3GPP TSG-RAN WG4 Meeting #111 R4-2410160

**Fukuoka City, Fukuoka, Japan, 20th – 24th May, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **DraftCR** | **Rev** | **1** | **Current version:** | **18.5.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Draft Big CR to 38.133 on RRM performance requirements for Positioning Enhancement | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh2-Perf | | | | |  | ***Date:*** | | | 2024-05-13 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | No accuracy requirements, side conditions, or test cases are defined for Rel-18 positioning enhancements, and the measurement report mapping is incomplete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | The big CR is based on the following endorsed CRs:  From RAN4#111:   1. General:   **R4-2410159**, draftCR on time window configuration, Huawei, HiSilicon  **R4-2410161**, DraftCR to 38.133 on general aspects related to performance requirement, Ericsson   1. RedCap:   **R4-2410162**, (2-4, 3-21, 22, 23, 24) Draft CR on PRS-RSRPP performance requirements and UE Rx-Tx measurement delay test cases for RedCap positioning, CATT  **R4-2410163**, [TC 3-29 and 3-30] Draft CR on TC for PRS-RSRPP delay with Rx FH in RRC CONNECTED, OPPO  **R4-2410164**, (3-17~20) Test cases for RedCap RSTD measurement delay with frequency hopping, Intel Corp.  **R4-2410165**, draftCR on performance requirements for RedCap positioning, Huawei, HiSilicon  **R4-2410166**, DraftCR to 38.133 on performance requirements for Rel.18 RedCap positioning, Ericsson  **R4-2410167**, (NR\_pos\_enh2-Perf) (3-9, 3-10) PRS-RSRP measurement delay test case for RedCap positioning without Rx FH in RRC CONNECTED state in FR1 and FR2, Nokia  **R4-2410168**, Draft CR for test case on RedCap positioning\_PRS RSRPP, ZTE Corp., Sanechips  **R4-2410169**, draftCR (3-1)(3-3)(4-1)(4-3) TCs for RedCap positioning without FH on RSTD measurement delay and accuracy in FR1, MediaTek Inc.   1. BW aggregation:   **R4-2410170**, (5-3, 4) Draft CR on RSTD measurement reporting delay test cases for PRS aggregation in FR1 and FR2 in RRC\_INACTIVE state, CATT  **R4-2410171**, [2-6] Draft CR on PRS-RSRP Measurements Based on PRS BWA, OPPO  **R4-2410172**, Draft CR – Test cases for UE Rx-Tx measurement delay with PRS BW aggregation, Sets 5-5, 5-6, 5-7, 5-8, Qualcomm Inc.  **R4-2410173**, Draft CR – Performance requirements for UE Rx-Tx measurements with PRS bandwidth aggregation (Set 2-7), Qualcomm Inc.  **R4-2410174**, Draft CR on PRS-RSRPP measurements based on PRS aggregation - set 2-8, vivo  **R4-2410175**, draftCR on performance requirements for PRS CA, Huawei, HiSilicon  **R4-2410176**, DraftCR to 38.133 to introduce test cases for PRS aggregation for positioning measurements, Ericsson   1. SL pos:   **R4-2410186**, (Set 1-4 & 10-2) Draft CR for SL PRS configuration and SL Rx-Tx measurement delay TC in FR1, CATT  **R4-2410187**, [2-14] Draft CR on Measurements Accuracy for SL PRS-RSRPP, OPPO  **R4-2410188**, Draft CR on measurement delay test cases for SL positioning - Sets 10-3 10-4, vivo  **R4-2410189**, draftCR on performance requirements for SL positioning, Huawei, HiSilicon  **R4-2410190**, Draft CR to 38.133 on SL positioning RRM performance, Ericsson   1. CPP:   **R4-2410177**, (Set 7-3 & 7-4) Draft CR for RSCPD with RSTD measurement delay TC in RRC\_INACTIVE in FR1 and FR2, CATT  **R4-2410178**, (8-5, 8-6) Draft CR Accuracy test cases for RSCP reporting with UE Rx-Tx measurement in RRC\_CONNECTED mode, Xiaomi  **R4-2410179**, Sets (2-9), (7-5) and (7-6) DL CPP performance requirements and measurement delay TCs for RSCP with UE Rx-Tx in RRC\_CONNECTED for FR1 and FR2, Nokia  **R4-2410180**, DraftCR to 38.133 to introduce measurement delay test case for RSCPD with RSTD measurement for NR positioning, Ericsson   1. LPHAP:   **R4-2410181**, [TC 9-5 and 9-6] Draft CR on PRS-RSRP delay TC for case 2 in FR1, OPPO  **R4-2410182**, Draft CR – Test cases for UE Rx-Tx measurement delay with eDRX > 10.24s in RRC\_INACTIVE, Sets 9-11, 9-12, Qualcomm Inc.  **R4-2410183**, Draft CR on measurement delay test cases for LPHAP - Sets 9-3 9-4, vivo  **R4-2410184**, draftCR on performance requirements for LPHAP, Huawei, HiSilicon  **R4-2410185**, DraftCR to 38.133 to introduce test cases for LPHAP in RRC\_INACTIVE state in FR1, Ericsson  From RAN4#110-bis:  **R4-2406523**, which is based on:   1. **R4-2405513**, Skeleton for accuracy and report mapping for Rel. 18 positioning, Ericsson, RAN4#110-bis, April 2024. 2. **R4-2406381**, Draft CR for 38.133 on SL positioning performance requirements, Ericsson, RAN4#110-bis, April 2024. 3. **R4-2403568**, Draft Big CR to 38.133 on RRM performance requirements for Positioning Enhancements, Ericsson, RAN4#110, March 2024.   The following changes are included in this big CR:  **Change #1** (R4-2406381): New abbreviation “SL-PRP” is introduced.  **Change #2** (R4-2403568 [R4-2400118, R4-2402692]):  R4-2400118: Introduce the accuracy requirements for positioning measurement in RRC\_IDLE.  R4-2402692: Report mapping tables for k = {-1, -2, -3, -4, -5, -6} are defined for:   * RSTD measurements, * UE Rx-Tx time difference measurements.   **Change #3**  (R4-2405513): The following high level sections are added:   * New sections for RedCap positioning, * New sections for bandwidth aggregation for positioning, * New sections for carrier phase measurement for positioning, * New sections for LPHAP.   (R4-2410162): [2-4] PRS-RSRPP performance requirements for RedCap positioning.  (R4-2410165): 2-3 UE Rx-Tx Time Difference Measurements for RedCap Positioning  **Change #4** (R4-2403568 [R4-2403292]):  A structure for new sections for SL positioning measurement accuracy requirements and measurement report mapping is added. The measurement report mapping is based on the earlier RAN4 agreement:  *RAN4 #108bis agreements:*   * *Reuse the existing report mapping for SL positioning:*   + *The report mapping for SL UE Rx-Tx is the same as for UE Rx-Tx.*   + *The report mapping for SL RSTD is the same as for RSTD.*   + *The report mapping for SL RTOA is the same as for UL-RTOA.*   **Change #5** (R4-2403568 [R4-2402692]):  Report mapping tables for k = {-1, -2, -3, -4, -5, -6} are defined for:   * - UL-RTOA measurements, * - gNB Rx-Tx measurements.   **Change #6\_2** (R4-2410161): Correction to PRS configuration.  **Change #6\_3** (R4-2410161): Clarification on test cases for RRC\_INACTIVE.  **Change #6\_4** (R4-2410161): Testing principles clarification for PRS aggregation, CPP, and RRC\_IDLE.  **Change #6\_5** (R4-2410161): Testing prinsiples for RedCap UEs.  **Change #6\_6**  (R4-2406381): A new section for SL-PRS configuration.  **(**R4-2410159): Introduce time window configuration for R18 positioning testing based on work split.  **Change #7** (R4-2406381): A new section structure for SL positioning test cases.  **Change #7\_001** (R4-2410164): Specify test case requirements for RedCap RSTD measurement delay.  **Change #7\_002** (R4-2410162): [3-21]: With Rx FH UE Rx-Tx measurement delay in RRC\_CONNECTED state in FR1.  **Change #7\_004** (R4-2410165)  **Change #7\_005**  (R4-2410165): 3-13 Without Rx FH: PRS-RSRPP measurement delay in RRC\_CONNECTED state in FR1  (R4-2410163): Introduce the test case for PRS-RSRPP measurement delay with Rx FH in RRC\_CONNECTED state.  **Change #7\_007** (R4-2410164): Specify test case requirements for RedCap RSTD measurement delay.  **Change #7\_01** (R4-2410162): [3-23]: With Rx FH UE Rx-Tx measurement delay in RRC\_INACTIVE state in FR1.  **Change #7\_013** (R4-2410165)  **Change #7\_015** (R4-2410164): Specify test case requirements for RedCap RSTD measurement delay.  **Change #7\_02** (R4-2410162): [3\_22]: With Rx FH UE Rx-Tx measurement delay in RRC\_CONNECTED state in FR2.  **Change #7\_025** (R4-2410163): Introduce the test case for PRS-RSRPP measurement delay with Rx FH in RRC\_CONNECTED state, FR2.  **Change #7\_027** (R4-2410164): Specify test case requirements for RedCap RSTD measurement delay.  **Change #7\_03** (R4-2410162): [3-24]: With Rx FH UE Rx-Tx measurement delay in RRC\_INACTIVE state in FR2.  **Change #7\_1** (R4-2410161): Conditions for rel.18 PRS measurements are added.  **Change #8** (R4-2406381): A table with side conditions is added for SL positioning. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No accuracy requirements, side conditions, or test cases are defined for Rel-18 positioning enhancements, and the measurement report mapping is incomplete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | Updated clauses:  **R4-2406381**: 3.3;  **R4-2403568** [R4-2400118]: 10.1.23.1, 10.1.24.1, 10.1.38.1;  **R4-2403568** [R4-2402692]: 10.1.23.3.1, 10.1.23.3.2, 10.1.23.3.3, 10.1.25.3.1, 10.1.25.3.2, 10.1.25.3.3;  **R4-2403568** [R4-2402692]: 13.1.1, 13.1.1A, 13.2.1, 13.2.1A;  **R4-2410161**: A.3.31, B.2.14, A.3.34.2, A.3.35.1.  New clauses:  **R4-2405513**: 10.1.X, 10.1.Y, 10.1.Z, 10.1.X1, 10.1.Y1, 10.1.Z1, 10.1A.X, 10.1A.Y, 10.1A.Z, 10.1A.X1;  **R4-2403568** [R4-2403292]: 10.4A, 10.4A.1, 10.4A.2, 10.4A.2.1, 10.4A.2.1.1, 10.4A.2.2;  10.4A.3, 10.4A.3.1, 10.4A.3.1.1, 10.4A.3.2, 10.4A.4, 10.4A.4.1, 10.4A.4.1.1, 10.4A.4.2, 10.4A.5, 10.4A.5.1, 10.4A.5.1.1, 10.4A.5.2, 10.4A.6, 10.4A.6.1, 10.4A.6.1.1, 10.4A.7, 10.4A.7.1, 10.4A.7.1.1;  **R4-2406381**: A.3.X, A.3.X.1, A.3.X.2, A.3.X.2.1;  **R4-2406381**: A.9A, A.9A.1, A.9A.1.1, A.9A.1.2;  **R4-2406381**: B.4A, B.4A.1  **R4-2410159**: A.3.Y.  **R4-2410161**: A.3.34.X, A.3.34.X1, A.3.34.Y, A.3.35.X.  **R4-2410162**: 10.1A.X1, A.16.6.X1.2, A.16.A.X1.2, A.17.6.X1.2, A.17.A.X1.2.  **R4-2410163**: A.16.6.X3.2 A.17.6.X3.2.  **R4-2410164**: A.16.6.X.2, A.17.6.X.2, A.16.A.X.2, A.17.A.X.2.  **R4-2410165**: 10.1A.Z, A.16.6.X3.1, A.16.A.X3.1, A.16.6.X2.2, A.16.A.X2.2, A.16.7.X2.1, A.16.B.X2.1, A.16.7.X2.2, A.16.B.X2.2.  **R4-2410166**: A.16.6.X1.1, A.16.7.X1.1, A.16.A.X1.1, A.16.B.X1.1, 10.1A.X, 10.1A.Y.  **R4-2410167**: A.6.6.X, A.7.X.X.  **R4-2410168**: A.16.B.X3.2, A.17.B.X3.2, A.16.7.X3.2, A.17.7X3.2.  **R4-2410169**: A.16.6.X.1, A.16.7.X.1, A.16.A.X.1, A.16.B.X.1.  **R4-2410186**: A.3.X, A.9A.1.1.X  **R4-2410187**: 10.4A.5.2  **R4-2410188**: A.9A.1.1.3, A.9A.1.1.4  **R4-2410189**: 10.4A.4.2.  **R4-2410190**: 10.4A.2.2, 10.4A.3.2, 10.4A.3.2.1, A.9A.1.1.X, A.9A.1.1.X.1, A.9A.1.1.X.2, B.4A.1.  **R4-2410177**: A.6.8.X, A.7.8.X.  **R4-2410178**: A.6.7.X, A.7.7.X.  **R4-2410179**: 10.1.Y1, 10.1.Y1.1, 10.1.Y1.2, 10.1.Y1.3, 10.1.Z1, 10.1.Z1.1, 10.1.Z1.2, 10.1.Z1.3, A.6.6.X, A.7.6.X.  **R4-2410180**: A.6.6.12.X.  **R4-2410181**: A.6.8.2.X A.16.A.X2.3.  **R4-2410182**: A.7.8.3.X, A.17.A.X1.3.  **R4-2410183:** A.6.8.3.X, A.16.A.X1.3;  **R4-2410184**: A.7.8.2.X, A.17.A.X2.3, A.6.2.2.1, A.7.2.2.1.  **R4-2410185**: A.6.8.1.X and A.16.A.X.3.  **R4-2410170**: A.6.8.X, A.7.8.X.  **R4-2410171**: 10.1.Y.  **R4-2410172**: A.6.6.14.X, A.7.6.11.X, A.6.8.3.X, A.7.8.3.X.  **R4-2410173**: 10.1.Z.  **R4-2410174**: 10.1.X.  **R4-2410175**: 10.1.X, A.6.9.1.X.  **R4-2410176**: A.6.6.12.X and A.6.7.13.X. | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R4-2409369, R4-2406523 (endorsed in RAN4#110-bis) , R4-2405532 | | | | | | | | |

## **--- Start of Change #1 ---**

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [11] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [11].

AoA Angle of Arrival

AoD Angle of Departure

ATG Air to Ground

BFD Beam Failure Detection

BFD-RS BFD Reference Signal

BLER Block Error Rate

BM-RS Beam Management Reference Signal

BWP Bandwidth Part

CA Carrier Aggregation

CBD Candidate Beam Detection

CBW Channel Bandwidth

CC Component Carrier

CCA Clear Channel Assessment

CG-SDT Configured Grant Small Data Transmisison

CLI Cross Link Interference

CMR Channel Measurement Resource

CORESET Control Resource Set

CP Cyclic Prefix

CSI Channel-State Information

CSI-RS CSI Reference Signal

CSI-RSRP CSI Reference Signal based Reference Signal Received Power

CSI-RSRQ CSI Reference Signal based Reference Signal Received Quality

CSI-SINR CSI Reference Signal based Signal to Noise and Interference Ratio

CSI\_RP Received (linear) average power of the resource elements that carry NR CSI-RS signals and channels, measured at the UE antenna connector

DBT Discovery Burst Transmission

DC Dual Connectivity

DCI Downlink Control Information

DL Downlink

DL-AoD Downlink Angle-of-Departure

DL-TDOA Downlink Time Difference Of Arrival

DMRS Demodulation Reference Signal

DRX Discontinuous Reception

E-CID Enhanced Cell ID

eDRX Extended DRX

E-UTRA Evolved UTRA

E-UTRAN Evolved UTRAN

EMW Effective measurement window

EMWRP Effective measurement window repetition period

EN-DC E-UTRA-NR Dual Connectivity

FDD Frequency Division Duplex

FH Frequency Hopping

FR Frequency Range

GEO Geostationary Earth Orbit

HARQ Hybrid Automatic Repeat Request

HO Handover

GAP Refers to any of Measurement Gap, activated Pre-MG and NCSG

IMR Interference Measurement Resource

L1-RSRP Layer 1 RSRP

L1 SL-RSRP Layer 1 Sidelink RSRP which corresponds to PSCCH-RSRP and/or PSSCH-RSRP

LEO Low Earth Orbit

LMF Location Management Function

LPP LTE Positioning Protocol

LTM L1/L2 triggered mobility

MAC Medium Access Control

MCG Master Cell Group

MDT Minimization of Drive Tests

MG Measurement Gap

MGL Measurement Gap Length

MGRP Measurement Gap Repetition Period

MIB Master Information Block

ML Measurement Length

MN Master Node

MR-DC Multi-Radio Dual Connectivity

MUSIM Multi-Universal Subscriber Identity Module

NCSG Network Controlled Small Gap

NE-DC NR-E-UTRA Dual Connectivity

NGEN-DC NG-RAN E-UTRA-NR Dual Connectivity

NR New Radio

NR-DC NR-NR Dual Connectivity

NTN Non-Terrestrial Network

OFDM Orthogonal Frequency Division Multiplexing

OFDMA Orthogonal Frequency Division Multiple Access

OTDOA Observed Time Difference Of Arrival

PBCH Physical Broadcast Channel

PCC Primary Component Carrier

PCell Primary Cell

PDCCH Physical Downlink Control Channel

PDSCH Physical Downlink Shared Channel

PLMN Public Land Mobile Network

PRACH Physical RACH

Pre-MG Pre-configured Measurement Gap

ProSe Proximity-based Service

PRP PRS Received Power

PRS Positioning Reference Signal

PRS-RSRP Positioning Reference Signal based Reference Signal Received Power

PPW PRS Processing Window

PSBCH Physical Sidelink Broadcast Channel

PSBCH-RSRP Physical Sidelink Broadcast Channel DMRS based Reference Signal Received Power

PSCCH Physical Sidelink Control Channel

PSCCH-RSRP Physical Sidelink Control Channel DMRS based Reference Signal Received Power

PSCell Primary SCell

PSS Primary Synchronization Signal

PSSCH Physical Sidelink Shared Channel

PSSCH-RSRP Physical Sidelink Shared Channel DMRS based Reference Signal Received Power

pTAG Primary Timing Advance Group

PTW Paging Time Window

PUCCH Physical Uplink Control Channel

PUSCH Physical Uplink Shared Channel

QCL Quasi Co-Location

RACH Random Access Channel

RAT Radio Access Technology

RLM Radio Link Monitoring

RLM-RS Reference Signal for RLM

RMSI Remaining Minimum System Information

RRC Radio Resource Control

RRH Remote Radio Head

RRM Radio Resource Management

RSCP Reference Signal Carrier Phase

RSCPD Reference Signal Carrier Phase Difference

RSSI Received Signal Strength Indicator

RSRP Reference Signal Received Power

RSRPP Reference Signal Received Path Power

RSRQ Reference Signal Received Quality

RSTD Reference Signal Time Difference

RTOA Relative Time Of Arrival

RTT Round Trip Time

S-SSB Sidelink Synchronization Signal Block

SSB\_RP Received (linear) average power of the resource elements that carry NR SSB signals and channels, measured at the UE antenna connector or radiated interface boundary.

SA Standalone operation mode

SAB Satellite access band

SAN Satellite Access Node

SCC Secondary Component Carrier

SCCH Sidelink Control Channel

SCell Secondary Cell

SCG Secondary Cell Group

SCS Subcarrier Spacing

SCSSSB SSB subcarrier spacing

SDL Supplementary Downlink

SDT Small Data Transmission

SFN System Frame Number

SFTD SFN and Frame Timing DifferenceSI System Information

SIB System Information Block

SL Sidelink

SL AoA Sidelink AoA

SL PRS-RSRP Sidelink PRS-based RSRP

SL PRS-RSRPP Sidelink PRS-based RSRPP

SL RSTD Sidelink RSTD

SL RTOA Sidelink RTOA

SL Rx-Tx Sidelink Receive-Transmit time difference

SL-PRP SL-PRS Received Power

SL-PRS Sidelink PRS

SL-RSSI Sidelink Received Signal Strength Indicator

SLPP Sidelink Positioning Protocol

SLSS Sidelink Synchronization Signal

SMTC SSB-based Measurement Timing configuration

SpCell Special Cell

SRS Sounding Reference Signal

SRS-RSRP Sounding Reference Signal based Reference Signal Received Power

SS-RSRP Synchronization Signal based Reference Signal Received Power

SS-RSRQ Synchronization Signal based Reference Signal Received Quality

SS-SINR Synchronization Signal based Signal to Noise and Interference Ratio

SSB Synchronization Signal Block

SSB\_RP Received (linear) average power of the resource elements that carry NR SSB signals and channels, measured at the UE antenna connector.

