 4 | dBm/SCS | -88 | -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.16.10.1.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| Config 4 | dBm/SCS | -98 | -98 | -98 |
| 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 |
| Config 4 | dB | -5.45 | -11.67 | -11.67 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 2 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| Config 3 | dBm/  18.36MHz | -65.61 | -65.61 | -65.61 |
| Config 4 | dBm/  9.36MHz | -68.52 | -68.52 | -68.52 |
| 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.16.10.1.1.2 Test Requirements

The RSTD measurement time without FH for RedCap fulfils the requirements specified in clause 4.6.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 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 repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD1970049.

## **END OF CHANGE 7**

## **START OF CHANGE 8**

#### A.17.6.5.1 NR RSTD measurement reporting delay test case for RedCap UE without FH in FR2 SA

##### A.17.6.5.1.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement for RedCap UE without FH in RRC CONNECTED state meets the requirements specified in clause 9.9A.2 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

Supported test configurations are shown in table A.17.6.5.1.1-1. The test parameters are as given in table A.17.6.5.1.1-2, Table A.17.6.5.1.1-3, and table A.17.6.5.1.1-4.

Table A.17.6.5.1.1-1: Supported test configurations for NR RSTD

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

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

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

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

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the RedCap UE during T1. The measurement reporting delay test in this clause is valid for the cases where the RedCap UE is either not configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* or the RedCap UE is configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* but reports the RSTD measurement based on the single hop in *NR-DL-TDOA-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

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 shall be aligned with the beginning of the first MG instance containing the PRS resources.

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

Table A.17.6.5.1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.3 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.1 FR2 | As specified in clause A.3. 31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#13 | GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.17.6.5.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| BWchannel | | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| Note 3 | Config 1 | dBm/SCS | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  95.04MHz | -57 | -57 | -57 |
| SSB\_RP Note4 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
| SSB | Config 1 | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  NOTE 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: SSB\_RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

Table A.17.6.5.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| BWchannel | | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |
| EPRE ratio of PRS to SSS | |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Io Note4 | Config 1 | dBm/  95.04MHz | -58.49 | -58.49 | -58.49 |
| PRS | | dB | -6 | -13 | -13 |
| PRP Note 4 | | dBm/SCS | -94.45 | -100.67 | -100.67 |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  NOTE 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: PRP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. The Io is calculated based only on the symbols in which PRS is transmitted.  NOTE 5: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] table 6.2.1.3-4. | | | | | |

##### A.17.6.5.1.2 Test Requirements

The RSTD measurement time without FH for RedCap fulfils the requirements specified in clause 9.9A.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.2A.5 starting from the beginning of time interval T2.

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

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## **END OF CHANGE 8**

## **START OF CHANGE 9**

#### A.17.6.5.2 NR RSTD measurement reporting delay test case with PRS frequency hopping

##### A.17.6.5.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in clause 9.9A.2.6 in FR2 in standalone scenario when PRS frequency hopping is configured.

Supported test configurations are shown in table A.17.6.5.2.1-1. The test parameters are as given in table A.17.6.5.2.1-2, table A.17.6.5.2.1-3, and table A.17.6.5.2.1-4.

Table A.17.6.5.2.1-1: Supported test configurations for NR RSTD

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 120 kHz SSB SCS, UE per hop bandwidth 100 MHz bandwidth, cell bandwidth 400 MHz, TDD duplex mode |

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

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

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

The *NR-DL-TDOA-ProvideAssistanceData* and *nr-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two 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 test requirements apply when *frequencyHopping* is configured to UE.

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

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

Table A.17.6.5.2.1-2: 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 RedCap FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 RedCap |  |
| PDSCH RMC configuration | Config 1 |  | SR.3.2 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.3.1 TDD |  |
| PRS Configuration | Config 1 |  | PRS.1.6 FR2 | PRS configured with frequency hopping as specified in clause A.3. 31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#13 | GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.17.6.5.2.1-3: 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 |
| BWchannel | | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  95.04MHz | -57.00 | -57.00 | -57.00 |
| SSB\_RP Note4 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
| SSB | Config 1 | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  NOTE 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: SSB\_RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

Table A.17.6.5.2.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| BWchannel | | MHz | 100: NRB,c = 66 | 100: NRB,c = 66 | 100: NRB,c = 66 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS | Config 1 | dB | -5.44 | -11.67 | -11.67 |
| Io Note4 | Config 1 | dBm/  95.04MHz | -58.48 | -58.48 | -58.48 |
| PRS | | dB | -6 | -13 | -13 |
| PRP Note 4 | | dBm/SCS | -94 | -101 | -101 |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  NOTE 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 4: PRP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. The Io is calculated based only on the symbols in which PRS is transmitted.  NOTE 5: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] table 6.2.1.3-4. | | | | | |

##### A.17.6.5.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in clause 9.9A.2.6.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9A.2.6 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## **END OF CHANGE 9**

## **START OF CHANGE 10**

#### A.17.8.1.1 NR RSTD measurement reporting delay test case for RedCap UE without FH in FR2 SA in RRC\_INACTIVE state

##### A.17.8.1.1.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement for RedCap UE without FH in RRC INACTIVE state meets the requirements specified in clause 5.6A.4.5 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in table A.17.8.1.1.1-1.

Table A.17.8.1.1.1-1: Supported test configurations for NR RSTD

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

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

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall be in RRC\_CONNECTED state and shall not have any timing information of Cell 2 and Cell3. During T2 UE shall be in RRC\_INACTIVE state and all 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 6.5.12.1], shall be provided to the RedCap UE during T1. The measurement reporting delay test in this clause is valid for the cases where the RedCap UE is either not configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* or the RedCap UE is configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* but reports the RSTD measurement based on the single hop in *NR-DL-TDOA-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

The last TTI containing the two messages shall be provided to the RedCap UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the first DRX cycle containing a DL PRS resource(s).