SSS Secondary Synchronization Signal

sTAG Secondary Timing Advance Group

SUL Supplementary Uplink

TA Timing Advance

TAG Timing Advance Group

TCI Transmission Configuration Indicator

TDD Time Division Duplex

TDOA Time Difference Of Arrival

TN Terrestrial Network

TRP Transmission-Reception Point

TTI Transmission Time Interval

U2N UE-to-Network

U2U UE-to-UE

UE User Equipment

UL Uplink

V2X Vehicle-to-Everything service

VIL Visible Interruption Length

VIRP Visible Interruption Repetition Period

VSAT Very Small Aperture Terminal

## **--- End of Change #1 ---**

## **--- Start of Change #2 ---**

### 10.1.23 RSTD Measurements

#### 10.1.23.1 Introduction

The requirements in Clause 10.1.23 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 10.1.23 shall apply:

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

- when UE is in RRC\_INACTIVE state,

- when UE is in RRC\_IDLE state.

**--- sections without change ---**

#### 10.1.23.3 Report mapping

##### 10.1.23.3.1 Absolute DL RSTD Measurement Reporting

The reporting range for the DL RSTD measurement is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc, where

Tc is defined in TS 38.211 [6],

*kmin*≤*k*≤*kmax*,

*kmin* = -6 and *kmax* = 5, when configured PRS resource for the reference cell and neighbor cell measured for the RSTD measurement are in FR1 and/or FR2,

*k≥* *timingReportingGranularityFactor* [34] configured by LMF via LPP for the RSTD measurement.

The measurement report mapping for different *k* values are specified in Tables 10.1.23.3.1-1 − 10.1.23.3.1-12.

Table 10.1.23.3.1-1: Report mapping for *k*=0

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_0000000 | RSTD < -985024 | Tc |
| RSTD\_0000001 | -985024 ≤ RSTD < -985023 | Tc |
| RSTD\_0000002 | -985023 ≤ RSTD < -985022 | Tc |
| … | … | … |
| RSTD\_0985024 | -1 ≤ RSTD < 0 | Tc |
| RSTD\_0985025 | 0 ≤ RSTD < 1 | Tc |
| … | … | … |
| RSTD\_1970047 | 985022 ≤ RSTD < 985023 | Tc |
| RSTD\_1970048 | 985023 ≤ RSTD < 985024 | Tc |
| RSTD\_1970049 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-2: Report mapping for *k*=1

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_000000 | RSTD < -985024 | Tc |
| RSTD\_000001 | -985024 ≤ RSTD < -985022 | Tc |
| RSTD\_000002 | -985022 ≤ RSTD < -985020 | Tc |
| … | … | … |
| RSTD\_492512 | -2 ≤ RSTD < 0 | Tc |
| RSTD\_492513 | 0 ≤ RSTD < 2 | Tc |
| … | … | … |
| RSTD\_985023 | 985020 ≤ RSTD < 985022 | Tc |
| RSTD\_985024 | 985022 ≤ RSTD < 985024 | Tc |
| RSTD\_985025 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-3: Report mapping for *k*=2

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_000000 | RSTD < -985024 | Tc |
| RSTD\_000001 | -985024 ≤ RSTD < -985020 | Tc |
| RSTD\_000002 | -985020 ≤ RSTD < -985016 | Tc |
| … | … | … |
| RSTD\_246256 | -4 ≤ RSTD < 0 | Tc |
| RSTD\_246257 | 0 ≤ RSTD < 4 | Tc |
| … | … | … |
| RSTD\_492511 | 985016 ≤ RSTD < 985020 | Tc |
| RSTD\_492512 | 985020 ≤ RSTD < 985024 | Tc |
| RSTD\_492513 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-4: Report mapping for *k*=3

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_000000 | RSTD < -985024 | Tc |
| RSTD\_000001 | -985024 ≤ RSTD < -985016 | Tc |
| RSTD\_000002 | -985016 ≤ RSTD < -985008 | Tc |
| … | … | … |
| RSTD\_123128 | -8 ≤ RSTD < 0 | Tc |
| RSTD\_123129 | 0 ≤ RSTD < 8 | Tc |
| … | … | … |
| RSTD\_246255 | 985008 ≤ RSTD < 985016 | Tc |
| RSTD\_246256 | 985016 ≤ RSTD < 985024 | Tc |
| RSTD\_246257 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-5: Report mapping for *k*=4

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_000000 | RSTD < -985024 | Tc |
| RSTD\_000001 | -985024 ≤ RSTD < -985008 | Tc |
| RSTD\_000002 | -985008 ≤ RSTD < -984992 | Tc |
| … | … | … |
| RSTD\_061564 | -16 ≤ RSTD < 0 | Tc |
| RSTD\_061565 | 0 ≤ RSTD < 16 | Tc |
| … | … | … |
| RSTD\_123127 | 984992 ≤ RSTD < 985008 | Tc |
| RSTD\_123128 | 985008 ≤ RSTD < 985024 | Tc |
| RSTD\_123129 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-6: Report mapping for *k*=5

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_00000 | RSTD < -985024 | Tc |
| RSTD\_00001 | -985024 ≤ RSTD < -984992 | Tc |
| RSTD\_00002 | -984992 ≤ RSTD < -984960 | Tc |
| … | … | … |
| RSTD\_30782 | -32 ≤ RSTD < 0 | Tc |
| RSTD\_30783 | 0 ≤ RSTD < 32 | Tc |
| … | … | … |
| RSTD\_61563 | 984960 ≤ RSTD < 984992 | Tc |
| RSTD\_61564 | 984992 ≤ RSTD < 985024 | Tc |
| RSTD\_61565 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-7 Report mapping for *k = -1*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_0000000 | RSTD < -985024 | Tc |
| RSTD\_0000001 | -985024 ≤ RSTD < -985023.5 | Tc |
| RSTD\_0000002 | -985023.5 ≤ RSTD < -985023 | Tc |
| … | … | … |
| RSTD\_1970048 | -0.5 ≤ RSTD < 0 | Tc |
| RSTD\_1970049 | 0 ≤ RSTD < 0.5 | Tc |
| … | … | … |
| RSTD\_3940095 | 985023 ≤ RSTD < 985023.5 | Tc |
| RSTD\_3940096 | 985023.5 ≤ RSTD < 985024 | Tc |
| RSTD\_3940097 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-8 Report mapping for *k = -2.*

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_0000000 | RSTD < -985024 | Tc |
| RSTD\_0000001 | -985024 ≤ RSTD < -985023.75 | Tc |
| RSTD\_0000002 | -985023.75 ≤ RSTD < -985023.5 | Tc |
| … | … | … |
| RSTD\_3940096 | -0.25 ≤ RSTD < 0 | Tc |
| RSTD\_3940097 | 0 ≤ RSTD < 0.25 | Tc |
| … | … | … |
| RSTD\_7880191 | 985023.5 ≤ RSTD < 985023.75 | Tc |
| RSTD\_7880192 | 985023.75 ≤ RSTD < 985024 | Tc |
| RSTD\_7880193 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-9 Report mapping for *k = -3*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_00000000 | RSTD < -985024 | Tc |
| RSTD\_00000001 | -985024 ≤ RSTD < -985023.875 | Tc |
| RSTD\_00000002 | -985023.875 ≤ RSTD < -985023.75 | Tc |
| … | … | … |
| RSTD\_07880192 | -0.125 ≤ RSTD < 0 | Tc |
| RSTD\_07880193 | 0 ≤ RSTD < 0.125 | Tc |
| … | … | … |
| RSTD\_15760383 | 985023.75 ≤ RSTD < 985023.875 | Tc |
| RSTD\_15760384 | 985023.875 ≤ RSTD < 985024 | Tc |
| RSTD\_15760385 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-10 Report mapping for *k = -4*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_00000000 | RSTD < -985024 | Tc |
| RSTD\_00000001 | -985024 ≤ RSTD < -985023.9375 | Tc |
| RSTD\_00000002 | -985023.9375 ≤ RSTD < -985023.875 | Tc |
| … | … | … |
| RSTD\_15760384 | -0. 0625 ≤ RSTD < 0 | Tc |
| RSTD\_15760385 | 0 ≤ RSTD < 0.0625 | Tc |
| … | … | … |
| RSTD\_31520767 | 985023.875 ≤ RSTD < 985023.9375 | Tc |
| RSTD\_31520768 | 985023.9375 ≤ RSTD < 985024 | Tc |
| RSTD\_31520769 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-11 Report mapping for *k = -5*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_00000000 | RSTD < -985024 | Tc |
| RSTD\_00000001 | -985024 ≤ RSTD < -985023.9688 | Tc |
| RSTD\_00000002 | -985023.9688 ≤ RSTD < -985023.9375 | Tc |
| … | … | … |
| RSTD\_31520768 | -0.0312 ≤ RSTD < 0 | Tc |
| RSTD\_31520769 | 0 ≤ RSTD < 0.0312 | Tc |
| … | … | … |
| RSTD\_63041535 | 985023.9375 ≤ RSTD < 985023.9688 | Tc |
| RSTD\_63041536 | 985023.9688 ≤ RSTD < 985024 | Tc |
| RSTD\_63041537 | 985024 ≤ RSTD | Tc |

Table 10.1.23.3.1-12 Report mapping for *k = -6*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| RSTD\_i | RSTD |  |
| RSTD\_000000000 | RSTD < -985024 | Tc |
| RSTD\_000000001 | -985024 ≤ RSTD < -985023.9844 | Tc |
| RSTD\_000000002 | -985023.9844 ≤ RSTD < -985023.9688 | Tc |
| … | … | … |
| RSTD\_063041536 | -0.0156 ≤ RSTD < 0 | Tc |
| RSTD\_063041537 | 0 ≤ RSTD < 0.0156 | Tc |
| … | … | … |
| RSTD\_126083071 | 985023.9688 ≤ RSTD < 985023.9844 | Tc |
| RSTD\_126083072 | 985023.9844 ≤ RSTD < 985024 | Tc |
| RSTD\_126083073 | 985024 ≤ RSTD | Tc |

##### 10.1.23.3.2 Differential Reporting for DL RSTD Measurement

A first DL RSTD measurement is reported by means of differential reporting, i.e. as ΔRSTD, relative to a second DL RSTD measurement (RSTD2), provided that:

- the absolute measured quantity value of the second DL RSTD measurement (RSTD2) is not larger than the absolute measured quantity value of the first DL RSTD measurement (RSTD1), i.e., ΔRSTD=RSTD1-RSTD2≥0, and

- the absolute value of the second DL RSTD measurement (RSTD2) is reported together with ΔRSTD for the first DL RSTD measurement.

The reporting range for differential reporting ΔRSTD of the first DL RSTD measurement is defined from 0 up to 8191×Tc with the resolution step of 2*k*×Tc, where

Tc is defined in TS 38.211 [6],

*kmin*≤*k*≤*kmax*,

*kmin* = -6 and *kmax* = 5, when configured PRS resource for the reference cell and neighbor cell measured for the RSTD measurement are in FR1 and/or FR2,

*k≥* *timingReportingGranularityFactor* [34] configured by LMF via LPP for the RSTD measurement.

The measurement report mapping for different *k* values are specified in Tables 10.1.23.3.2-1 − 10.1.23.3.2-12.

Table 10.1.23.3.2-1: Report mapping for *k*=0

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_0000 | 0 ≤ ΔRSTD < 1 | Tc |
| DIFFRSTD\_0001 | 1 ≤ ΔRSTD < 2 | Tc |
| DIFFRSTD\_0002 | 2 ≤ ΔRSTD < 3 | Tc |
| … | … | … |
| DIFFRSTD\_8189 | 8189 ≤ ΔRSTD < 8190 | Tc |
| DIFFRSTD\_8190 | 8190 ≤ ΔRSTD < 8191 | Tc |
| DIFFRSTD\_8191 | 8191 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-2: Report mapping for *k*=1

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_0000 | 0 ≤ ΔRSTD < 2 | Tc |
| DIFFRSTD\_0001 | 2 ≤ ΔRSTD < 4 | Tc |
| DIFFRSTD\_0002 | 4 ≤ ΔRSTD < 6 | Tc |
| … | … | … |
| DIFFRSTD\_4093 | 8186 ≤ ΔRSTD < 8188 | Tc |
| DIFFRSTD\_4094 | 8188 ≤ ΔRSTD < 8190 | Tc |
| DIFFRSTD\_4095 | 8190 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-3: Report mapping for *k*=2

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_0000 | 0 ≤ ΔRSTD < 4 | Tc |
| DIFFRSTD\_0001 | 4 ≤ ΔRSTD < 8 | Tc |
| DIFFRSTD\_0002 | 8 ≤ ΔRSTD < 12 | Tc |
| … | … | … |
| DIFFRSTD\_2045 | 8180 ≤ ΔRSTD < 8184 | Tc |
| DIFFRSTD\_2046 | 8184 ≤ ΔRSTD < 8188 | Tc |
| DIFFRSTD\_2047 | 8188 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-4: Report mapping for *k*=3

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_0000 | 0 ≤ ΔRSTD < 8 | Tc |
| DIFFRSTD\_0001 | 8 ≤ ΔRSTD < 16 | Tc |
| DIFFRSTD\_0002 | 16 ≤ ΔRSTD < 24 | Tc |
| … | … | … |
| DIFFRSTD\_1021 | 8168 ≤ ΔRSTD < 8176 | Tc |
| DIFFRSTD\_1022 | 8176 ≤ ΔRSTD < 8184 | Tc |
| DIFFRSTD\_1023 | 8184 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-5: Report mapping for *k*=4

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_000 | 0 ≤ ΔRSTD < 16 | Tc |
| DIFFRSTD\_001 | 16 ≤ ΔRSTD < 32 | Tc |
| DIFFRSTD\_002 | 32 ≤ ΔRSTD < 48 | Tc |
| … | … | … |
| DIFFRSTD\_509 | 8144 ≤ ΔRSTD < 8160 | Tc |
| DIFFRSTD\_510 | 8160 ≤ ΔRSTD < 8176 | Tc |
| DIFFRSTD\_511 | 8176 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-6: Report mapping for *k*=5

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_000 | 0 ≤ ΔRSTD < 32 | Tc |
| DIFFRSTD\_001 | 32 ≤ ΔRSTD < 64 | Tc |
| DIFFRSTD\_002 | 64 ≤ ΔRSTD < 96 | Tc |
| … | … | … |
| DIFFRSTD\_253 | 8096 ≤ ΔRSTD < 8128 | Tc |
| DIFFRSTD\_254 | 8128 ≤ ΔRSTD < 8160 | Tc |
| DIFFRSTD\_255 | 8160 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-7: Report mapping for *k = -1*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_00000 | 0 ≤ ΔRSTD < 0.5 | Tc |
| DIFFRSTD\_00001 | 0.5 ≤ ΔRSTD < 1 | Tc |
| DIFFRSTD\_00002 | 1 ≤ ΔRSTD < 1.5 | Tc |
| … | … | … |
| DIFFRSTD\_16380 | 8190 ≤ ΔRSTD < 8190.5 | Tc |
| DIFFRSTD\_16381 | 8190.5 ≤ ΔRSTD < 8191 | Tc |
| DIFFRSTD\_16382 | 8191 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-8: Report mapping for *k = -2*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_00000 | 0 ≤ ΔRSTD < 0.25 | Tc |
| DIFFRSTD\_00001 | 0.25 ≤ ΔRSTD < 0.5 | Tc |
| DIFFRSTD\_00002 | 0.5 ≤ ΔRSTD < 0. 75 | Tc |
| … | … | … |
| DIFFRSTD\_32762 | 8190.5 ≤ ΔRSTD < 8190.75 | Tc |
| DIFFRSTD\_32763 | 8190.75 ≤ ΔRSTD < 8191 | Tc |
| DIFFRSTD\_32764 | 8191 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-9: Report mapping for *k = -3*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_00000 | 0 ≤ ΔRSTD < 0.125 | Tc |
| DIFFRSTD\_00001 | 0.125 ≤ ΔRSTD < 0.25 | Tc |
| DIFFRSTD\_00002 | 0.25 ≤ ΔRSTD < 0. 375 | Tc |
| … | … | … |
| DIFFRSTD\_65526 | 8190.75 ≤ ΔRSTD < 8190.875 | Tc |
| DIFFRSTD\_65527 | 8190.875 ≤ ΔRSTD < 8191 | Tc |
| DIFFRSTD\_65528 | 8191 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-10: Report mapping for *k = -4*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_000000 | 0 ≤ ΔRSTD < 0.0625 | Tc |
| DIFFRSTD\_000001 | 0.0625 ≤ ΔRSTD < 0.125 | Tc |
| DIFFRSTD\_000002 | 0.125 ≤ ΔRSTD < 0.1875 | Tc |
| … | … | … |
| DIFFRSTD\_131054 | 8190.875 ≤ ΔRSTD < 8190.9375 | Tc |
| DIFFRSTD\_131055 | 8190.9375 ≤ ΔRSTD < 8191 | Tc |
| DIFFRSTD\_131056 | 8191 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-11: Report mapping for *k = -5*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_000000 | 0 ≤ ΔRSTD < 0.0312 | Tc |
| DIFFRSTD\_000001 | 0.0312 ≤ ΔRSTD < 0.0625 | Tc |
| DIFFRSTD\_000002 | 0.0625 ≤ ΔRSTD < 0.0938 | Tc |
| … | … | … |
| DIFFRSTD\_262110 | 8190.9375 ≤ ΔRSTD < 8190.9688 | Tc |
| DIFFRSTD\_262111 | 8190.9688 ≤ ΔRSTD < 8191 | Tc |
| DIFFRSTD\_262112 | 8191 ≤ ΔRSTD | Tc |

Table 10.1.23.3.2-12: Report mapping for *k = -6*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  DIFFRSTD\_i | ΔRSTD = RSTD1 − RSTD2 | Unit |
| DIFFRSTD\_000000 | 0 ≤ ΔRSTD < 0. 0156 | Tc |
| DIFFRSTD\_000001 | 0. 0156≤ ΔRSTD < 0. 0312 | Tc |
| DIFFRSTD\_000002 | 0. 0312 ≤ ΔRSTD < 0.0469 | Tc |
| … | … | … |
| DIFFRSTD\_524222 | 8190.9688≤ ΔRSTD < 8190. 9844 | Tc |
| DIFFRSTD\_524223 | 8190. 9844≤ ΔRSTD < 8191 | Tc |
| DIFFRSTD\_524224 | 8191 ≤ ΔRSTD | Tc |

##### 10.1.23.3.3 Additional Path Report Mapping for DL RSTD

The reporting range for the additional path reporting for an RSTD measurement is defined up to the range from -8175×Tc to 8175×Tc with the resolution step of 2*k*×Tc, where

Tc is defined in TS 38.211 [6],

*kmin*≤*k*≤*kmax*,

*kmin* = -6 and *kmax*= 5, when configured PRS resource for the reference cell and neighbor cell measured for the RSTD measurement are in FR1 and/or FR2,

*k≥* *timingReportingGranularityFactor* [34] configured by LMF via LPP for the RSTD measurement.

The UE can report the timing of up to two additional paths with respect to the path timing determining the RSTD measurement.

A UE capable of *additionalPathsExtSupport-r17* can report the timing for a number additional paths, up to its capability, with respect to the path timing determining the RSTD measurement.

The report mappings for different *k* values are specified in Tables 10.1.23.3.3-1 − 10.1.23.3.3-12.

Table 10.1.23.3.3-1: Report mapping for *k*=0

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174 | Tc |
| path\_00002 | -8174 ≤ Δpath < -8173 | Tc |
| … | … | … |
| path\_08175 | -1 ≤ Δpath < 0 | Tc |
| path\_08176 | 0 ≤ Δpath < 1 | Tc |
| … | … | … |
| path\_16349 | 8173 ≤ Δpath < 8174 | Tc |
| path\_16350 | 8174 ≤ Δpath < 8175 | Tc |
| path\_16351 | 8175 ≤ Δpath | Tc |

Table 10.1.23.3.3-2: Report mapping for *k*=1

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8175 | Tc |
| path\_0001 | -8175 ≤ Δpath < -8173 | Tc |
| path\_0002 | -8173 ≤ Δpath < -8171 | Tc |
| … | … | … |
| path\_4088 | -1 ≤ Δpath < 1 | Tc |
| … | … | … |
| path\_8174 | 8171 ≤ Δpath < 8173 | Tc |
| path\_8175 | 8173 ≤ Δpath < 8175 | Tc |
| path\_8176 | 8175 ≤ Δpath | Tc |

Table 10.1.23.3.3-3: Report mapping for *k*=2

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8174 | Tc |
| path\_0001 | -8174 ≤ Δpath < -8170 | Tc |
| path\_0002 | -8170 ≤ Δpath < -8166 | Tc |
| … | … | … |
| path\_2044 | -2 ≤ Δpath < 2 | Tc |
| … | … | … |
| path\_4086 | 8166 ≤ Δpath < 8170 | Tc |
| path\_4087 | 8170 ≤ Δpath < 8174 | Tc |
| path\_4088 | 8174 ≤ Δpath | Tc |

Table 10.1.23.3.3-4: Report mapping for *k*=3

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8172 | Tc |
| path\_0001 | -8172 ≤ Δpath < -8164 | Tc |
| path\_0002 | -8164 ≤ Δpath < -8156 | Tc |
| … | … | … |
| path\_1022 | -4 ≤ Δpath < 4 | Tc |
| … | … | … |
| path\_2042 | 8156 ≤ Δpath < 8164 | Tc |
| path\_2043 | 8164 ≤ Δpath < 8172 | Tc |
| path\_2044 | 8172 ≤ Δpath | Tc |

Table 10.1.23.3.3-5: Report mapping for *k*=4

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8168 | Tc |
| path\_0001 | -8168 ≤ Δpath < -8152 | Tc |
| path\_0002 | -8152 ≤ Δpath < -8136 | Tc |
| … | … | … |
| path\_511 | -8 ≤ Δpath < 8 | Tc |
| … | … | … |
| path\_1020 | 8136 ≤ Δpath < 8152 | Tc |
| path\_1021 | 8152 ≤ Δpath < 8168 | Tc |
| path\_1022 | 8168 ≤ Δpath | Tc |

Table 10.1.23.3.3-6: Report mapping for *k*=5

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_000 | Δpath < -8160 | Tc |
| path\_001 | -8160 ≤ Δpath < -8128 | Tc |
| path\_002 | -8128 ≤ Δpath < -8096 | Tc |
| … | … | … |
| path\_256 | 0 ≤ Δpath < 32 | Tc |
| … | … | … |
| path\_509 | 8096 ≤ Δpath < 8128 | Tc |
| path\_510 | 8128 ≤ Δpath < 8160 | Tc |
| path\_511 | 8160 ≤ Δpath | Tc |

Table 10.1.23.3.3-7 Report mapping for *k = -1*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.5 | Tc |
| path\_00002 | -8174.5 ≤ Δpath < -8174 | Tc |
| … | … | … |
| path\_16350 | -0.5 ≤ Δpath < 0 | Tc |
| path\_16351 | 0 ≤ Δpath < 0.5 | Tc |
| … | … | … |
| path\_32699 | 8174 ≤ Δpath < 8174.5 | Tc |
| path\_32700 | 8174.5 ≤ Δpath < 8175 | Tc |
| path\_32701 | 8175 ≤ Δpath | Tc |

Table 10.1.23.3.3-8 Report mapping for for *k = -2*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.75 | Tc |
| path\_00002 | -8174.75 ≤ Δpath < -8174.5 | Tc |
| … | … | … |
| path\_32700 | -0.25 ≤ Δpath < 0 | Tc |
| path\_32701 | 0 ≤ Δpath < 0.25 | Tc |
| … | … | … |
| path\_65399 | 8174.5 ≤ Δpath < 8174.75 | Tc |
| path\_65400 | 8174.75 ≤ Δpath < 8175 | Tc |
| path\_65401 | 8175 ≤ Δpath | Tc |

Table 10.1.23.3.3-9 Report mapping for for *k = -3*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.8750 | Tc |
| path\_00002 | -8174.8750≤ Δpath < -8174.7500 | Tc |
| … | … | … |
| path\_065400 | -0.25 ≤ Δpath < 0 | Tc |
| path\_065401 | 0 ≤ Δpath < 0.25 | Tc |
| … | … | … |
| path\_130799 | 8174.7500 ≤ Δpath < 8174.8750 | Tc |
| path\_130800 | 8174.8750 ≤ Δpath < 8175 | Tc |
| path\_130801 | 8175 ≤ Δpath | Tc |

Table 10.1.23.3.3-10 Report mapping for for *k = -4*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.9375 | Tc |
| path\_000002 | -8174.9375≤ Δpath < -8174.8750 | Tc |
| … | … | … |
| path\_130800 | -0.25 ≤ Δpath < 0 | Tc |
| path\_130801 | 0 ≤ Δpath < 0.25 | Tc |
| … | … | … |
| path\_261599 | 8174.8750 ≤ Δpath < 8174.9375 | Tc |
| path\_261600 | 8174.9375 ≤ Δpath < 8175 | Tc |
| path\_261601 | 8175 ≤ Δpath | Tc |

Table 10.1.23.3.3-11 Report mapping for for *k = -5*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_0000000 | Δpath < -8175 | Tc |
| path\_0000001 | -8175 ≤ Δpath < -8174.9688 | Tc |
| path\_0000002 | -8174.9688 ≤ Δpath < -8174.9375 | Tc |
| … | … | … |
| path\_0261600 | -0.0312 ≤ Δpath < 0 | Tc |
| path\_0261601 | 0 ≤ Δpath < 0.0312 | Tc |
| … | … | … |
| path\_523199 | 8174.9375 ≤ Δpath < 8174.9688 | Tc |
| path\_523200 | 8174.9688 ≤ Δpath < 8175 | Tc |
| path\_523201 | 8175 ≤ Δpath | Tc |

Table 10.1.23.3.3-12 Report mapping for for *k = -6*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_0000000 | Δpath < -8175 | Tc |
| path\_0000001 | -8175 ≤ Δpath < -8174.9844 | Tc |
| path\_0000002 | -8174.9844 ≤ Δpath < -8174.9688 | Tc |
| … | … | … |
| path\_0523200 | -0.0156 ≤ Δpath < 0 | Tc |
| path\_0523201 | 0 ≤ Δpath < 0.0156 | Tc |
| … | … | … |
| path\_1046399 | 8174.9688 ≤ Δpath < 8174.9844 | Tc |
| path\_1046400 | 8174.9844 ≤ Δpath < 8175 | Tc |
| path\_1046401 | 8175 ≤ Δpath | Tc |

**--- sections without change ---**

### 10.1.24 PRS-RSRP Measurements

#### 10.1.24.1 Introduction

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

The requirements in clause 10.1.24 apply for UE in RRC\_CONNECTED, including PRS-RSRP measurement with MG and outside MG, as well as for UE in RRC\_INACTIVE and RRC\_IDLE state. For PRS-RSRP measurement in FR2, the requirements apply with and without reduced Rx beam sweeping factor.

**--- sections without change ---**

### 10.1.25 UE Rx-Tx Time Difference Measurements

**--- sections without change ---**

#### 10.1.25.3 Report mapping

Absolute UE Rx-Tx measurement reporting in clause 10.1.25.3.1, differential reporting for UE Rx-Tx measurement in clause 10.1.25.3.2, and additional path report mapping for UE Rx-Tx measurement in clause 10.1.25.3.3 applies, regardless of number of samples used to measure PRS, to report:

- TEG based measurement corresponding to UE reported Rx TEG in *nr-UE-Rx-TEG-ID-r17* [34],

- gap-based UE Rx-Tx measurement,

- gapless UE Rx-Tx measurement,

- UE Rx-Tx in RRC\_INACTIVE state.

##### 10.1.25.3.1 Absolute UE Rx-Tx Measurement Report Mapping

The reporting range for the absolute UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from -985024Tc to 985024Tc with the resolution step of 2*k*Tc, where:

Tc is defined in TS 38.211 [6],

*kmin*≤*k*≤*kmax*,

*kmin* = -6 and *kmax* = 5, when configured PRS and SRS resource for TUE Rx-Tx measurement are in FR1 and/or FR2,

*k≥* *timingReportingGranularityFactor* [34] configured by LMF via LPP for the UE Rx-Tx time difference measurement.

The TUE Rx-Tx report mapping for *k* = {0, 1, 2, 3, 4, 5, -1, -2, -3, -4, -5, -6} are specified in Tables 10.1.25.3.1-1, 10.1.25.3.1-2, 10.1.25.3.1-3, 10.1.25.3.1-4, 10.1.25.3.1-5, 10.1.25.3.1-6, 10.1.25.3.1-7, 10.1.25.3.1-8, 10.1.25.3.1-9, 10.1.25.3.1-10, 10.1.25.3.1-11, and 10.1.25.3.1-12 respectively.

Table 10.1.25.3.1-1: Absolute UE Rx-Tx time difference measurement report mapping for *k*=0

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_0000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0000001 | -985024  TUE Rx-Tx < -985023 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0000002 | -985023  TUE Rx-Tx < -985022 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_0985024 | -1  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0985025 | 0  TUE Rx-Tx < 1 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_1970047 | 985022  TUE Rx-Tx < 985023 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_1970048 | 985023  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_1970049 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-2: Absolute UE Rx-Tx time difference measurement report mapping for *k*=1

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_000001 | -985024  TUE Rx-Tx < -985022 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_000002 | -985022  TUE Rx-Tx < -985020 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_492512 | -2  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_492513 | 0  TUE Rx-Tx < 2 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_985023 | 985020  TUE Rx-Tx < 985022 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_985024 | 985022  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_985025 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-3: Absolute UE Rx-Tx time difference measurement report mapping for *k*=2

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_000001 | -985024  TUE Rx-Tx < -985020 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_000002 | -985020  TUE Rx-Tx < -985016 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_246256 | -4  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_246257 | 0  TUE Rx-Tx < 4 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_492511 | 985016  TUE Rx-Tx < 985020 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_492512 | 985020  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_492513 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-4: Absolute UE Rx-Tx time difference measurement report mapping for *k*=3

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_000001 | -985024  TUE Rx-Tx < -985016 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_000002 | -985016  TUE Rx-Tx < -985008 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_123128 | -8  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_123129 | 0  TUE Rx-Tx < 8 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_246255 | 985008  TUE Rx-Tx < 985016 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_246256 | 985016  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_246257 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-5: Absolute UE Rx-Tx time difference measurement report mapping for *k*=4

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_000001 | -985024  TUE Rx-Tx < -985008 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_000002 | -985008  TUE Rx-Tx < -984992 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_061564 | -16  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_061565 | 0  TUE Rx-Tx < 16 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_123127 | 984992  TUE Rx-Tx < 985008 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_123128 | 985008  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_123129 | 985024  TUE Rx-Tx | Tc |

**Table 10.1.25.3.1-6: Absolute UE Rx-Tx time difference measurement report mapping for *k*=5**

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_00000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00001 | -985024  TUE Rx-Tx < -984992 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00002 | -984992  TUE Rx-Tx < -984960 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_30782 | -32  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_30783 | 0  TUE Rx-Tx < 32 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_61563 | 984960  TUE Rx-Tx < 984992 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_61564 | 984992  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_61565 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-7: Absolute UE Rx-Tx time difference measurement report mapping for *k = -1*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_0000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0000001 | -985024  TUE Rx-Tx < -985023.5 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0000002 | -985023.5  TUE Rx-Tx < -985023 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_1970048 | -0.5  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_1970049 | 0  TUE Rx-Tx < 0.5 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_3940095 | 985023  TUE Rx-Tx < 985023.5 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_3940096 | 985023.5  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_3940097 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-8: Absolute UE Rx-Tx time difference measurement report mapping for *k = -2.*

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_0000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0000001 | -985024  TUE Rx-Tx < -985023.75 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_0000002 | -985023.75  TUE Rx-Tx < -985023.5 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_3940096 | -0.25  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_3940097 | 0  TUE Rx-Tx < 0.25 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_7880191 | 985023.5  TUE Rx-Tx < 985023.75 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_7880192 | 985023.75  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_7880193 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-9: Absolute UE Rx-Tx time difference measurement report mapping for *k = -3.*

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_00000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00000001 | -985024  TUE Rx-Tx < -985023.875 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00000002 | -985023.875  TUE Rx-Tx < -985023.75 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_07880192 | -0.125  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_07880193 | 0  TUE Rx-Tx < 0.125 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_15760383 | 985023.75  TUE Rx-Tx < 985023.875 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_15760384 | 985023.875  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_15760385 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-10: Absolute UE Rx-Tx time difference measurement report mapping for *k = -4*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_00000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00000001 | -985024  TUE Rx-Tx < -985023.9375 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00000002 | -985023.9375  TUE Rx-Tx < -985023.875 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_15760384 | -0.0625  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_15760385 | 0  TUE Rx-Tx < 0.0625 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_31520767 | 985023.875  TUE Rx-Tx < 985023.9375 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_31520768 | 985023.9375  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_31520769 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-11: Absolute UE Rx-Tx time difference measurement report mapping for *k = -5.*

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_00000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00000001 | -985024  TUE Rx-Tx < -985023.9688 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00000002 | -985023.9688  TUE Rx-Tx < -985023.9375 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_31520768 | -0.0312  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_31520769 | 0  TUE Rx-Tx < 0.0312 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_63041535 | 985023.9375  TUE Rx-Tx < 985023.9688 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_63041536 | 985023.9688  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_63041537 | 985024  TUE Rx-Tx | Tc |

Table 10.1.25.3.1-12: Absolute UE Rx-Tx time difference measurement report mapping for *k = -6.*

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_TIME\_DIFFERENCE\_00000000 | TUE Rx-Tx < -985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00000001 | -985024  TUE Rx-Tx < -985023.9844 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_00000002 | -985023.9844  TUE Rx-Tx < -985023.9688 | Tc |
|  |  | … |
| RX-TX\_TIME\_DIFFERENCE\_63041536 | -0.0156  TUE Rx-Tx < 0 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_63041537 | 0  TUE Rx-Tx < 0.0156 | Tc |
| … | … | … |
| RX-TX\_TIME\_DIFFERENCE\_126083071 | 985023.9688  TUE Rx-Tx < 985023.9844 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_126083072 | 985023.9844  TUE Rx-Tx < 985024 | Tc |
| RX-TX\_TIME\_DIFFERENCE\_126083073 | 985024  TUE Rx-Tx | Tc |

##### 10.1.25.3.2 Differential UE Rx-Tx Measurement Report Mapping

The reporting range for differential UE Rx-Tx time difference measurement (TUE Rx-Tx) is defined from 0 up to 8191Tc where:

TUE Rx-Tx = TUE Rx-Tx1 - TUE Rx-Tx2; where:

TUE Rx-Tx1 > TUE Rx-Tx2,

TUE Rx-Tx1 is the first absolute UE Rx-Tx time difference measurement,

TUE Rx-Tx1 is the second absolute UE Rx-Tx time difference measurement,

Tc is defined in TS 38.211 [6],

*kmin*≤*k*≤*kmax*,

*kmin* = -6 and *kmax* = 5, when PRS and SRS resource configured for ΔTUE Rx-Tx measurement are in FR1 and/or FR2,

*k≥* *timingReportingGranularityFactor* [34] configured by LMF via LPP for the UE Rx-Tx time difference measurement.

The TUE Rx-Tx report mapping for *k* = {0, 1, 2, 3, 4, 5, -1, -2, -3, -4, -5, -6} are specified in Tables 10.1.25.3.2-1, 10.1.25.3.2-2, 10.1.25.3.2-3, 10.1.25.3.2-4, 10.1.25.3.2-5, 10.1.25.3.2-6, 10.1.25.3.2-7, 10.1.25.3.2-8, 10.1.25.3.2-9, 10.1.25.3.2-10, 10.1.25.3.2-11, and 10.1.25.3.2-12 respectively.

Table 10.1.25.3.2-1: Differential UE Rx-Tx time difference measurement report mapping for *k*=0

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0000 | 0  TUE Rx-Tx < 1 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0001 | 1  TUE Rx-Tx < 2 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0002 | 2  TUE Rx-Tx < 3 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_8189 | 8189  TUE Rx-Tx < 8190 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_8190 | 8190  TUE Rx-Tx < 8191 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_8191 | 8191  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-2: Differential UE Rx-Tx time difference measurement report mapping for *k*=1

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0000 | 0  TUE Rx-Tx < 2 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0001 | 2  TUE Rx-Tx < 4 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0002 | 4  TUE Rx-Tx < 6 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_4093 | 8186  TUE Rx-Tx < 8188 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_4094 | 8188  TUE Rx-Tx < 8190 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_4095 | 8190  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-3: Differential UE Rx-Tx time difference measurement report mapping for *k*=2

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0000 | 0  TUE Rx-Tx < 4 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0001 | 4  TUE Rx-Tx < 8 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0002 | 8  TUE Rx-Tx < 12 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_2045 | 8180  TUE Rx-Tx < 8184 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_2046 | 8184  TUE Rx-Tx < 8188 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_2047 | 8188  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-4: Differential UE Rx-Tx time difference measurement report mapping for *k*=3

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0000 | 0  TUE Rx-Tx < 8 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0001 | 8  TUE Rx-Tx < 16 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_0002 | 16  TUE Rx-Tx < 24 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_1021 | 8168  TUE Rx-Tx < 8176 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_1022 | 8176  TUE Rx-Tx < 8184 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_1023 | 8184  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-5: Differential UE Rx-Tx time difference measurement report mapping for *k*=4

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000 | 0  TUE Rx-Tx < 16 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_001 | 16  TUE Rx-Tx < 32 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_002 | 32  TUE Rx-Tx < 48 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_509 | 8144  TUE Rx-Tx < 8160 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_510 | 8160  TUE Rx-Tx < 8176 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_511 | 8176  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-6: Differential UE Rx-Tx time difference measurement report mapping for *k*=5

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000 | 0  TUE Rx-Tx < 32 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_001 | 32  TUE Rx-Tx < 64 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_002 | 64  TUE Rx-Tx < 96 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_253 | 8096  TUE Rx-Tx < 8128 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_254 | 8128  TUE Rx-Tx < 8160 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_255 | 8160  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-7: Differential UE Rx-Tx time difference measurement report mapping for *k = -1*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00000 | 0  TUE Rx-Tx < 0.5 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00001 | 0.5  TUE Rx-Tx < 1 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00002 | 1  TUE Rx-Tx < 1.5 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_16380 | 8190  TUE Rx-Tx < 8190.5 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_16381 | 8190.5  TUE Rx-Tx < 8191 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_16382 | 8191  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-8: Differential UE Rx-Tx time difference measurement report mapping for *k = -2*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00000 | 0  TUE Rx-Tx < 0.25 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00001 | 0.25  TUE Rx-Tx < 0.5 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00002 | 0.5  TUE Rx-Tx < 0.75 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_32762 | 8190.5  TUE Rx-Tx < 8190.75 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_32763 | 8190.75  TUE Rx-Tx < 8191 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_32764 | 8191  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-9: Differential UE Rx-Tx time difference measurement report mapping for *k = -3*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00000 | 0  TUE Rx-Tx < 0.125 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00001 | 0.125  TUE Rx-Tx < 0.25 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_00002 | 0.25  TUE Rx-Tx < 0.375 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_65526 | 8190.75  TUE Rx-Tx < 8190.875 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_65527 | 8190.875  TUE Rx-Tx < 8191 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_65528 | 8191  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-10: Differential UE Rx-Tx time difference measurement report mapping for *k = -4*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000000 | 0  TUE Rx-Tx < 0.0625 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000001 | 0.0625  TUE Rx-Tx < 0.125 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000002 | 0.125  TUE Rx-Tx < 0.1875 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_131054 | 8190.875  TUE Rx-Tx < 8190.9375 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_131055 | 8190.9375  TUE Rx-Tx < 8191 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_131056 | 8191  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-11: Differential UE Rx-Tx time difference measurement report mapping for *k = -5*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000000 | 0  TUE Rx-Tx < 0.0312 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000001 | 0.0312  TUE Rx-Tx < 0.0625 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000002 | 0.0625  TUE Rx-Tx < 0.0938 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_262110 | 8190.9375  TUE Rx-Tx < 8190.9688 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_262111 | 8190.9688  TUE Rx-Tx < 8191 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_262112 | 8191  TUE Rx-Tx | Tc |

Table 10.1.25.3.2-12: Differential UE Rx-Tx time difference measurement report mapping for *k = -6*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000000 | 0  TUE Rx-Tx < 0.0156 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000001 | 0.0156  TUE Rx-Tx < 0.0312 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_000002 | 0.0312  TUE Rx-Tx < 0.0469 | Tc |
|  |  | … |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_524222 | 8190.9688  TUE Rx-Tx < 8190.9844 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_524223 | 8190.9844  TUE Rx-Tx < 8191 | Tc |
| DIFF\_RX-TX\_TIME\_DIFFERENCE\_524224 | 8191  TUE Rx-Tx | Tc |

##### 10.1.25.3.3 Additional Path Report Mapping for UE Rx-Tx Time Difference

The reporting range for the additional path reporting for an UE Rx-Tx time difference measurement is defined up to the range from -8175×Tc to 8175×Tc with the resolution step of 2*k*×Tc, where

Tc is defined in TS 38.211 [6],

*kmin*≤*k*≤*kmax*,

*kmin* = -6 and *kmax* = 5, when PRS and SRS resource configured for the UE Rx-Tx time difference measurement are in FR1 and/or FR2,

*k≥* *timingReportingGranularityFactor* [34] configured by LMF via LPP for the UE Rx-Tx time difference measurement.