The UE is configured with DRX cycle of 0.64 s.

The general test parameters are listed in table A.17.8.1.1.1-2, and cell specific test parameters are listed in table A.17.8.1.1.1-3 and table A.17.8.1.1.1-4.

Table A.17.8.1.1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| BWchannel | | MHz | 100: NRB,c = 66 |  |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.5 FR2 | As specified in clause A.3. 31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 0.64 |  |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.17.8.1.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.5 FDD | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  95.04MHz | -57 | -57 | -57 |
| SSB RP Note4 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
|  |  | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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.17.8.1.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|  | |  | T2 | T2 | T2 |
| RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS | Config 1 | dB | -5.44 | -11.67 | -11.67 |
| Io | Config 1 | dBm/  95.04MHz | -58.49 | -58.49 | -58.49 |
| 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 slots 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.17.8.1.1.2 Test Requirements

The RSTD measurement time without FH for RedCap fulfils the requirements specified in clause 5.6A.4.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 5.6A.4.5 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 repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## **END OF CHANGE 10**

## **START OF CHANGE 11**

#### A.17.8.1.2 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA in RRC\_INACTIVE state

##### A.17.8.1.2.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in clause 5.6A.4.6 in FR2 in standalone scenario when PRS frequency hopping is configured.

The supported test configurations are specified in table A.17.8.1.2.1-1.

Table A.17.8.1.2.1-1: Supported test configurations for NR RSTD

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 120 kHz SSB SCS, UE per hop bandwidth 100 MHz bandwidth, cell bandwidth 400 MHz, TDD duplex mode |

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

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall be in RRC\_CONNECTED state and shall not have any timing information of Cell 2 and Cell3. During T2 UE shall be in RRC\_INACTIVE state and all 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 6.5.12.1], shall be provided to the UE during T1. The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The test requirements apply when *frequencyHopping* is configured to UE.

The beginning of the time interval T2 shall be aligned with the first DRX cycle containing a DL PRS resource(s).

The UE is configured with DRX cycle of 0.64 s.

The general test parameters are listed in table A.17.8.1.2.1-2, and cell specific test parameters are listed in table A.17.8.1.2.1-3 and table A.17.8.1.2.1-4.

Table A.17.8.1.2.1-2: 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. |
| BWchannel | | MHz | 100: NRB,c = 66 |  |
| SSB configuration | Config 1 |  | SSB.1 RedCap FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 RedCap |  |
| PDSCH RMC configuration | Config 1 |  | SR.3.2 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.3.1 TDD |  |
| PRS Configuration | Config 1 |  | PRS.1.6 FR2 | PRS configured with frequency hopping as specified in clause A.3. 31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 0.64 |  |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.17.8.1.2.1-3: 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 | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.5 FDD | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  95.04MHz | -58.86 | -60.01 | -60.01 |
| SSB RP Note4 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
|  |  | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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.17.8.1.2.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|  | |  | T2 | T2 | T2 |
| RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS | Config 1 | dB | -5.44 | -11.67 | -11.67 |
| Io | Config 1 | dBm/  9.36MHz | -59.65 | -59.92 | -59.92 |
| PRS | | dB | -6 | -13 | -13 |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  NOTE 2: The resources for uplink transmission are assigned 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.17.8.1.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in clause 5.6A.4.6.

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 5.6A.4.6 starting from the beginning of time interval T2.

The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## **END OF CHANGE 11**

## **START OF CHANGE 12**

#### A.17.10.1.1 NR RSTD measurement reporting delay test case for RedCap UE without FH in FR2 SA in RRC\_IDLE state without eDRX

##### A.17.10.1.1.1 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 and without eDRX meets the requirements specified in clause 4.6.2.5 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in table A.17.10.1.1.1-1.

Table A.17.10.1.1.1-1: Supported test configurations for NR RSTD

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

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

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall be in RRC\_CONNECTED state and shall not have any timing information of Cell 2 and Cell3. During T2 UE shall be in RRC\_IDLE state and all 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 6.5.12.1], shall be provided to the RedCap UE during T1. The measurement reporting delay test in this clause is valid for the cases where the RedCap UE is either not configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* or the RedCap UE is configured by the LMF to perform RSTD measurement with RX FH via *NR-DL-TDOA-RequestLocationInformation* but reports the RSTD measurement based on the single hop in *NR-DL-TDOA-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

The last TTI containing the two messages shall be provided to the RedCap UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *DL-TDOA assistance* data and location information request.

The beginning of the time interval T2 shall be aligned with the first DRX cycle containing a DL PRS resource(s).

The UE is configured with DRX cycle of 0.64 s.

The general test parameters are listed in table A.17.10.1.1.1-2, and cell specific test parameters are listed in table A.17.10.1.1.1-3 and table A.17.10.1.1.1-4.

Table A.17.10.1.1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| BWchannel | | MHz | 100: NRB,c = 66 |  |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.5 FR2 | As specified in clause A.3. 31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 0.64 |  |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 3 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.17.10.1.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.5 FDD | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  95.04MHz | -57 | -57 | -57 |
| SSB RP Note4 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
|  |  | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| NOTE 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  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.17.10.1.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|  | |  | T2 | T2 | T2 |
| RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS | Config 1 | dB | -5.44 | -11.67 | -11.67 |
| Io | Config 1 | dBm/  95.04MHz | -58.49 | -58.49 | -58.49 |
| 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 slots 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.17.10.1.1.2 Test Requirements

The RSTD measurement time without FH for RedCap fulfils the requirements specified in clause 4.6.2.5.

The UE shall perform and report the RSTD measurements for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 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 repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1A.16.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## **END OF CHANGE 12**