The UE can report the timing of up to two additional paths with respect to the path timing determining the UE Rx-Tx time difference measurement.

The UE capable of  *additionalPathsExtSupport-r17* can report the timing of up to its supported number of additional paths with respect to the path timing determining the UE Rx-Tx measurement.

The report mappings for different *k* values are specified in Tables 10.1.25.3.3-1 − 10.1.25.3.3-12.

Table 10.1.25.3.3-1: Report mapping for *k*=0

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174 | Tc |
| path\_00002 | -8174 ≤ Δpath < -8173 | Tc |
| … | … | … |
| path\_08175 | -1 ≤ Δpath < 0 | Tc |
| path\_08176 | 0 ≤ Δpath < 1 | Tc |
| … | … | … |
| path\_16349 | 8173 ≤ Δpath < 8174 | Tc |
| path\_16350 | 8174 ≤ Δpath < 8175 | Tc |
| path\_16351 | 8175 ≤ Δpath | Tc |

Table 10.1.25.3.3-2: Report mapping for *k*=1

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8175 | Tc |
| path\_0001 | -8175 ≤ Δpath < -8173 | Tc |
| path\_0002 | -8173 ≤ Δpath < -8171 | Tc |
| … | … | … |
| path\_4088 | -1 ≤ Δpath < 1 | Tc |
| … | … | … |
| path\_8174 | 8171 ≤ Δpath < 8173 | Tc |
| path\_8175 | 8173 ≤ Δpath < 8175 | Tc |
| path\_8176 | 8175 ≤ Δpath | Tc |

Table 10.1.25.3.3-3: Report mapping for *k*=2

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8174 | Tc |
| path\_0001 | -8174 ≤ Δpath < -8170 | Tc |
| path\_0002 | -8170 ≤ Δpath < -8166 | Tc |
| … | … | … |
| path\_2044 | -2 ≤ Δpath < 2 | Tc |
| … | … | … |
| path\_4086 | 8166 ≤ Δpath < 8170 | Tc |
| path\_4087 | 8170 ≤ Δpath < 8174 | Tc |
| path\_4088 | 8174 ≤ Δpath | Tc |

Table 10.1.25.3.3-4: Report mapping for *k*=3

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8172 | Tc |
| path\_0001 | -8172 ≤ Δpath < -8164 | Tc |
| path\_0002 | -8164 ≤ Δpath < -8156 | Tc |
| … | … | … |
| path\_1022 | -4 ≤ Δpath < 4 | Tc |
| … | … | … |
| path\_2042 | 8156 ≤ Δpath < 8164 | Tc |
| path\_2043 | 8164 ≤ Δpath < 8172 | Tc |
| path\_2044 | 8172 ≤ Δpath | Tc |

Table 10.1.25.3.3-5: Report mapping for *k*=4

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8168 | Tc |
| path\_0001 | -8168 ≤ Δpath < -8152 | Tc |
| path\_0002 | -8152 ≤ Δpath < -8136 | Tc |
| … | … | … |
| path\_511 | -8 ≤ Δpath < 8 | Tc |
| … | … | … |
| path\_1020 | 8136 ≤ Δpath < 8152 | Tc |
| path\_1021 | 8152 ≤ Δpath < 8168 | Tc |
| path\_1022 | 8168 ≤ Δpath | Tc |

Table 10.1.25.3.3-6: Report mapping for *k*=5

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_000 | Δpath < -8160 | Tc |
| path\_001 | -8160 ≤ Δpath < -8128 | Tc |
| path\_002 | -8128 ≤ Δpath < -8096 | Tc |
| … | … | … |
| path\_256 | 0 ≤ Δpath < 32 | Tc |
| … | … | … |
| path\_509 | 8096 ≤ Δpath < 8128 | Tc |
| path\_510 | 8128 ≤ Δpath < 8160 | Tc |
| path\_511 | 8160 ≤ Δpath | Tc |

Table 10.1.25.3.3-7: Report mapping for *k = -1*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.5 | Tc |
| path\_00002 | -8174.5 ≤ Δpath < -8174 | Tc |
| … | … | … |
| path\_16350 | -0.5 ≤ Δpath < 0 | Tc |
| path\_16351 | 0 ≤ Δpath < 0.5 | Tc |
| … | … | … |
| path\_32699 | 8174 ≤ Δpath < 8174.5 | Tc |
| path\_32700 | 8174.5 ≤ Δpath < 8175 | Tc |
| path\_32701 | 8175 ≤ Δpath | Tc |

Table 10.1.25.3.3-8: Report mapping for *k = -2*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.75 | Tc |
| path\_00002 | -8174.75 ≤ Δpath < -8174.5 | Tc |
| … | … | … |
| path\_32700 | -0.25 ≤ Δpath < 0 | Tc |
| path\_32701 | 0 ≤ Δpath < 0.25 | Tc |
| … | … | … |
| path\_65399 | 8174.5 ≤ Δpath < 8174.75 | Tc |
| path\_65400 | 8174.75 ≤ Δpath < 8175 | Tc |
| path\_65401 | 8175 ≤ Δpath | Tc |

Table 10.1.25.3.3-9: Report mapping for *k = -3*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.875 | Tc |
| path\_00002 | -8174.875 ≤ Δpath < -8174.75 | Tc |
| … | … | … |
| path\_65400 | -0.125 ≤ Δpath < 0 | Tc |
| path\_65401 | 0 ≤ Δpath < 0.125 | Tc |
| … | … | … |
| path\_130799 | 8174.75 ≤ Δpath < 8174.875 | Tc |
| path\_130800 | 8174.875 ≤ Δpath < 8175 | Tc |
| path\_130801 | 8175 ≤ Δpath | Tc |

Table 10.1.25.3.3-10: Report mapping for *k = -4*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.9375 | Tc |
| path\_00002 | -8174.9375 ≤ Δpath < -8174.875 | Tc |
| … | … | … |
| path\_130800 | -0.0625 ≤ Δpath < 0 | Tc |
| path\_130801 | 0 ≤ Δpath < 0.0625 | Tc |
| … | … | … |
| path\_261599 | 8174.875 ≤ Δpath < 8174.9375 | Tc |
| path\_261600 | 8174.9375 ≤ Δpath < 8175 | Tc |
| path\_261601 | 8175 ≤ Δpath | Tc |

Table 10.1.25.3.3-11: Report mapping for *k = -5*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.9688 | Tc |
| path\_000002 | -8174.9688 ≤ Δpath < -8174.9375 | Tc |
| … | … | … |
| path\_261600 | -0.0312 ≤ Δpath < 0 | Tc |
| path\_261601 | 0 ≤ Δpath < 0.0312 | Tc |
| … | … | … |
| path\_523199 | 8174.9375 ≤ Δpath < 8174.9688 | Tc |
| path\_523200 | 8174.9688 ≤ Δpath < 8175 | Tc |
| path\_ 523201 | 8175 ≤ Δpath | Tc |

Table 10.1.25.3.3-12: Report mapping for *k = -6*.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_0000000 | Δpath < -8175 | Tc |
| path\_0000001 | -8175 ≤ Δpath < -8174.9844 | Tc |
| path\_0000002 | -8174.9844 ≤ Δpath < -8174.9688 | Tc |
| … | … | … |
| path\_0523200 | -0.0156 ≤ Δpath < 0 | Tc |
| path\_0523201 | 0 ≤ Δpath < 0.0156 | Tc |
| … | … | … |
| path\_1046399 | 8174.9688≤ Δpath < 8174.9844 | Tc |
| path\_1046400 | 8174.9844 ≤ Δpath < 8175 | Tc |
| path\_1046401 | 8175 ≤ Δpath | Tc |

**--- sections without change ---**

### 10.1.38 PRS-RSRPP Measurements

#### 10.1.38.1 Introduction

The requirements in Clause 10.1.38.2 shall apply, provided the UE has received *nr-DL-AoD-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more DL PRS-RSRPP measurements defined in TS 38.215 [4]. The requirements in Clause 10.1.38 shall apply:

- when UE is in RRC\_CONNECTED state,

- when UE is in RRC\_INACTIVE state,

- when UE is in RRC\_IDLE state.

The requirements in Clause 10.1.38.2 apply for the first path PRS-RSRP measurement.

## **--- End of Change #2 ---**

## **--- Start of Change #3 ---**

### 10.1.X RSTD Measurements Based on PRS Aggregation

#### 10.1.X.1 Introduction

The requirements in Clause 10.1.X shall apply, provided the UE has received *nr-DL-TDOA-RequestLocationInformation* message with *nr-DL-PRS-JointMeasurementRequestedPFL-List* from LMF via LPP [34] requesting the UE to report one or more DL RSTD measurements defined in TS 38.215 [4] with aggregated measurement. The requirements in Clause 10.1.X shall apply:

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

- when UE is in RRC\_INACTIVE state,

- when UE is in RRC\_IDLE state.

#### 10.1.X.2 Measurement Accuracy Requirements

When UE measures RSTD on PRS resources belonging to different PFLs or different PFL combinations, then the RSTD accuracy is defined as the accuracy corresponding to the largest accuracy value among different PFLs or different PFL combinations.

The requirements in this clause for 3-PFL and 2-PFL apply provided that

- PRS resources linked for aggregation saftisfy all the conditions specified in 38.214 clause 5.1.6.5.3.

- The spacing between adjacent PFLs in frequency does not exceed TBD.

The accuracy requirements for RSTD measurement based on PRS Aggregation shall be within ±(X+Y+Z+Δ) Tc.

X is defined in Table 10.1.X.2-1a and Table 10.1.X.2-1b for AWGN channel and Table 10.1.X.2-3a and Table 10.1.X.2-3b for fading channel for FR1, provided that the following conditions are met.

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

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE does not perform positioning measurement with reduced number of samples.

X is defined in Table 10.1.X.2-2a and Table 10.1.X.2-2b for AWGN channel and Table 10.1.X.2-4a and Table 10.1.X.2-4b for fading channel for FR2, provided that the following conditions are met.

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

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE does not perform positioning measurement with reduced number of samples.

X is defined in Table 10.1.X.2-5a and Table 10.1.X.2-5b for AWGN channel in FR1 provided that the following conditions are met.

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

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE supports positioning measurement with reduced number of sample and is indicated by LMF to perform positioning measurement with reduced number of samples.

X is defined in Table 10.1.X.2-6a and Table 10.1.X.2-6b for AWGN channel in FR2 provided that the following conditions are met.

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

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE supports positioning measurement with reduced number of sample and is indicated by LMF to perform positioning measurement with reduced number of samples.

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

*Editor’s Note: values of Y, Z and Δ are FFS.*

Table 10.1.X.2-1a: RSTD absolute accuracy in FR1 for AWGN channel for 2-PFL

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth per PFL**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 104 | ≥ 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 |
| TBD | 30 | ≥ 132 | ≥ 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 |
| TBD | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 60 | ≥ 64 | ≥ 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 |
| TBD | 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS. | | | | | | | |

Table 10.1.X.2-1b: RSTD absolute accuracy in FR1 for AWGN channel for 3-PFL

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth per PFL**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 60 | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table Table 10.1.X.2-1a. | | | | | | | |

Table 10.1.X.2-2a: RSTD absolute accuracy in FR2 for AWGN channel for 2-PFL

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per PFL  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 64 | ≥ 1 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| TBD | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| TBD | 120 | ≥ 64 | ≥ 1 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| TBD | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS. | | | | | | |

Table 10.1.X.2-2b: RSTD absolute accuracy in FR2 for AWGN channel for 3-PFL

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per PFL  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| TBD | 120 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table 10.1.X.2-2a. | | | | | | |

Table 10.1.X.2-3a: RSTD absolute accuracy in FR1 for fading channel for 2-PFL

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth per PFL**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 60 | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table Table 10.1.X.2-1a. | | | | | | | |

Table 10.1.X.2-3b: RSTD absolute accuracy in FR1 for fading channel for 3-PFL

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth per PFL**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 60 | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table Table 10.1.X.2-1a. | | | | | | | |

Table 10.1.X.2-4a: RSTD absolute accuracy in FR2 for fading channel for 2-PFL

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per PFL  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| TBD | 120 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table 10.1.X.2-2a. | | | | | | |

Table 10.1.X.2-4b: RSTD absolute accuracy in FR2 for fading channel for 3-PFL

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per PFL  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| TBD | 120 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table 10.1.X.2-2a. | | | | | | |

Table 10.1.X.2-5a: RSTD absolute accuracy in FR1 for AWGN channel with reduced number of samples for 2-PFL

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth per PFL**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| TBD | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 15 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 60 | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table Table 10.1.X.2-1a. | | | | | | | |

Table 10.1.X.2-5b: RSTD absolute accuracy in FR1 for AWGN channel with reduced number of samples for 3-PFL

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth per PFL**  **Note 1** | **PRS resource repetition ()**  **Note 2** | **Io Note 3 range** | | |
| **NR operating band groups Note 4** | **Minimum Io** | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| TBD | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 15 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 272 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 60 | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table Table 10.1.X.2-1a. | | | | | | | |

Table 10.1.X.2-6a: RSTD absolute accuracy in FR2 for AWGN channel with reduced number of samples for 2-PFL

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per PFL  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 60 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| TBD | 120 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table 10.1.X.2-2a. | | | | | | |

Table 10.1.X.2-6b: RSTD absolute accuracy in FR2 for AWGN channel with reduced number of samples for 3-PFL

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth per PFL  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 60 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| TBD | 120 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| TBD | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth per PFL, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i among all the aggregated PFLs.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table 10.1.X.2-2a. | | | | | | |

#### 10.1.X.3 Report Mapping

##### 10.1.X.3.1 Absolute DL RSTD Measurement Reporting

The report mapping as defined in clause 10.1.23.3.1 shall apply.

##### 10.1.X.3.2 Differential Reporting for DL RSTD Measurement

The report mapping as defined in clause 10.1.23.3.2 shall apply.

##### 10.1.X.3.3 Additional Path Report Mapping for DL RSTD

The report mapping as defined in clause 10.1.23.3.3 shall apply.

### 10.1.X RSTD Measurements Based on PRS Aggregation

#### 10.1.X.1 Introduction

The requirements in Clause 10.1.X.2 shall apply, provided the UE has received *nr-DL-TDOA-RequestLocationInformation* or *nr-Multi-RTT-RequestLocationInformation* or *nr-DL-AoD-RequestLocationInformation* message from LMF via LPP [34] with a request to perform measurement by aggregating PRS resources from multiple PFLs via *nr-DL-PRS-JointMeasurementRequested* for UE to report one or more DL PRS-RSRPP measurements defined in TS 38.215 [4]. The requirements in Clause 10.1.X shall apply:

- when UE is in RRC\_CONNECTED state, and the measurement is performed with MG,

- when UE is in RRC\_INACTIVE state.

- when UE is in RRC\_IDLE state.

The requirements in Clause 10.1.X.2 apply for the first path PRS-RSRP measurement.

#### 10.1.X.2 Measurement Accuracy Requirements

##### 10.1.X.2.1 Absolute PRS RSRPP accuracy

The accuracy requirements in clause 10.1.38.2.1 corresponding to the total aggregated PRS bandwidth shall apply.

#### 10.1.X.3 Report Mapping

##### 10.1.X.3.1 Absolute DL RSTD Measurement Reporting

The absolute report mapping for PRS-RSRPP measurement in clause 10.1.38.3.1 shall apply.

##### 10.1.X.3.2 Differential Reporting for DL RSTD Measurement

##### The differential report mapping for PRS-RSRPP measurement in clause 10.1.38.3.2 shall apply.10.1.X.3.3 Additional Path Report Mapping for DL RSTD

### 10.1.Y PRS-RSRP Measurements Based on PRS Aggregation

#### 10.1.Y.1 Introduction

The requirements in Clause 10.1.Y shall apply, provided that the UE has received *nr-DL-TDOA-RequestLocationInformation* or *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more DL PRS-RSRP measurements defined in TS 38.215 [4], and requesting the UE to perform PRS measurement by aggregating PRS resources from multiple PFLs via *nr-DL-PRS-JointMeasurementRequested [34]*.

The requirements in clause 10.1.Y apply for UE in RRC\_CONNECTED, i.e. PRS-RSRP measurement with MG, as well as for UE in RRC\_INACTIVE and RRC\_IDLE. For PRS-RSRP measurement in FR2, the requirements apply with and without reduced Rx beam sweeping factor.

#### 10.1.Y.2 Measurement Accuracy Requirements

##### 10.1.Y.2.1 Absolute PRS RSRP Accuracy Requirement

The accuracy requirements in clause 10.1.24.2.1 corresponding to the total aggregated PRS bandwidth shall apply.

##### 10.1.Y.2.2 Relative PRS RSRP Accuracy Requirement

The accuracy requirements in clause 10.1.24.2.2 corresponding to the total aggregated PRS bandwidth shall apply.

#### 10.1.Y.3 Report Mapping

##### 10.1.Y.3.1 Absolute PRS-RSRP Measurement Report Mapping

The absolute report mapping for PRS-RSRP measurement in clause 10.1.24.3.1 shall apply.

##### 10.1.Y.3.2 Differential Report Mapping for PRS-RSRP Measurement

The differential report mapping for PRS-RSRP measurement in clause 10.1.24.3.2 shall apply.

### 10.1.Z UE Rx-Tx Time Difference Measurement Based on PRS Aggregation

#### 10.1.Z.1 Introduction

The requirements in clause 10.1.Z apply provided the UE has received *nr-Multi-RTT-RequestLocationInformation* message from LMF via LPP [31] requesting the UE to report one or more UE Rx-Tx time difference measurements, defined in TS 38.215 [4], performed by aggregating PRS resources on multiple PFLs. The requirements in clause 10.1.Z apply:

- when UE is in RRC\_CONNECTED state and the measurement is performed with MG,

- when UE is in RRC\_INACTIVE state.

#### 10.1.Z.2 Measurement Accuracy Requirements

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

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

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

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

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

- PRS resources linked for aggregation saftisfy all the conditions specified in 38.214 clause 5.1.6.5.3.

- PRS resources linked for aggregation belong to intra-band contiguous PFLs, which means that the spacing between adjacent PFLs in frequency does not exceed [the nominal channel spacing for intra-band contiguous CA defined in 38.101-1, clause 5.4A.1 for FR1 and in 38.101-2, clause 5.4A.1 for FR2-1].

If the uplink transmission timing changes during the UE Rx-Tx measurement period due to the autonomous timing adjustment defined in clause 7.1.2 then:

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

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

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

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

The accuracy requirements in Table 10.1.Z.2-1 for FR1 are valid under the following conditions:

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

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

AWGN propagation condition.

**Table 10.1.Z.2-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy**  **for**  **3 PFLs** | **Accuracy for**  **2 PFLs** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth per PFL** | **PRS SCS** | **PRS resource repetition Note 3** | **NR operating band groupsNote 2** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± TBD+δ | ± TBD+δ | -3 | ≥104 | 15 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥132 | 30 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥272 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 60 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥ 132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | -13 | ≥104 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥132 | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥272 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥ 64 | 60 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥ 132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1.Z.2-5. | | | | | | | | |

The accuracy requirements in Table 10.1.Z.2-1a 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.

Number of measurement samples is less than 4

AWGN propagation condition.

**Table 10.1.Z.2-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy**  **for**  **3 PFLs** | **Accuracy for**  **2 PFLs** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth per PFL** | **PRS SCS** | **PRS resource repetition Note 3** | **NR operating band groupsNote 2** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± TBD+δ | ± TBD+δ | 0 | ≥104 | 15 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥132 | 30 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥272 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 60 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥ 132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | -6 | ≥104 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥132 | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥272 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥ 64 | 60 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥ 132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1.Z.2-5. | | | | | | | | |

The relative accuracy requirements in Table 10.1.Z.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 10.1.Z.2-1b: UE Rx-Tx time difference relative measurement accuracy in FR1 in AWGN with TEG reporting**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy**  **for**  **3 PFLs** | **Accuracy for**  **2 PFLs** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth per PFL Note 1** | **PRS SCS** | **PRS resource repetition Note 2** | **NR operating band groupsNote 4** | **IoNote 3 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± TBD+ ΔNote 7 | ± TBD+Δ | (PRS Ês/Iot)*j*≥-6  (PRS Ês/Iot)*i* ≥-13 | ≥104 | 15 | ≥1 | 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 |
| ± TBD+Δ | ± TBD+Δ | ≥132 | 30 | ≥1 | 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 |
| ± TBD+Δ | ± TBD+Δ | ≥272 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+Δ | ± TBD+Δ | ≥64 | 60 | ≥1 | 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 |
| ± TBD+Δ | ± TBD+Δ | ≥ 132 | ≥1 | 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 RB number for the corresponding SCS.  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 10.1.Z.2-5 (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 10.1.Z.2-2 for FR1 are valid under the following conditions:

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

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

Fading propagation condition.

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

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy**  **for**  **3 PFLs** | **Accuracy for**  **2 PFLs** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth per PFL** | **PRS SCS** | **PRS resource repetition Note 3** | **NR operating band groupsNote 2** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± TBD+δ | ± TBD+δ | -3 | ≥104 | 15 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥132 | 30 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥272 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 60 | ≥1 | 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 |
| ± TBD+δ | ± TBD+δ | ≥ 132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | --13 | ≥104 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥132 | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥272 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥ 64 | 60 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥ 132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1.Z.2-5. | | | | | | | | |

The accuracy requirements in Table 10.1.Z.2-3 for FR2 are valid under the following conditions:

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

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

AWGN propagation condition.

**Table 10.1.Z.2-3: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy for**  **3 PFLs** | **Accuracy for**  **2 PFLs** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth per PFL** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± TBD+δ | ± TBD+δ | -3 | ≥64 | 60 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± TBD+δ | ± TBD+δ | ≥132 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 120 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± TBD+δ | ± TBD+δ | ≥128 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | -13 | ≥64 | 60 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 120 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥128 | ≥1 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1.Z.2-6. | | | | | | | |

The accuracy requirements in Table 10.1.Z.2-3a 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.

**Table 10.1.Z.2-3a: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN with reduced measurement samples**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy for**  **3 PFLs** | **Accuracy for**  **2 PFLs** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth per PFL** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± TBD+δ | ± TBD+δ | 0 | ≥64 | 60 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± TBD+δ | ± TBD+δ | ≥132 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 120 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± TBD+δ | ± TBD+δ | ≥128 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | -6 | ≥64 | 60 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 120 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥128 | ≥1 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1.Z.2-6. | | | | | | | |

The relative accuracy requirements in Table 10.1.Z.2-3b 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 two UE Rx-Tx time difference measurements are associated with the same RxTx TEG

**Table 10.1.Z.2-3b: UE Rx-Tx time difference relative measurement accuracy in FR2 in AWGN with TEG reporting**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy for**  **3 PFLs** | **Accuracy for**  **2 PFLs** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth per PFL Note 1** | **PRS SCS** | **PRS resource repetitionNote 2** | **IoNote 3 range** | |
| **Minimum Io** | **Maximum Io** |
| **TcNote 5** | **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| TBD+ΔNote 6 | TBD+Δ | (PRS Ês/Iot)*j*≥-6  (PRS Ês/Iot)*i* ≥-13 | ≥64 | 60 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| TBD+Δ | TBD+Δ | ≥132 | ≥1 | NOTE 6 | NOTE 6 |
| TBD+Δ | TBD+Δ | ≥64 | 120 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| TBD+Δ | TBD+Δ | ≥128 | ≥1 | 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: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: Δ 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 10.1.Z.2-6 (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 10.1.Z.2-4 for FR2 are valid under the following conditions:

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

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

Fading propagation condition.

**Table 10.1.Z.2-4: UE Rx-Tx time difference measurement accuracy in FR2 in fading**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy for**  **3 PFLs** | **Accuracy for**  **2 PFLs** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth per PFL** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± TBD+δ | ± TBD+δ | -3 | ≥64 | 60 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± TBD+δ | ± TBD+δ | ≥132 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 120 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± TBD+δ | ± TBD+δ | ≥128 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | -13 | ≥64 | 60 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥64 | 120 | ≥1 | NOTE 6 | NOTE 6 |
| ± TBD+δ | ± TBD+δ | ≥128 | ≥1 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1.Z.2-6. | | | | | | | |

**Table 10.1.Z.2-5: Margin for UE Rx-Tx time difference measurement accuracy in FR1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Min(PRS BW, SRS BW) (RB)** | | | **Margin (Tc Note 1)** |
| **SCS = 15 kHz** | **SCS = 30 kHz** | **SCS = 60 kHz** |
| ≥ TBD | ≥ TBD | ≥ TBD | ≥ TBD |
| ≥ TBD | ≥ TBD | ≥ TBD | ≥ TBD |
| ≥ TBD | ≥ TBD | ≥ TBD | ≥ TBD |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies. | | | |

**Table 10.1.Z.2-6: Margin for UE Rx-Tx time difference measurement accuracy in FR2**

|  |  |  |
| --- | --- | --- |
| **Min(PRS BW, SRS BW) (MHz)** | | **Margin (Tc Note 1)** |
| **SCS = 60 kHz** | **SCS = 120 kHz** |
| ≥ TBD | ≥ TBD | ≥ TBD |
| ≥ TBD | ≥ TBD | ≥ TBD |
| ≥ TBD | ≥ TBD | ≥ TBD |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies. | | |

##### 10.1.Z.2.1 Absolute UE Rx-Tx Accuracy Requirement

##### 10.1.Z.2.2 Relative UE Rx-Tx Accuracy Requirement

#### 10.1.Z.3 Report mapping

Applicable measurement report mappings are defined in clause 10.1.25.3.

##### 10.1.Z.3.1 Absolute UE Rx-Tx Measurement Report Mapping

##### 10.1.Z.3.2 Differential UE Rx-Tx Measurement Report Mapping

##### 10.1.Z.3.3 Additional Path Report Mapping for UE Rx-Tx Time Difference

### 10.1.X1 PRS-RSRPP Measurements Based on PRS Aggregation

#### 10.1.X1.1 Introduction

#### 10.1.X1.2 Measurement Accuracy Requirements

##### 10.1.X1.2.1 Absolute PRS RSRPP accuracy

#### 10.1.X1.3 Report mapping

##### 10.1.X1.3.1 Absolute PRS-RSRPP Measurement Report Mapping

##### 10.1.X1.3.2 Differential Report Mapping for PRS-RSRPP Measurement

### 10.1.Y1 DL-RSCPD Measurement

#### 10.1.Y1.1 Introduction

The requirements in Clause 10.1.Y1 shall apply, provided the UE has received *NR-DL-TDOA-RequestLocationInformation* message with *nr-DL-PRS-RSCPD-Request* from LMF via LPP [34] requesting the UE to measure and report DL RSCPD measurement together with DL RSTD measurements defined in TS 38.215 [4]. The requirements in Clause 10.1.Y1 shall apply:

- when UE is in RRC\_CONNECTED state and the measurement is performed with MG,

- when UE is in RRC\_IDLE or RRC\_INACTIVE state.

#### 10.1.Y1.2 Measurement Accuracy Requirements

The accuracy requirements for DL RSCPD measurement are based on single measurement sample in single PFL and shall be within ±(X+Y) degree.

The accuracy requirements for DL RSTD are contained in clause 10.1.23.2.

The requirements in this clause are derived based on AWGN channel and based on two-tap channel defined in 38.101-4 Annex B.2.4 (a = 1, τd=0.45 µs and fD=5 Hz).

X is defined in Tables 10.1.Y1.2-1 for AWGN channel for FR1, provided that the following conditions are met.

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

- Conditions for DL RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE does not perform DL RSTD measurement with reduced number of samples.

X is defined in Tables 10.1.Y1.2-2 for AWGN channel and Table 10.1.Y1.2-3 for two-tap channel for FR1, provided that the following conditions are met.

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

- Conditions for DL RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE performs DL RSTD measurement with reduced number of samples.

X is defined in Table 10.1.Y1.2-4 for AWGN channel for FR2, provided that the following conditions are met.

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

- Conditions for DL RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE does not perform DL RSTD measurement with reduced number of samples.

X is defined in Tables 10.1.Y1.2-5 for AWGN channel and Table 10.1.Y1.2-6 for two-tap channel for FR2, provided that the following conditions are met.

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

- Conditions for DL RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE performs DL RSTD measurement with reduced number of samples.

Y is defined in Table 10.1.Y1.2-7 for FR1 and Table 10.1.Y1.2-8 for FR2, respectively and specifies the margin caused by impairments.

Table 10.1.Y1.2-1: DL RSCPD absolute accuracy in FR1 for AWGN channel

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition ()  Note 2 | Io Note 3 range | | |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| degree | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| [TBD] | (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 |
| [TBD] | ≥ 52 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 104 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | 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 |
| [TBD] | ≥ 48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 132 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | 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 |
| [TBD] | ≥ 64 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 132 | ≥ 1 | Note 5 | 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: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS. | | | | | | | |

Table 10.1.Y1.2-2: DL RSCPD absolute accuracy in FR1 for AWGN channel with reduced number of samples for DL RSTD

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| degree | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| [TBD] | (PRS Ês/Iot)ref ≥ -3dB  (PRS Ês/Iot)*i* ≥  -6dB | 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 |
| [TBD] | ≥ 52 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 104 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | 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 |
| [TBD] | ≥ 48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 132 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | 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 |
| [TBD] | ≥ 64 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 132 | ≥ 1 | Note 5 | 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: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS. | | | | | | | |

Table 10.1.Y1.2-3: DL RSCPD absolute accuracy in FR1 for two-tap channel with reduced number of samples for DL RSTD

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |
| degree | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| [TBD] | (PRS Ês/Iot)ref ≥ -3dB  (PRS Ês/Iot)*i* ≥  -6dB | 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 |
| [TBD] | ≥ 52 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 104 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | 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 |
| [TBD] | ≥ 48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 132 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | 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 |
| [TBD] | ≥ 64 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| [TBD] | ≥ 132 | ≥ 1 | Note 5 | 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: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS. | | | | | | | |

Table 10.1.Y1.2-4: DL RSCPD absolute accuracy in FR2 for AWGN channel

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| degree | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| [TBD] | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 24 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [TBD] | ≥ 64 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | ≥ 132 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | 120 | ≥ 32 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [TBD] | ≥ 64 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | ≥ 128 | ≥ 1 | Note 4 | Note 4 |
| 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS. | | | | | | |

Table 10.1.Y1.2-5: DL RSCPD absolute accuracy in FR2 for AWGN channel with reduced number of samples for DL RSTD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| degree | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| [TBD] | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 60 | ≥ 24 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [TBD] | ≥ 64 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | ≥ 132 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | 120 | ≥ 32 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [TBD] | ≥ 64 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | ≥ 128 | ≥ 1 | Note 4 | Note 4 |
| 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS. | | | | | | |

Table 10.1.Y1.2-6: DL RSCPD absolute accuracy in FR2 for two-tap channel with reduced number of samples for DL RSTD

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | PRS SCS | PRS bandwidth  Note 1 | PRS resource repetition  () Note 2 | Io Note 3 range | |
| Minimum Io | Maximum Io |
| degree | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| [TBD] | (PRS Ês/Iot)ref ≥-3dB  (PRS Ês/Iot)*i* ≥-6dB | 60 | ≥ 24 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [TBD] | ≥ 64 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | ≥ 132 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | 120 | ≥ 32 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [TBD] | ≥ 64 | ≥ 1 | Note 4 | Note 4 |
| [TBD] | ≥ 128 | ≥ 1 | Note 4 | Note 4 |
| 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS. | | | | | | |

Table 10.1.Y1.2-7: Margin for DL RSCPD measurement accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| PRS BW (RB number) | | | Margin (degree) |
| SCS=15kHz | SCS=30kHz | SCS=60kHz |
| ≥ 24 | N/A | N/A | [TBD] |
| ≥ 52 | ≥ 24 | N/A | [TBD] |
| ≥ 104 | ≥ 48 | ≥ 24 | [TBD] |
| N/A | ≥ 132 | ≥ 64 | [TBD] |
| N/A | N/A | ≥ 132 | [TBD] |

Table 10.1.Y1.2-8: Margin for DL RSCPD measurement accuracy in FR2

|  |  |  |
| --- | --- | --- |
| PRS BW (RB number) | | Margin (degree) |
| SCS=60kHz | SCS=120kHz |
| ≥ 24 | N/A | [TBD] |
| ≥ 64 | ≥ 32 | [TBD] |
| ≥ 132 | ≥ 64 | [TBD] |
| N/A | ≥ 128 | [TBD] |

#### 10.1.Y1.3 Report Mapping

##### 10.1.Y1.3.1 Absolute DL RSCPD Measurement Reporting

The reporting range of DL RSCPD, as defined in Clause 5.1.43 of TS 38.215 [4], is defined from -180 degree to +180 degree. The reporting resolution is 0.1 degree.

The mapping of DL RSCPD measured quantity is defined in Table 10.1.Y1.3.1-1.

Table 10.1.Y1.3.1-1: DL RSCPD measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value (DL RSCPD) | Unit |
| DL\_RSCPD\_0 | -180 ≤ DL RSCPD < -179.9 | degree |
| DL\_RSCPD\_1 | -179.9 ≤ DL RSCPD < -179.8 | degree |
| DL\_RSCPD\_2 | -179.8 ≤ DL RSCPD < -179.7 | degree |
| … | … | … |
| DL\_RSCPD\_1798 | -0.2 ≤ DL RSCPD < -0.1 | degree |
| DL\_RSCPD\_1799 | -0.1 ≤ DL RSCPD < 0 | degree |
| DL\_RSCPD\_1800 | 0 ≤ DL RSCPD < 0.1 | degree |
| DL\_RSCPD\_1801 | 0.1 ≤ DL RSCPD < 0.2 | degree |
| DL\_RSCPD\_1802 | 0.2 ≤ DL RSCPD < 0.3 | degree |
| … | … | … |
| DL\_RSCPD\_3598 | 179.8 ≤ DL RSCPD < 179.9 | degree |
| DL\_RSCPD\_3599 | 179.9 ≤ DL RSCPD < 180 | degree |

### 10.1.Z1 DL-RSCP Measurement

#### 10.1.Z1.1 Introduction

The requirements in Clause 10.1.Z1 shall apply, provided the UE has received *NR-Multi-RTT-RequestLocationInformation* message with *nr-DL-PRS-RSCP-Request* from LMF via LPP [34] requesting the UE to measure and report DL RSCP measurement together with UE Rx-Tx time difference measurements defined in TS 38.215 [4]. The requirements in Clause 10.1.Z1 shall apply:

- when UE is in RRC\_CONNECTED state and the measurement is performed with MG,

- when UE is in RRC\_INACTIVE state.

#### 10.1.Z1.2 Measurement Accuracy Requirements

The relative accuracy of DL RSCP measurement in this clause is defined as accuracy of the difference between two DL RSCP measurements, each based on single measurement sample in single PFL.

The accuracy requirements for UE Rx-Tx are contained in clause 10.1.25.2.

The requirements in this clause are derived based on AWGN channel and based on two-tap channel defined in 38.101-4 Annex B.2.4 (a = 1, τd=0.45 µs and fD=5 Hz).

The DL RSCP relative measurement accuracy requirements in this clause shall not apply, if:

* NTA\_offset defined in Table 7.1.2-2 changes during the DL RSCP with UE Rx-Tx measurement period or
* if the uplink transmission timing changes during the DL RSCP with UE Rx-Tx measurement period due to the network-configured Timing Advance.

The DL RSCP relative 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 DL RSCP with UE Rx-Tx measurement period due to the autonomous timing adjustment defined in clause 7.1.2 then:

- DL RSCP and UE Rx-Tx measurement accuracy requirements shall apply for a cell, which is also the downlink reference cell (defined in section 7.1.1) for SRS transmission.

- UE Rx-Tx measurement accuracy requirements shall not apply for a cell, which is not the downlink reference cell (defined in section 7.1.1) for SRS transmission.

When a serving cell change occurs during the DL RSCP with UE Rx-Tx measurement period, UE Rx-Tx measurement accuracy requirements and DL RSCP measurement requirements do not apply.

The relative accuracy requirements in Table 10.1.Z1.2-1 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.
* UE does not perform UE Rx-Tx measurement with reduced number of samples.
* AWGN propagation condition.

The relative accuracy requirements in Table 10.1.Z1.2-2 for FR1 are valid under the following conditions:

* Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.
* PRP|dBm according to Annex B.2.14 for a corresponding Band.
* UE performs UE Rx-Tx measurement with reduced number of samples.
* AWGN propagation condition.

The relative accuracy requirements in Table 10.1.Z1.2-3 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.
* UE performs UE Rx-Tx measurement with reduced number of samples.
* Two-tap channel propagation condition.

The relative accuracy requirements in Table 10.1.Z1.2-4 for FR2 are valid under the following conditions:

* Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.
* PRP|dBm according to Annex B.2.14 for a corresponding Band.
* UE does not perform UE Rx-Tx measurement with reduced number of samples.
* AWGN propagation condition.

The relative accuracy requirements in Table 10.1.Z1.2-5 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.
* UE performs UE Rx-Tx measurement with reduced number of samples.
* AWGN propagation condition.

The relative accuracy requirements in Table 10.1.Z1.2-6 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.
* UE performs UE Rx-Tx measurement with reduced number of samples.
* Two-tap channel propagation condition.

**Table 10.1.Z1.2-1: DL RSCP relative 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** |
| **degree** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| [TBD]+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 |  |
| [TBD]+δ | ≥52 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | >104 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+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 |
| [TBD]+δ | ≥48 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥132 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+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 |
| [TBD]+δ | ≥ 64 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥ 132 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | -13 | ≥24 | 15 | ≥4 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥52 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | >104 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥24 | 30 | ≥4 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥48 | 60 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥132 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥24 | ≥4 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥ 64 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | ≥ 132 | ≥1 | 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: 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from Table 10.1.Z1.2-7. | | | | | | | |

Table 10.1.Z1.2-2: DL RSCP relative measurement accuracy in FR1 in AWGN with reduced number of samples for UE Rx-Tx time difference

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |
| **degree** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| [TBD]+δ | 0 | ≥52 | 15 | ≥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 |
| [TBD]+δ |  |  |  |  | NR\_FDD\_FR1\_N | -120.5 | -50 |
| [TBD]+δ |  | >104 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥48 | 30 | ≥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 |
| [TBD]+δ |  |  |  |  | NR\_FDD\_FR1\_N | -117.5 | -50 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 | 60 | ≥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 |
| [TBD]+δ |  |  |  |  | NR\_FDD\_FR1\_N | -114.5 | -50 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | -6 | ≥52 | 15 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | >104 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥48 | 30 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 | 60 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | 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: 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from Table 10.1.Z1.2-7. | | | | | | | |

Table 10.1.Z1.2-3: DL RSCP relative measurement accuracy in FR1 in two-tap channel with reduced number of samples for UE Rx-Tx time difference

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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** |
| **degree** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| [TBD]+δ | 0 | ≥52 | 15 | ≥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 |
| [TBD]+δ |  |  |  |  | NR\_FDD\_FR1\_N | -120.5 | -50 |
| [TBD]+δ |  | >104 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥48 | 30 | ≥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 |
| [TBD]+δ |  |  |  |  | NR\_FDD\_FR1\_N | -117.5 | -50 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 | 60 | ≥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 |
| [TBD]+δ |  |  |  |  | NR\_FDD\_FR1\_N | -114.5 | -50 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ | -6 | ≥52 | 15 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | >104 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥48 | 30 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 | 60 | ≥1 | Note 5 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | 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: 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from Table 10.1.Z1.2-7. | | | | | | | |

**Table 10.1.Z1.2-4: DL RSCP relative measurement accuracy in FR2 in AWGN**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **degree** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| [TBD]+δ | -3 | ≥24 | 60 | ≥4 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [TBD]+δ |  | ≥64 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ | ≥32 | 120 | ≥4 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| [TBD]+δ |  | ≥64 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥128 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ | -13 | ≥24 | 60 | ≥4 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ | ≥32 | 120 | ≥4 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥128 |  | ≥1 | 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: 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from Table 10.1.Z1.2-8. | | | | | | |

Table 10.1.Z1.2-5: DL RSCP relative measurement accuracy in FR2 in AWGN with reduced number of samples for UE Rx-Tx time difference

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **degree** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| [TBD]+δ | 0 | ≥64 | 60 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 | 120 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | Note 5 |
| [TBD]+δ |  | ≥128 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ | -6 | ≥64 | 60 | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 | 120 | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥128 |  | ≥1 | 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: are configured by higher layer parameter dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeNdefined 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from Table 10.1.Z1.2-8. | | | | | | |

Table 10.1.Z1.2-6: DL RSCP relative measurement accuracy in FR2 in two-tap channel with reduced number of samples for UE Rx-Tx time difference

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **degree** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| [TBD]+δ | 0 | ≥64 | 60 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 | 120 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | Note 5 |
| [TBD]+δ |  | ≥128 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ | -6 | ≥64 | 60 | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥132 |  | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥64 | 120 | ≥1 | Note 5 | Note 5 |
| [TBD]+δ |  | ≥128 |  | ≥1 | 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: are configured by higher layer parameter dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeNdefined 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: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from Table 10.1.Z1.2-8. | | | | | | |

Table 10.1.Z1.2-7: Margin for relative DL RSCP measurement accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| PRS BW (RB number) | | | Margin (degree) |
| SCS=15kHz | SCS=30kHz | SCS=60kHz |
| ≥ 24 | N/A | N/A | [TBD] |
| ≥ 52 | ≥ 24 | N/A | [TBD] |
| ≥ 104 | ≥ 48 | ≥ 24 | [TBD] |
| N/A | ≥ 132 | ≥ 64 | [TBD] |
| N/A | N/A | ≥ 132 | [TBD] |

Table 10.1.Z1.2-8: Margin for relative DL RSCP measurement accuracy in FR2

|  |  |  |
| --- | --- | --- |
| PRS BW (RB number) | | Margin (degree) |
| SCS=60kHz | SCS=120kHz |
| ≥ 24 | N/A | [TBD] |
| ≥ 64 | ≥ 32 | [TBD] |
| ≥ 132 | ≥ 64 | [TBD] |
| N/A | ≥ 128 | [TBD] |

#### 10.1.Z1.3 Report Mapping

Relative DL RSCP measurement reporting in clause 10.1.Z1.3.1 applies, regardless of samples used to measure PRS, to report:

- gap-based DL RSCP measurement,

- DL RSCP in RRC\_INACTIVE state.

##### 10.1.Z1.3.1 Relative DL RSCP Measurement Reporting

The reporting range of relative DL RSCP, as defined in Clause 5.1.42 of TS 38.215 [4], is defined from 0 degree to 360 degree. The reporting resolution is 0.1 degree.

The mapping of DL RSCP measured quantity is defined in Table 10.1.Z1.3.1-1.

Table 10.1.Z1.3.1-1: DL RSCP measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value (DL RSCP) | Unit |
| DL\_RSCP\_0 | 0 ≤ DL RSCP < 0.1 | degree |
| DL\_RSCP\_1 | 0.1 ≤ DL RSCP < 0.2 | degree |
| DL\_RSCP\_2 | 0.2 ≤ DL RSCP < 0.3 | degree |
| … | … | … |
| DL\_RSCP\_1798 | 179.8 ≤ DL RSCP < 179.9 | degree |
| DL\_RSCP\_1799 | 179.9 ≤ DL RSCP < 180 | degree |
| DL\_RSCP\_1800 | 180 ≤ DL RSCP < 180.1 | degree |
| DL\_RSCP\_1801 | 180.1 ≤ DL RSCP < 180.2 | degree |
| DL\_RSCP\_1802 | 180.2 ≤ DL RSCP < 180.3 | degree |
| … | … | … |
| DL\_RSCP\_3598 | 359.8 ≤ DL RSCP < 359.9 | degree |
| DL\_RSCP\_3599 | 359.9 ≤ DL RSCP < 360 | degree |

**--- unchanged clauses ---**

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

#### 10.1A.X.1 Introduction

The requirements in Clause 10.1A.X 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.X 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.X are valid under the conditions defined in 10.1.23.

#### 10.1A.X.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. 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.X.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.X.2.1-1 in FR1 for AWGN, and in Table 10.1A.X.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.X.2.1-3 in FR1 for AWGN.

Table 10.1A.X.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 | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (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 |
| TBD | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 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 |
|  | 30 | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 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 RB number for the corresponding SCS. | | | | | | | |

Table 10.1A.X.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 | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (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 |
| TBD | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 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 |
| TBD | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 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 RB number for the corresponding SCS. | | | | | | | |

Table 10.1A.X.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 | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (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 |
| TBD | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 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 RB number for the corresponding SCS. | | | | | | | |

##### 10.1A.X.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.X.2.2-1 in FR1 for AWGN, 10.1A.X.2.2-2 in FR2 for AWGN, 10.1A.X.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.X.2.2-5 in FR1 for AWGN, and 10.1A.X.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.X.2.2-7 in FR1 for AWGN, and 10.1A.X.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.X.2.2-9 in FR1 for AWGN.

Table 10.1A.X.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 | RB | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | [≥ 24] | [268] | ≥ 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 |
| TBD | [≥ 52] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | [≥ 104] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | [≥ 24] | [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 |
| TBD | [≥ 52] | [272] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 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 RB 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.X.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 | RB | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | [≥ 24] | [264] | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| TBD | [≥ 64] | ≥ 1 | Note 5 | Note 5 |
| TBD | [≥ 132] | ≥ 1 | Note 5 | Note 5 |
| TBD | 120 | [≥ 32] | [264] | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| TBD | [≥ 64] | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | |

Table 10.1A.X.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 | RB | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 15 | [≥ 24] | [268] | ≥ 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 |
| TBD | [≥ 52] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | [≥ 104] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | [≥ 24] | [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 |
| TBD | [≥ 52] | [272] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 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 RB 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.X.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 | RB | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-13dB | 60 | [≥ 24] | [264] | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| TBD | [≥ 64] | ≥ 1 | Note 5 | Note 5 |
| TBD | [≥ 132] | ≥ 1 | Note 5 | Note 5 |
| TBD | 120 | [≥ 32] | [264] | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| TBD | [≥ 64] | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 6: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | |

Table 10.1A.X.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 | RB | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (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 |
| TBD | [≥ 104] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | [≥ 52] | [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 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | | |

Table 10.1A.X.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 | RB | RB |  | dBm/SCS | dBm/BWChannel |
| TBD | (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 |
| TBD | [≥ 132] | [264] | ≥ 1 | Note 5 | Note 5 |
| TBD | 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 RB 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.X.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 | RB | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-10dB | 15 | [≥ 24] | [268] | ≥ 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 |
| TBD | [≥ 52] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | [≥ 104] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | [≥ 24] | [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 |
| TBD | 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 RB 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.X.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 | RB | MHz |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (PRS Ês/Iot)ref ≥-6dB  (PRS Ês/Iot)*i* ≥-10dB | 15 | [≥ 24] | [268] | ≥ 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 |
| TBD | ≥ 52 | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | [≥ 104] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | [≥ 24] | [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 |
| TBD | [≥ 52] | [272] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 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 RB 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.X.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 | RB | MHz |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (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 |
| TBD | [≥ 104] | [268] | ≥ 1 | Note 6 | Note 6 | Note 6 |
| TBD | 30 | [≥ 52] | [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 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.  NOTE 3: Io is assumed to have constant EPRE across the bandwidth.  NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: Total PRS bandwidth after all hops regardless of the size of the overlapping bandwidth between hops. | | | | | | | | |

#### 10.1A.X.3 Report Mapping

##### 10.1A.X.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.X.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.X.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.

### 10.1A.Y PRS-RSRP Measurements for RedCap positioning

#### 10.1A.Y.1 Introduction

The requirements in Clause 10.1A.Y shall apply, provided the UE has received *nr-DL-TDOA-RequestLocationInformation* or *nr-Multi-RTT-RequestLocationInformation* or *nr-DL-AoD-RequestLocationInformation* message from LMF via LPP [34] requesting the UE to report one or more DL PRS-RSRP measurements defined in TS 38.215 [4].

The requirements in Clause 10.1A.Y shall apply,

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

The requirements defined in Clause 10.1A.Y are valid under the conditions defined in Clause 10.1.24.1.

#### 10.1A.Y.2 Measurement Accuracy Requirements

##### 10.1A.Y.2.1 Absolute PRS RSRP Accuracy Requirement

Accuracy requirement, corresponding to the PRS bandwidth supported by the RedCap UE for measurement without RX FH, defined in Clause 10.1.24.2.1 apply to the PRS-RSRP measurement performed by 2Rx RedCap UE without RX FH.

Accuracy requirement in Clause 10.1.24.2.1 apply to the PRS-RSRP measurement performed by 2Rx RedCap UE with RX FH, where the PRS bandwidth in Clause 10.1.24.2.1 correspond to the PRS bandwidth measured by the RedCap UE per hop.

Accuracy requirement in Table 10.1A.Y.2.1-1 applies to the 4-sample PRS-RSRP measurement performed by 1Rx RedCap UE without RX FH.

Accuracy requirement in Table 10.1A.Y.2.1-2 applies to reduced sample PRS-RSRP measurement performed by 1Rx RedCap UE without RX FH

Accuracy requirement in Table 10.1A.Y.2.1-1 and Table 10.1A.Y.2.1-2 apply to the PRS-RSRP measurement performed by 1Rx RedCap UE with RX FH, where the PRS bandwidth in Table 10.1A.Y.2.1-1 and Table 10.1A.Y.2.1-2 correspond to the PRS bandwidth measured by the RedCap UE per hop.

Table 10.1A.Y.2.1-1: PRS-RSRP absolute accuracy for 1Rx RedCap UE in FR1 (without RX FH).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | | |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BWNote 2 | Repetition factor  ( | Io Note 5 range | | | | |
| NR operating band groups Note 6 | Minimum Io Note 1  dBm / SCSPRS | | | Maximum Io |
| dB | dB | dB | PRB | - |  | dBm / SCSPRS | | | dBm/BWChannel |
| dBm/15kHz Note 4 | dBm/30kHz Note 4 | dBm/60kHz Note 4 |
| [±TBD] | [±TBD] | ≥-3dB | ≥24 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -117.5 | -114.5 | -50 |
| [±TBD] | [±TBD] | ≥-10dB | 24 ≤ BW ≤ 52 | All | Note 3 | | | | |
| [±TBD] | [±TBD] | 52< BW≤ 104 | All | Note 3 | | | | |
| [±TBD] | [±TBD] | BW >104 | All | Note 3 | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.  NOTE 4: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 5: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 6: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

Table 10.1A.Y.2.1-2: PRS-RSRP absolute accuracy for 1Rx RedCap UE in FR1 with reduced sample number (without RX FH).

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BWNote 2** | **Repetition factor**  **(** | **Io Note 6 range** | | | | | |
| **NR operating band groups Note 5** | **Minimum Io Note 1**  **dBm / SCSPRS** | | | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | **dBm / SCSPRS** | | | | **dBm/BWChannel** |
| **dBm/15kHz Note 4** | | **dBm/30kHz Note 4** | **dBm/60kHz Note 4** |
| [±TBD] | [±TBD] | ≥0 | ≥48 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | | -117.5 | -50 |
|  |  |  |  |  | NR\_FDD\_FR1\_N | -120.5 | -117.5 | | -114.5 | -50 |
| [±TBD] | [±TBD] | ≥-6 | 48 ≤ BW ≤ 52 | All | Note 3 | | | | | |
| [±TBD] | [±TBD] | 52< BW≤ 104 | All | Note 3 | | | | | |
| [±TBD] | [±TBD] | BW >104 | All | Note 3 | | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.  NOTE 4: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 5: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | | |

##### 10.1A.Y.2.2 Relative PRS RSRP Accuracy Requirement

Relative accuracy requirement, corresponding to the PRS bandwidth supported by the RedCap UE for measurement without RX FH, defined in Clause 10.1.24.2.2 apply to the PRS-RSRP measurement performed by 2Rx RedCap UE without RX FH.

Relative accuracy requirement in Clause 10.1.24.2.2 apply to the PRS-RSRP measurement performed by 2Rx RedCap UE with RX FH, where the PRS bandwidth in Clause 10.1.24.2.2 correspond to the PRS bandwidth measured by the RedCap UE per hop.

Relative accuracy requirement in Table 10.1A.Y.2.2-1 applies to the 4-sample PRS-RSRP measurement performed by 1Rx RedCap UE without RX FH.

Relative accuracy requirement in Table 10.1A.Y.2.2-2 applies to reduced sample PRS-RSRP measurement performed by 1Rx RedCap UE without RX FH

Relative accuracy requirement in Table 10.1A.Y.2.2-1 and Table 10.1A.Y.2.2-2 apply to the PRS-RSRP measurement performed by 1Rx RedCap UE with RX FH, where the PRS bandwidth in Table 10.1A.Y.2.1-1 and Table 10.1A.Y.2.1-2 correspond to the PRS bandwidth measured by the RedCap UE per hop.

Table 10.1A.Y.2.2-1: PRS-RSRP relative accuracy for 1Rx RedCap UE in FR1 (without RX FH).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | | |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BWNote 2 | Repetition factor  ( | Io Note 5 range | | | | |
| NR operating band groups Note 6 | Minimum Io Note 1  dBm / SCSPRS | | | Maximum Io |
| dB | dB | dB | PRB | - |  | dBm / SCSPRS | | | dBm/BWChannel |
| dBm/15kHz Note 4 | dBm/30kHz Note 4 | dBm/60kHz Note 4 |
| [±TBD] | [±TBD] | ≥-3dB | ≥24 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -117.5 | -114.5 | -50 |
| [±TBD] | [±TBD] | ≥-10dB | 24 ≤ BW ≤ 52 | All | Note 3 | | | | |
| [±TBD] | [±TBD] | 52< BW≤ 104 | All | Note 3 | | | | |
| [±TBD] | [±TBD] | BW >104 | All | Note 3 | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.  NOTE 4: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 5: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 6: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

Table 10.1A.Y.2.2-2: PRS-RSRP relative accuracy for 1Rx RedCap UE in FR1 with reduced sample number (without RX FH).

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | | **Conditions** | | | | | | | |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BWNote 2** | **Repetition factor**  **(** | **Io Note 5 range** | | | | |
| **NR operating band groups Note 6** | **Minimum Io Note 1**  **dBm / SCSPRS** | | | **Maximum Io** |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | **dBm / SCSPRS** | | | **dBm/BWChannel** |
| **dBm/15kHz Note 4** | **dBm/30kHz Note 4** | **dBm/60kHz Note 4** |
| [±TBD] | [±TBD] | ≥0 | ≥48 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
|  |  |  |  |  | NR\_FDD\_FR1\_N | -120.5 | -117.5 | -114.5 | -50 |
| [±TBD] | [±TBD] | ≥-6 | 48 ≤ BW ≤ 52 | All | Note 3 | | | | |
| [±TBD] | [±TBD] | 52< BW≤ 104 | All | Note 3 | | | | |
| [±TBD] | [±TBD] | BW >104 | All | Note 3 | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.  NOTE 4: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 5: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 6: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

#### 10.1A.Y.3 Report Mapping

##### 10.1A.Y.3.1 Absolute PRS-RSRP Measurement Report Mapping

Measurement reporting range and report mapping tables defined in Clause 10.1.24.3.1 apply to PRS-RSRP measurement reporting for both 1Rx and 2Rx RedCap UEs and PRS-RSRP measurement performed with and without

##### 10.1A.Y.3.2 Differential Report Mapping for PRS-RSRP Measurement

Measurement reporting range and report mapping tables defined in Clause 10.1.24.3.2 apply to PRS-RSRP measurement reporting for both 1Rx and 2Rx RedCap UEs and PRS-RSRP measurement performed with and without RX FH.

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

#### 10.1A.Z.1 Introduction

The requirements in Clause 10.1A.Z 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.Z shall apply:

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

- when UE is in RRC\_INACTIVE state.

#### 10.1A.Z.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.Z.2.1 UE Rx-Tx Accuracy Requirement for 2RX RedCap UE without FH

The accuracy requirements in Table 10.1A.Z.2.1-1 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.x.y for a corresponding Band.

- AWGN propagation condition.

Table 10.1A.Z.2.1-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Accuracy** | **Conditions** | | | | | | |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetition Note 3** | **NR operating band groupsNote 2** | **IoNote 4 range** | |
| **Minimum IoNote 1** | **Maximum Io** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± 78+δ | -3 | ≥24 | 15 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -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 |
| ± [59]+δ | ≥[52] | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [30]+δ | [104] | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 57+δ | ≥24 | 30 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,  NR\_SDL\_FR1\_A | -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 |
| ± [30]+δ | [48] | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [29]+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 |
| ± 101+δ | -13 | ≥24 | 15 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [75]+δ | ≥[52] | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [37]+δ | [104] | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 58+δ | ≥24 | 30 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [39]+δ | [48] | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [36]+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 RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1A.Z.2.1-5. | | | | | | | |

The accuracy requirements in Table 10.1A.Z.2.1-1a 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.x.y for a corresponding Band.

- Number of measurement samples is less than 4

- AWGN propagation condition.

Table 10.1A.Z.2.1-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetition Note 3 | NR operating band groupsNote 2 | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | RB | kHz |  |  | dBm / SCSPRS | dBm/BW |
| ± 59+δ | 0 | ≥52 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [30]+δ | [104] | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [30]+δ | [48] | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 75+δ | -6 | ≥52 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [37]+δ | [104] | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± [39]+δ | [48] | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table 10.1A.Z.2.1-1.  NOTE 7: δ is the margin determined from Table 10.1A.Z.2.1-5. | | | | | | | |

The relative accuracy requirements in Table 10.1A.Z.2.1-1b 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.Z.2.1-1b: UE Rx-Tx time difference relative measurement accuracy in FR1 in AWGN with TEG reporting

TBA

The accuracy requirements in Table 10.1A.Z.2.1-2 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.Z.2.1-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading

TBA

The accuracy requirements in Table 10.1A.Z.2.1-3 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.x.y for a corresponding Band.

- AWGN propagation condition.

Table 10.1A.Z.2.1-3: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetitionNote 3 | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± 22+δ | -3 | ≥24 | 60 | ≥4 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± 15+δ | ≥64 | ≥1 | NOTE 6 | NOTE 6 |
| ± [7]+δ | [132] | ≥1 | NOTE 6 | NOTE 6 |
| ± 12+δ | ≥32 | 120 | ≥4 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± [7]+δ | [64] | ≥1 | NOTE 6 | NOTE 6 |
| ± 35+δ | -13 | ≥24 | 60 | ≥4 | NOTE 6 | NOTE 6 |
| ± 15+δ | ≥64 | ≥1 | NOTE 6 | NOTE 6 |
| ± [7]+δ | [132] | ≥1 | NOTE 6 | NOTE 6 |
| ± 14+δ | ≥32 | 120 | ≥4 | NOTE 6 | NOTE 6 |
| ± [9]+δ | [64] | ≥1 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN*defined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.  NOTE 7: δ is the margin determined from Table 10.1A.Z.2.1-6. | | | | | | |

The accuracy requirements in Table 10.1A.Z.2.1-3a 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.x.y for a corresponding Band.

- Number of measurement samples is less than 4

- AWGN propagation condition.

Table 10.1A.Z.2.1-3a: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN with reduced measurement samples

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetitionNote 3 | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 5 | dB | RB | kHz |  | dBm / SCSPRS | dBm/BWChannel |
| ± 15+δ | 0 | ≥64 | 60 | ≥1 | NOTE 6 | NOTE 6 |
| ± [7]+δ | [132] | ≥1 | NOTE 6 | NOTE 6 |
| ± [7]+δ | [64] | 120 | ≥1 | NOTE 6 | NOTE 6 |
| ± 15+δ | -6 | ≥64 | 60 | ≥1 | NOTE 6 | NOTE 6 |
| ± 7+δ | [132] | ≥1 | NOTE 6 | NOTE 6 |
| ± 9+δ | [64] | 120 | ≥1 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: NR operating band groups are as defined in Section 3.5.  NOTE 3: are configured by higher layer parameter dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeNdefined in TS 37.355 [34].  NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.  NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS as defined in Table 10.1A.Z.2.1-3.  NOTE 7: δ is the margin determined from Table 10.1.25.2-6. | | | | | | |

The relative accuracy requirements in Table 10.1A.Z.2.1-3b 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.x.y 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.Z.2.1-3b: UE Rx-Tx time difference relative measurement accuracy in FR2 in AWGN with TEG reporting

TBA

The accuracy requirements in Table 10.1A.Z.2.1-4 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.x.y for a corresponding Band.

- Fading propagation condition.

Table 10.1A.Z.2.1-4: UE Rx-Tx time difference measurement accuracy in FR2 in fading

TBA

Table 10.1A.Z.2.1-5: Margin for UE Rx-Tx time difference measurement accuracy in FR1

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

Table 10.1A.Z.2.1-6: Margin for UE Rx-Tx time difference measurement accuracy in FR2

|  |  |  |
| --- | --- | --- |
| Min(PRS BW, SRS BW) (MHz) | | Margin (Tc Note 1) |
| SCS = 60 kHz | SCS = 120 kHz |
| ≥ 24 | N/A | [76] |
| ≥ 64 | ≥ 32 | [32] |
| [132] | [64] | [24] |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].  NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies. | | |

##### 10.1A.Z.2.2 UE Rx-Tx Accuracy Requirement for 1RX RedCap UE without FH

The accuracy requirements in Table 10.1A.Z.2.2.2.2-1 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.x.y for a corresponding Band.

- AWGN propagation condition.

**Table 10.1A.Z.2.2.2.2-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN**

**TBA**

The accuracy requirements in Table 10.1A.Z.2.2.2.2-1a 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.x.y for a corresponding Band.

- Number of measurement samples is less than 4

- AWGN propagation condition.

**Table 10.1A.Z.2.2.2.2-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples**

**TBA**

The relative accuracy requirements in Table 10.1A.Z.2.2.2.2-1b 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.Z.2.2.2.2-1b: UE Rx-Tx time difference relative measurement accuracy in FR1 in AWGN with TEG reporting**

**TBA**

The accuracy requirements in Table 10.1A.Z.2.2.2.2-2 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.Z.2.2.2.2-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading**

**TBA**

**Table 10.1A.Z.2.2.2.2-5: Margin for UE Rx-Tx time difference measurement accuracy in FR1**

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

##### 10.1A.Z.2.3 UE Rx-Tx Accuracy Requirement for 2RX RedCap UE with FH

The accuracy requirements in Table 10.1A.Z.2.3.3-1 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.x.y 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.Z.2.3.3-1: 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** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± TBD+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 |
| ± TBD+δ | ≥[52] | 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 |
| ± TBD+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 |
| ± TBD+δ | -13 | ≥[52] | 15 | [268] | NOTE 5 | NOTE 5 | NOTE 5 |
| ± TBD+δ | ≥[52] | 30 | [272] | NOTE 5 | NOTE 5 | NOTE 5 |
| ± TBD+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 RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from TBD. | | | | | | | |

The accuracy requirements in Table 10.1A.Z.2.3.3-1a 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.x.y 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.Z.2.3.3-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples**

**TBA**

The accuracy requirements in Table 10.1A.Z.2.3.3-2 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.Z.2.3.3-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading**

**TBA**

The accuracy requirements in Table 10.1A.Z.2.3.3-3 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.x.y 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.Z.2.3.3-3: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | Total PRS bandwidth after FH | IoNote 4 range | |
| Minimum IoNote 1 | Maximum Io |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± TBD+δ | -3 | ≥[68] | 60 | [264] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± TBD+δ | ≥[68] | 120 | [264] | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± TBD+δ | -13 | ≥[68] | 60 | [264] | NOTE 5 | NOTE 5 |
| ± TBD+δ | ≥[68] | 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 RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from TBD. | | | | | | |

The accuracy requirements in Table 10.1A.Z.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.x.y 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.Z.2.3.3-3a: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN with reduced measurement samples**

**TBA**

The accuracy requirements in Table 10.1A.Z.2.3.3-4 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.x.y 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.Z.2.3.3-4: UE Rx-Tx time difference measurement accuracy in FR2 in fading**

**TBA**

##### 10.1A.Z.2.4 UE Rx-Tx Accuracy Requirement for 1RX RedCap UE with FH

The accuracy requirements in Table 10.1A.Z.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.x.y for a corresponding Band.

- AWGN propagation condition.

Table 10.1A.Z.2.4-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN

TBA

The accuracy requirements in Table 10.1A.Z.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.x.y for a corresponding Band.

- Number of measurement samples is less than 4

- AWGN propagation condition.

Table 10.1A.Z.2.4-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples

TBA

The accuracy requirements in Table 10.1A.Z.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.Z.2.4-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading

TBA

#### 10.1A.Z.3 Report mapping

##### 10.1A.Z.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.Z.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.Z.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.

### 10.1A.X1 PRS-RSRPP Measurements for RedCap Positioning

#### 10.1A.X1.1 Introduction

The requirements in Clause 10.1A.X1.2 shall apply, provided the RedCap UE has received *nr-DL-AoD-RequestLocationInformation* message from LMF via LPP [34] requesting the RedCap UE to report one or more DL PRS-RSRPP measurements defined in TS 38.215 [4]. The requirements in Clause 10.1A.X1 shall apply:

- when RedCap UE is in RRC\_CONNECTED state,

- when RedCap UE is in RRC\_INACTIVE state,

- when RedCap UE is in RRC\_IDLE state.

The requirements in Clause 10.1A.X1.2 apply for the first path PRS-RSRP measurement.

#### 10.1A.X1.2 Measurement Accuracy Requirements

##### 10.1A.X1.2.1 Absolute PRS RSRPP accuracy

The absolute accuracy requirements for PRS-RSRPP measurements for 1Rx RedCap UE for FR1 defined in Table 10.1A.X1.2.1-1 and Table 10.1A.X1.2.1-2 are valid under the following conditions:

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

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

The absolute accuracy requirements for PRS-RSRPP measurements defined in clause 10.1.38.2.1 are reused for 2Rx RedCap UE.

The absolute accuracy requirements for PRS-RSRPP measurement defined in Table 10.1A.X1.2.1-1 apply for the RedCap UE not supporting *supportedDL-PRS-ProcessingSamples* [34] or LMF does not indicate RedCap UE to perform positioning measurements with reduced number of samples.

The absolute accuracy requirements for PRS-RSRPP measurement defined in Table 10.1A.X1.2.1-2 apply for the RedCap UE supporting *supportedDL-PRS-ProcessingSamples* [34].

The absolute accuracy requirements for PRS-RSRPP measurement defined in this clause apply to the measurements with and without frequency hopping. For the measurements with frequency hopping, the accuracy requirements apply for the corresponding PRS bandwidth per hop.

Note: The requriements in this clause are derived based on two-tap channel defined in 38.101-4 Annex B.2.4 (a = 1, τd=0.45 µs and fD=5 Hz).

Note: The requirements in this clause are derived based on the difference between the estimated PRS-RSRPP compared to the ideal PRS-RSRPP defined as

Where:

is the effective channel frequency response (over REs occupied by PRS) measured without receiver noise.

is the exact delay of the p-th path in the channel model.

Table 10.1A.X1.2.1-1: PRS-RSRPP absolute accuracy for 1Rx RedCap UE for FR1

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | | |
| **Normal condition** | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor  ( | **Io Note 7 range** | | | | |
| NR operating band groups Note 8 | Minimum Io Note 1  dBm / SCSPRS | | | Maximum Io |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | dBm / SCSPRS | | | dBm/BWChannel |
| dBm/15kHz Note 6 | dBm/30kHz Note 6 | dBm/60kHz Note 6 |
| TBD | TBD | ≥-3 | ≥24 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -117.5 | -114.5 | -50 |
| Note 4 | | | | |
| Note 4 | | | | |
| TBD | TBD | ≥-10 | 24 ≤ BW ≤ 52 | All | Note 4 | | | | |
| TBD | TBD | BW > 52 | All | Note 4 | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Void.  NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the DL-TDOA or DL-AoD assistance data defined in [34].  NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.  NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 8: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

Table 10.1A.X1.2.1-2: PRS-RSRPP absolute accuracy for 1Rx RedCap UE for FR1

for reduced number of samples

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | | |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor  ( | Io Note 7 range | | | | |
| NR operating band groups Note 8 | Minimum Io Note 1  dBm / SCSPRS | | | Maximum Io |
| dB | dB | dB | PRB | - |  | dBm / SCSPRS | | | dBm/BWChannel |
| dBm/15kHz Note 6 | dBm/30kHz Note 6 | dBm/60kHz Note 6 |
| TBD | TBD | ≥0 | ≥48 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| NR\_FDD\_FR1\_N | -120.5 | -117.5 | -114.5 | -50 |
| Note 4 | | | | |
| Note 4 | | | | |
| TBD | TBD | ≥-6 | 48 ≤ BW ≤ 52 | All | Note 4 | | | | |
| TBD | TBD | BW >52 | All | Note 4 | | | | |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: Void.  NOTE 3: PRS bandwidth is as indicated in *prs-Bandwidth* in the DL-TDOA or DL-AoD assistance data defined in [34].  NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.  NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.  NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.  NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 8: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | | |

#### 10.1A.X1.3 Report mapping

##### 10.1A.X1.3.1 Absolute PRS-RSRPP Measurement Report Mapping

The absolute PRS-RSRPP measurement report mapping defined in clause 10.1.38.3.1 applies.

##### 10.1A.X1.3.2 Differential Report Mapping for PRS-RSRPP Measurement

The differential report mapping for PRS-RSRPP measurement defined in clause 10.1.38.3.2 applies.

## **--- End of Change #3 ---**

## **--- Start of Change #4 ---**

## 10.4A NR Sidelink Measurements for Positioning

### 10.4A.1 Introduction

The SL measurements for positioning are performed based on SL-PRS. The SL-PRS reception procedure is as described in TS 38.321 [7]. The UE shall monitor PSCCH to receive the associated SL-PRS in the same slot [26].

### 10.4A.2 SL RSTD measurements

#### 10.4A.2.1 Measurement Report Mapping

##### 10.4A.2.1.1 Absolute SL RSTD Measurement Reporting

The reporting range for the SL RSTD measurement is defined from -985024×Tc to 985024×Tc with the resolution step of 2*k*×Tc, where

Tc is defined in TS 38.211 [6],

*kmin*≤*k*≤*kmax*,

*kmin*=2 and *kmax*=5, when configured SL-PRS resource of at least one of the reference cell and neighbor cell measured for the SL RSTD measurement is in FR1.

The measurement report mapping for different *k* values are specified in Tables 10.4A.2.1.1-1 − 10.4A.2.1.1-4.

Table 10.4A.2.1.1-1: Report mapping for *k*=2

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| SL\_RSTD\_i | SL\_RSTD |  |
| SL\_RSTD\_000000 | SL\_RSTD < -985024 | Tc |
| SL\_RSTD\_000001 | -985024 ≤ SL\_RSTD < -985020 | Tc |
| SL\_RSTD\_000002 | -985020 ≤ SL\_RSTD < -985016 | Tc |
| … | … | … |
| SL\_RSTD\_246256 | -4 ≤ SL\_RSTD < 0 | Tc |
| SL\_RSTD\_246257 | 0 ≤ SL\_RSTD < 4 | Tc |
| … | … | … |
| SL\_RSTD\_492511 | 985016 ≤ SL\_RSTD < 985020 | Tc |
| SL\_RSTD\_492512 | 985020 ≤ SL\_RSTD < 985024 | Tc |
| SL\_RSTD\_492513 | 985024 ≤ SL\_RSTD | Tc |

Table 10.4A.2.1.1-2: Report mapping for *k*=3

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value, | Unit |
| SL\_RSTD\_i | SL\_RSTD |  |
| SL\_RSTD\_000000 | SL\_RSTD < -985024 | Tc |
| SL\_RSTD\_000001 | -985024 ≤ SL\_RSTD < -985016 | Tc |
| SL\_RSTD\_000002 | -985016 ≤ SL\_RSTD < -985008 | Tc |
| … | … | … |
| SL\_RSTD\_123128 | -8 ≤ SL\_RSTD < 0 | Tc |
| SL\_RSTD\_123129 | 0 ≤ SL\_RSTD < 8 | Tc |
| … | … | … |
| SL\_RSTD\_246255 | 985008 ≤ SL\_RSTD < 985016 | Tc |
| SL\_RSTD\_246256 | 985016 ≤ SL\_RSTD < 985024 | Tc |
| SL\_RSTD\_246257 | 985024 ≤ SL\_RSTD | Tc |

Table 10.4A.2.1.1-3: Report mapping for *k*=4

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| SL\_RSTD\_i | SL\_RSTD |  |
| SL\_RSTD\_000000 | SL\_RSTD < -985024 | Tc |
| SL\_RSTD\_000001 | -985024 ≤ SL\_RSTD < -985008 | Tc |
| SL\_RSTD\_000002 | -985008 ≤ SL\_RSTD < -984992 | Tc |
| … | … | … |
| SL\_RSTD\_061564 | -16 ≤ SL\_RSTD < 0 | Tc |
| SL\_RSTD\_061565 | 0 ≤ SL\_RSTD < 16 | Tc |
| … | … | … |
| SL\_RSTD\_123127 | 984992 ≤ SL\_RSTD < 985008 | Tc |
| SL\_RSTD\_123128 | 985008 ≤ SL\_RSTD < 985024 | Tc |
| SL\_RSTD\_123129 | 985024 ≤ SL\_RSTD | Tc |

Table 10.4A.2.1.1-4: Report mapping for *k*=5

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value, | Measured Quantity Value, | Unit |
| SL\_RSTD\_i | SL\_RSTD |  |
| SL\_RSTD\_00000 | SL\_RSTD < -985024 | Tc |
| SL\_RSTD\_00001 | -985024 ≤ SL\_RSTD < -984992 | Tc |
| SL\_RSTD\_00002 | -984992 ≤ SL\_RSTD < -984960 | Tc |
| … | … | … |
| SL\_RSTD\_30782 | -32 ≤ SL\_RSTD < 0 | Tc |
| SL\_RSTD\_30783 | 0 ≤ SL\_RSTD < 32 | Tc |
| … | … | … |
| SL\_RSTD\_61563 | 984960 ≤ SL\_RSTD < 984992 | Tc |
| SL\_RSTD\_61564 | 984992 ≤ SL\_RSTD < 985024 | Tc |
| SL\_RSTD\_61565 | 985024 ≤ SL\_RSTD | Tc |

#### 10.4A.2.2 Measurement Accuracy Requirements

The accuracy requirements for SL RSTD measurement shall be within ±(X+Y+Z) Tc, where X, Y, and Z are defined as follows.

X is defined in Table 10.4A.2.2-1 for AWGN channel and Table 10.4A.2.2-2 for fading channel for FR1, provided that the following conditions are met.

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

- Conditions for SL RSTD measurements are fulfilled according to Annex B.4A.1 for a corresponding Band for each relevant SL-PRS resource configured for measurement.

NOTE: The requriements for fading channel in this clause are derived based on TDL-A (30 ns delay spread, 5 Hz) for FR1.

Y=32 Tc, provided that the time offset between the two SL-PRS resource instances from the reference UE and the second anchor UE, which are used for a single SL RSTD estimate, is no greater than 160 ms.

Z is defined in Table 10.4A.2.2-3 for FR1.

Table 10.4A.2.2-1: SL RSTD absolute accuracy in FR1 for AWGN channel

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| SL-PRS Ês/Iot | SL-PRS SCS | SL-PRS bandwidth  Note 1 | Number of samples, S | Io Note 2 range | | |
| NR operating band groups Note 3 | Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (SL-PRS Ês/Iot)ref ≥  0 dB  (SL-PRS Ês/Iot)*i* ≥  -3 dB | 15 | 48 | ≥ 4 | NR\_TDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_J | -122.5 | -50 |
| TBD | >48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| TBD | ≥ 96 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| TBD  TBD | 30 | ≥ 24 | ≥ 4 | NR\_TDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_J | -119.5 | -50 |
| TBD | >48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| TBD | 60 | ≥ 24 | ≥ 4 | NR\_TDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_J | -116.5 | -50 |
| NOTE 1: Minimum SL-PRS bandwidth, which is the minimum of the SL-PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.  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 SL-PRS bandwidth of the smallest PRB number for the corresponding SCS. | | | | | | | |

Table 10.4A.2.2-2: SL RSTD absolute accuracy in FR1 for fading channel

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| SL-PRS Ês/Iot | SL-PRS SCS | SL-PRS bandwidth  Note 1 | Number of samples, S | Io Note 2 range | | |
| NR operating band groups Note 3 | Minimum Io | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| TBD | (SL-PRS Ês/Iot)ref ≥  0 dB  (SL-PRS Ês/Iot)*i* ≥  -3 dB | 15 | 48 | ≥ 4 | NR\_TDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_J | -122.5 | -50 |
| TBD | >48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| TBD | ≥ 96 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| TBD  TBD | 30 | ≥ 24 | ≥ 4 | NR\_TDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_J | -119.5 | -50 |
| TBD | >48 | ≥ 1 | Note 5 | Note 5 | Note 5 |
| TBD | 60 | ≥ 24 | ≥ 4 | NR\_TDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_J | -116.5 | -50 |
| NOTE 1: Minimum SL-PRS bandwidth, which is the minimum of the SL-PRS bandwidths of the reference resource and the measured neighbour resource i.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.  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 SL-PRS bandwidth of the smallest PRB number for the corresponding SCS. | | | | | | | |

Table 10.4A.2.2-3: Margin for SL RSTD measurement accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| PRS BW (RB number) | | | Margin (Tc) |
| SCS=15kHz | SCS=30kHz | SCS=60kHz |
| ≥ 48 | ≥ 24 | N/A | TBD |
| ≥ 96 | ≥ 48 | ≥ 24 | TBD |

### 10.4A.3 SL PRS-RSRP measurements

#### 10.4A.3.1 Measurement Report Mapping

10.4A.3.1.1 Absolute SL PRS-RSRP Measurement Report Mapping

The reporting range of absolute SL PRS-RSRP measurement is defined from -156 dBm to -31 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.4A.3.1.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 10.4A.3.1.1-1: Measurement report mapping for SL PRS-RSRP**

|  |  |  |
| --- | --- | --- |
| **Reported value** | **Measured quantity value** | **Unit** |
| SL\_PRS-RSRP\_0 | SL\_PRS-RSRP<-156 | dBm |
| SL\_PRS-RSRP\_1 | -156≤SL\_PRS-RSRP<-155 | dBm |
| SL\_PRS-RSRP\_2 | -155≤SL\_PRS-RSRP<-154 | dBm |
| SL\_PRS-RSRP\_3 | -154≤SL\_PRS-RSRP<-153 | dBm |
| SL\_PRS-RSRP\_4 | -153≤SL\_PRS-RSRP<-152 | dBm |
| SL\_PRS-RSRP\_5 | -152≤SL\_PRS-RSRP<-151 | dBm |
| SL\_PRS-RSRP\_6 | -151≤SL\_PRS-RSRP<-150 | dBm |
| SL\_PRS-RSRP\_7 | -150≤SL\_PRS-RSRP<-149 | dBm |
| SL\_PRS-RSRP\_8 | -149≤SL\_PRS-RSRP<-148 | dBm |
| SL\_PRS-RSRP\_9 | -148≤SL\_PRS-RSRP<-147 | dBm |
| SL\_PRS-RSRP\_10 | -147≤SL\_PRS-RSRP<-146 | dBm |
| SL\_PRS-RSRP\_11 | -146≤SL\_PRS-RSRP<-145 | dBm |
| SL\_PRS-RSRP\_12 | -145≤SL\_PRS-RSRP<-144 | dBm |
| SL\_PRS-RSRP\_13 | -144≤SL\_PRS-RSRP<-143 | dBm |
| SL\_PRS-RSRP\_14 | -143≤SL\_PRS-RSRP<-142 | dBm |
| SL\_PRS-RSRP\_15 | -142≤SL\_PRS-RSRP<-141 | dBm |
| SL\_PRS-RSRP\_16 | -141≤SL\_PRS-RSRP<-140 | dBm |
| SL\_PRS-RSRP\_17 | -140≤SL\_PRS-RSRP<-139 | dBm |
| SL\_PRS-RSRP\_18 | -139≤SL\_PRS-RSRP<-138 | dBm |
| … | … | … |
| SL\_PRS-RSRP\_111 | -46≤SL\_PRS-RSRP<-45 | dBm |
| SL\_PRS-RSRP\_112 | -45≤SL\_PRS-RSRP<-44 | dBm |
| SL\_PRS-RSRP\_113 | -44≤SL\_PRS-RSRP<-43 | dBm |
| SL\_PRS-RSRP\_114 | -43≤SL\_PRS-RSRP<-42 | dBm |
| SL\_PRS-RSRP\_115 | -42≤SL\_PRS-RSRP<-41 | dBm |
| SL\_PRS-RSRP\_116 | -41≤SL\_PRS-RSRP<-40 | dBm |
| SL\_PRS-RSRP\_117 | -40≤SL\_PRS-RSRP<-39 | dBm |
| SL\_PRS-RSRP\_118 | -39≤SL\_PRS-RSRP<-38 | dBm |
| SL\_PRS-RSRP\_119 | -38≤SL\_PRS-RSRP<-37 | dBm |
| SL\_PRS-RSRP\_120 | -37≤SL\_PRS-RSRP<-36 | dBm |
| SL\_PRS-RSRP\_121 | -36≤SL\_PRS-RSRP<-35 | dBm |
| SL\_PRS-RSRP\_122 | -35≤SL\_PRS-RSRP<-34 | dBm |
| SL\_PRS-RSRP\_123 | -34≤SL\_PRS-RSRP<-33 | dBm |
| SL\_PRS-RSRP\_124 | -33≤SL\_PRS-RSRP<-32 | dBm |
| SL\_PRS-RSRP\_125 | -32≤SL\_PRS-RSRP<-31 | dBm |
| SL\_PRS-RSRP\_126 | -31≤SL\_PRS-RSRP | dBm |

#### 10.4A.3.2 Measurement Accuracy Requirements

##### 10.4A.3.2.1 Absolute SL PRS-RSRP accuracy

The absolute accuracy requirements for SL PRS-RSRP measurement for FR1 defined in Table 10.4A.3.2.1-1 are valid under the following conditions:

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

- PRP 1,2|dBm according to Annex B.4A.1 for a corresponding Band.

Table 10.4A.3.2.1-1: SL PRS-RSRP absolute accuracy for FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | |
| Normal condition | Extreme condition | SL- PRS Ês/Iot | SL-PRS SCS | SL-PRS BW Note 2 | Number of SL-PRS samples, S | NR operating band group Note 5 | Io Note 4 range | |
| Minimum Io Note 1 | Maximum Io |
| dB | dB | dB | kHz | PRB | - |  | dBm / SCSPRS | dBm/ BWChannel |
| [TBD] | [TBD] | ≥-3 dB | 15 | ≥ 24 | ≥4 | NR\_TDD\_FR1\_B | -126.5 | -50 |
| [TBD] | [TBD] | NR\_TDD\_FR1\_J | -122.5 | -50 |
| [TBD] | [TBD] | > 48 | ≥1 | Note 3 | | |
| [TBD] | [TBD] | ≥ 96 | ≥1 | Note 3 | | |
| [TBD] | [TBD] | 30 | ≥ 24 | ≥4 | NR\_TDD\_FR1\_B | -123.5 | -50 |
| [TBD] | [TBD] | NR\_TDD\_FR1\_J | -119.5 | -50 |
| [TBD] | [TBD] | > 48 | ≥1 | Note 3 | | |
| [TBD] | [TBD] | 60 | ≥ 24 | ≥4 | NR\_TDD\_FR1\_B | -120.5 | -50 |
| [TBD] | [TBD] | NR\_TDD\_FR1\_J | -116.5 | -50 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: SL-PRS bandwidth is as indicated in *sl-PRS-BW* in the *SL-PRS-AssistanceData* defined in [37].  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the SL-PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 4: The Io is defined in PRS positioning slots. The same Io range applies to SL-PRS and non-SL-PRS symbols. Io levels are different in SL-PRS and non-SL-PRS symbols within the same slot.  NOTE 5: NR operating band groups are as defined in Section 3.5.2. | | | | | | | | |

### 10.4A.4 SL Rx-Tx measurements

#### 10.4A.4.1 Measurement Report Mapping

10.4A.4.1.1 Absolute SL Rx-Tx Measurement Report Mapping

The reporting range for the absolute SL Rx-Tx time difference measurement (TSL Rx-Tx) is defined from -985024´Tc to 985024´Tc with the resolution step of 2*k*´Tc, where:

Tc is defined in TS 38.211 [6],

*kmin*≤*k*≤*kmax*,

*kmin*=2 and *kmax*=5, when at least one of the PRS and the SRS resources configured for TSL Rx-Tx is in FR1.

The TSL Rx-Tx report mapping for *k* = 2, 3, 4, and 5 are specified in Tables 10.4A.4.1.1-1, 10.4A.4.1.1-2, 10.4A.4.1.1-3, and 10.4A.4.1.1-4, respectively.

**Table 10.4A.4.1.1-1: Absolute SL Rx-Tx time difference measurement report mapping for *k*=2**

|  |  |  |
| --- | --- | --- |
| **Reported Quantity Value** | **Measured Quantity Value** | **Unit** |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0000 | TSL Rx-Tx < -985024 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0001 | -985024 £ TSL Rx-Tx < -985020 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0002 | -985020 £ TSL Rx-Tx < -985016 | Tc |
| ¼ | ¼ | … |
| SL\_RX-TX\_TIME\_DIFFERENCE\_246256 | -4 £ TSL Rx-Tx < 0 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_246257 | 0 £ TSL Rx-Tx < 4 | Tc |
| … | … | … |
| SL\_RX-TX\_TIME\_DIFFERENCE\_492511 | 985016 £ TSL Rx-Tx < 985020 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_492512 | 985020 £ TSL Rx-Tx < 985024 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_492513 | 985024 £ TSL Rx-Tx | Tc |

**Table 10.4A.4.1.1-2: Absolute SL Rx-Tx time difference measurement report mapping for *k*=3**

|  |  |  |
| --- | --- | --- |
| **Reported Quantity Value** | **Measured Quantity Value** | **Unit** |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0000 | TSL Rx-Tx < -985024 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0001 | -985024 £ TSL Rx-Tx < -985016 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0002 | -985016 £ TSL Rx-Tx < -985008 | Tc |
| ¼ | ¼ | … |
| SL\_RX-TX\_TIME\_DIFFERENCE\_123128 | -8 £ TSL Rx-Tx < 0 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_123129 | 0 £ TSL Rx-Tx < 8 | Tc |
| … | … | … |
| SL\_RX-TX\_TIME\_DIFFERENCE\_246255 | 985008 £ TSL Rx-Tx < 985016 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_246256 | 985016 £ TSL Rx-Tx < 985024 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_246257 | 985024 £ TSL Rx-Tx | Tc |

**Table 10.4A.4.1.1-3: Absolute SL Rx-Tx time difference measurement report mapping for *k*=4**

|  |  |  |
| --- | --- | --- |
| **Reported Quantity Value** | **Measured Quantity Value** | **Unit** |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0000 | TSL Rx-Tx < -985024 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0001 | -985024 £ TSL Rx-Tx < -985008 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0002 | -985008 £ TSL Rx-Tx < -984992 | Tc |
| ¼ | ¼ | … |
| SL\_RX-TX\_TIME\_DIFFERENCE\_61564 | -16 £ TSL Rx-Tx < 0 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_61565 | 0 £ TSL Rx-Tx < 16 | Tc |
| … | … | … |
| SL\_RX-TX\_TIME\_DIFFERENCE\_123127 | 984992 £ TSL Rx-Tx < 985008 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_123128 | 985008 £ TSL Rx-Tx < 985024 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_123129 | 985024 £ TSL Rx-Tx | Tc |

**Table 10.4A.4.1.1-4: Absolute SL Rx-Tx time difference measurement report mapping for *k*=5**

|  |  |  |
| --- | --- | --- |
| **Reported Quantity Value** | **Measured Quantity Value** | **Unit** |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0000 | TSL Rx-Tx < -985024 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0001 | -985024 £ TSL Rx-Tx < -984992 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_0002 | -984992 £ TSL Rx-Tx < -984960 | Tc |
| ¼ | ¼ | … |
| SL\_RX-TX\_TIME\_DIFFERENCE\_30782 | -32 £ TSL Rx-Tx < 0 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_30783 | 0 £ TSL Rx-Tx < 32 | Tc |
| … | … | … |
| SL\_RX-TX\_TIME\_DIFFERENCE\_61563 | 984960 £ TSL Rx-Tx < 984992 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_61564 | 984992 £ TSL Rx-Tx < 985024 | Tc |
| SL\_RX-TX\_TIME\_DIFFERENCE\_61565 | 985024 £ TSL Rx-Tx | Tc |

#### 10.4A.4.2 Measurement Accuracy

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

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

- the reference timing used for SL PRS transmissions is a NR serving cell.

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

- The UE transmits SL PRS within [-160, 160] msec of at least one SL PRS resource of each of the anchor UEs in the assistance data.

The accuracy requirements in Table 10.4A.4.2-1 for FR1 are valid under the following conditions:

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

- SL PRP|dBm according to Annex B.4A.1 for a corresponding Band.

- AWGN propagation condition.

Table 10.4A.4.2-1: SL Rx-Tx time difference measurement accuracy in FR1 in AWGN

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | Number of samples, S | PRS SCS | NR operating band groupsNote 2 | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | RB |  | kHz |  | dBm / SCSPRS | dBm/BW |
| ± TBD+δ | -3 | 48 | ≥ 4 | 15 | NR\_TDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_J | -122.5 |
| >48 | ≥ 1 | NOTE 5 | NOTE 5 | NOTE 5 |
| ± TBD+δ | ≥ 96 | ≥ 1 | NOTE 5 | NOTE 5 | NOTE 5 |
| ± TBD+δ | ≥ 24 | ≥ 4 | 30 | NR\_TDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_J | -119.5 |
| ± TBD+δ | >48 | ≥ 1 | NOTE 5 | NOTE 5 | NOTE 5 |
| ± TBD+δ | ≥ 24 | ≥ 4 | 60 | NR\_TDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_J | -116.5 |
| 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 RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from Table 10.4A.4.2-3. | | | | | | | |

The accuracy requirements in Table 10.4A.4.2-2 for FR1 are valid under the following conditions:

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

- SL PRP|dBm according to Annex B.4A.1 for a corresponding Band.

- Fading propagation condition.

Table 10.4A.4.2-2: SL Rx-Tx time difference measurement accuracy in FR1 in fading

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | Conditions | | | | | | |
| PRS Ês/Iot | Minimum PRS bandwidth | Number of samples, S | PRS SCS | NR operating band groupsNote 2 | IoNote 3 range | |
| Minimum IoNote 1 | Maximum Io |
| TcNote 4 | dB | RB |  | kHz |  | dBm / SCSPRS | dBm/BW |
| ± TBD+δ | -3 | 48 | ≥ 4 | 15 | NR\_TDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_J | -122.5 |
| >48 | ≥ 1 | NOTE 5 | NOTE 5 | NOTE 5 |
| ± TBD+δ | ≥ 96 | ≥ 1 | NOTE 5 | NOTE 5 | NOTE 5 |
| ± TBD+δ | ≥ 24 | ≥ 4 | 30 | NR\_TDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_J | -119.5 |
| ± TBD+δ | >48 | ≥ 1 | NOTE 5 | NOTE 5 | NOTE 5 |
| ± TBD+δ | ≥ 24 | ≥ 4 | 60 | NR\_TDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_J | -116.5 |
| 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 RB number for the corresponding SCS.  NOTE 6: δ is the margin determined from Table 10.4A.4.2-3. | | | | | | | |

Table 10.4A.4.2-3: Margin for UE Rx-Tx time difference measurement accuracy in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| [Min(PRS Rx BW, PRS Tx BW) (RB)] | | | Margin (Tc) |
| SCS = 15 kHz | SCS = 30 kHz | SCS = 60 kHz |
| ≥ 48 | ≥ 24 | N/A | TBD |
| ≥ 96 | ≥ 48 | ≥ 24 | TBD |

### 10.4A.5 SL PRS-RSRPP measurements

#### 10.4A.5.1 Measurement Report Mapping

10.4A.5.1.1 Absolute SL PRS-RSRPP Measurement Report Mapping

The reporting range of absolute SL PRS-RSRPP measurement is defined from -156 dBm to -31 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.4A.5.1.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

**Table 10.4A.5.1.1-1: Measurement report mapping for SL PRS-RSRPP**

|  |  |  |
| --- | --- | --- |
| **Reported value** | **Measured quantity value** | **Unit** |
| SL\_PRS-RSRPP\_0 | SL\_PRS-RSRPP<-156 | dBm |
| SL\_PRS-RSRPP\_1 | -156≤SL\_PRS-RSRPP<-155 | dBm |
| SL\_PRS-RSRPP\_2 | -155≤SL\_PRS-RSRPP<-154 | dBm |
| SL\_PRS-RSRPP\_3 | -154≤SL\_PRS-RSRPP<-153 | dBm |
| SL\_PRS-RSRPP\_4 | -153≤SL\_PRS-RSRPP<-152 | dBm |
| SL\_PRS-RSRPP\_5 | -152≤SL\_PRS-RSRPP<-151 | dBm |
| SL\_PRS-RSRPP\_6 | -151≤SL\_PRS-RSRPP<-150 | dBm |
| SL\_PRS-RSRPP\_7 | -150≤SL\_PRS-RSRPP<-149 | dBm |
| SL\_PRS-RSRPP\_8 | -149≤SL\_PRS-RSRPP<-148 | dBm |
| SL\_PRS-RSRPP\_9 | -148≤SL\_PRS-RSRPP<-147 | dBm |
| SL\_PRS-RSRPP\_10 | -147≤SL\_PRS-RSRPP<-146 | dBm |
| SL\_PRS-RSRPP\_11 | -146≤SL\_PRS-RSRPP<-145 | dBm |
| SL\_PRS-RSRPP\_12 | -145≤SL\_PRS-RSRPP<-144 | dBm |
| SL\_PRS-RSRPP\_13 | -144≤SL\_PRS-RSRPP<-143 | dBm |
| SL\_PRS-RSRPP\_14 | -143≤SL\_PRS-RSRPP<-142 | dBm |
| SL\_PRS-RSRPP\_15 | -142≤SL\_PRS-RSRPP<-141 | dBm |
| SL\_PRS-RSRPP\_16 | -141≤SL\_PRS-RSRPP<-140 | dBm |
| SL\_PRS-RSRPP\_17 | -140≤SL\_PRS-RSRPP<-139 | dBm |
| SL\_PRS-RSRPP\_18 | -139≤SL\_PRS-RSRPP<-138 | dBm |
| … | … | … |
| SL\_PRS-RSRPP\_111 | -46≤SL\_PRS-RSRPP<-45 | dBm |
| SL\_PRS-RSRPP\_112 | -45≤SL\_PRS-RSRPP<-44 | dBm |
| SL\_PRS-RSRPP\_113 | -44≤SL\_PRS-RSRPP<-43 | dBm |
| SL\_PRS-RSRPP\_114 | -43≤SL\_PRS-RSRPP<-42 | dBm |
| SL\_PRS-RSRPP\_115 | -42≤SL\_PRS-RSRPP<-41 | dBm |
| SL\_PRS-RSRPP\_116 | -41≤SL\_PRS-RSRPP<-40 | dBm |
| SL\_PRS-RSRPP\_117 | -40≤SL\_PRS-RSRPP<-39 | dBm |
| SL\_PRS-RSRPP\_118 | -39≤SL\_PRS-RSRPP<-38 | dBm |
| SL\_PRS-RSRPP\_119 | -38≤SL\_PRS-RSRPP<-37 | dBm |
| SL\_PRS-RSRPP\_120 | -37≤SL\_PRS-RSRPP<-36 | dBm |
| SL\_PRS-RSRPP\_121 | -36≤SL\_PRS-RSRPP<-35 | dBm |
| SL\_PRS-RSRPP\_122 | -35≤SL\_PRS-RSRPP<-34 | dBm |
| SL\_PRS-RSRPP\_123 | -34≤SL\_PRS-RSRPP<-33 | dBm |
| SL\_PRS-RSRPP\_124 | -33≤SL\_PRS-RSRPP<-32 | dBm |
| SL\_PRS-RSRPP\_125 | -32≤SL\_PRS-RSRPP<-31 | dBm |
| SL\_PRS-RSRPP\_126 | -31≤SL\_PRS-RSRPP | dBm |

#### 10.4A.5.2 Measurement Accuracy

##### 10.4A.5.2.1 Introduction

The requirements in clause 10.4A.5.2 shall apply provided the UE has received *SL-TDOA-RequestLocationInformation* or *SL-AOA-RequestLocationInformation* or *SL-TOA-RequestLocationInformation* or *SL-RTT-RequestLocationInformation* from LMF or another UE via SLPP requesting the UE to measure and report SL PRS-RSRPP measurements defined in TS 38.215 [4].

The requirements in Clause 10.4A.5.2 apply for the first path SL PRSRSRPP measurement.

##### 10.4A.5.2.2 Measurement Accuracy Requirements

###### 10.4A.5.2.2.2 Absolute SL PRS-RSRPP accuracy

The absolute accuracy requirements for SL PRS-RSRPP measurement for FR1 defined in Table 10.4A.5.2.2.2-1 are valid under the following conditions:

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

- PRP 1,2|dBm according to Annex B.4A.1 for a corresponding Band.

NOTE 1: The requriements in this clause are derived based on two-tap channel defined in 38.101-4 Annex B.2.4 (a = 1, τd=0.45 µs and fD=5 Hz).

NOTE 2: The requirements in this clause are derived based on the difference between the estimated SL PRSRSRPP compared to the ideal SL PRSRSRPP defined as

where:

is the effective channel frequency response (over REs occupied by SL-PRS) measured without receiver noise.

is the exact delay of the p-th path in the channel model.

Table 10.4A.5.2.2.2-1: SL PRS-RSRPP absolute accuracy for FR1

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Accuracy | | Conditions | | | | | | |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS SCS | PRS BW Note 2 | PRS sample | operating band group Note 5 | Io Note 4 range | |
| Minimum Io Note 1 | Maximum Io |
| dB | dB | dB | kHz | PRB | - |  | dBm / SCSPRS | dBm/BWChannel |
| [TBD] | [TBD] | ≥-3 | 15 | ≥ 24 | ≥4 | NR\_TDD\_FR1\_B | -126.5 | -50 |
| [TBD] | [TBD] | NR\_TDD\_FR1\_J | -122.5 | -50 |
| [TBD] | [TBD] | > 48 | ≥1 | Note 3 | | |
| [TBD] | [TBD] | ≥ 96 | ≥1 | Note 3 | | |
| [TBD] | [TBD] | 30 | ≥ 24 | ≥4 | NR\_TDD\_FR1\_B | -123.5 | -50 |
| [TBD] | [TBD] | NR\_TDD\_FR1\_J | -119.5 | -50 |
| [TBD] | [TBD] | > 48 | ≥1 | Note 3 | | |
| [TBD] | [TBD] | 60 | ≥ 24 | ≥4 | NR\_TDD\_FR1\_B | -120.5 | -50 |
| [TBD] | [TBD] | NR\_TDD\_FR1\_J | -116.5 | -50 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.  NOTE 2: SL PRS bandwidth is as indicated in *sl-PRS-BW* in the SL-PRS-AssistanceData defined in [37].  NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the SL PRS bandwidth of the smallest PRB number for the corresponding SCS.  NOTE 4: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.  NOTE 5: NR V2X operating band groups are as defined in Section 3.5.2. | | | | | | | | |

### 10.4A.6 SL AoA measurements

#### 10.4A.6.1 Measurement Report Mapping

##### 10.4A.6.1.1 Absolute SL AoA Measurement Report Mapping

The UE shall report A-AoA measurement results based on measurement report mapping in this clause. The UE shall report Z-AoA measurement results based on measurement report mapping in this clause.

The reporting range of SL AoA, as defined in TS 38.215 [4], is defined from -180 degree to +180 degree for A-AoA. The reporting resolution is 0.1 degree. The mapping of A-AoA measured quantity is defined in Table 10.4A.6.1.1-1.

**Table 10.4A.6.1.1-1: A-AoA measurement report mapping**

|  |  |  |
| --- | --- | --- |
| **Reported value** | **Measured quantity value (A-AoA)** | **Unit** |
| A-AoA\_0 | -180 ≤ A-AoA < -179.9 | Degree |
| A-AoA\_1 | -179.9 ≤ A-AoA < -179.8 | Degree |
| A-AoA\_2 | -179.8 ≤ A-AoA < -179.7 | Degree |
| … | … | … |
| A-AoA\_1798 | -0.2 ≤ A-AoA < -0.1 | Degree |
| A-AoA\_1799 | -0.1 ≤ A-AoA < 0 | Degree |
| A-AoA\_1800 | 0 ≤ A-AoA < 0.1 | Degree |
| A-AoA\_1801 | 0.1 ≤ A-AoA < 0.2 | Degree |
| A-AoA\_1802 | 0.2 ≤ A-AoA < 0.3 | Degree |
| … | … | … |
| A-AoA\_3598 | 179.8 ≤ A-AoA < 179.9 | Degree |
| A-AoA\_3599 | 179.9 ≤ A-AoA < 180 | Degree |

The reporting range of SL AoA, as defined in TS 38.215 [4], is defined from 0 degree to +180 degree for Z-AoA. The reporting resolution is 0.1 degree. The reporting resolution is 0.1 degree. The mapping of Z-AoA measured quantity is defined in Table 10.4A.6.1.1-2.

**Table 10.4A.6.1.1-2: Z-AoA measurement report mapping**

|  |  |  |
| --- | --- | --- |
| **Reported value** | **Measured quantity value (Z-AoA)** | **Unit** |
| Z-AoA\_0 | 0 ≤ Z-AoA < 0.1 | degree |
| Z-AoA \_1 | 0.1 ≤ Z-AoA < 0.2 | degree |
| Z-AoA \_2 | 0.2 ≤ Z-AoA < 0.3 | degree |
| … | … | … |
| Z-AoA \_1798 | 179.8 ≤ Z-AoA < 179.9 | degree |
| Z-AoA \_1799 | 179.9 ≤ Z-AoA ≤ 180 | degree |

### 10.4A.7 SL RTOA measurements

#### 10.4A.7.1 Measurement Report Mapping

10.4A.7.1.1 Absolute SL Rx-Tx Measurement Report Mapping

The reporting range of SL RTOA measurement, as defined in Clause 5.2.2 of TS 38.215 [4], is defined from -985024Tc to +985024×Tc. The reporting resolution is uniform across the reporting range and is defined as T = Tc\*2k where k is selected from the set {0, 1, 2, 3, 4, 5}.

Tc is defined in TS 38.211 [6].

The mapping of measured quantity for each reporting resolution (k) is defined in Table 10.4A.7.1.1-1 to Table 10.4A.7.1.1-6.

**Table 10.4A.7.1.1-1: Absolute SL RTOA measurement report mapping for k=0**

|  |  |  |
| --- | --- | --- |
| **Reported Value** | **Measured Quantity Value** | **Unit** |
| SL\_RTOA\_0000 | -985024 > SL\_RTOA | Tc |
| SL\_RTOA\_0001 | -985024 ≤ SL\_RTOA < -985023 | Tc |
| SL\_RTOA\_0002 | -985023 ≤ SL\_RTOA < -985022 | Tc |
| … | … | … |
| SL\_RTOA\_985023 | -2 ≤ SL\_RTOA < -1 | Tc |
| SL\_RTOA\_985024 | -1 ≤ SL\_RTOA ≤ 0 | Tc |
| SL\_RTOA\_985025 | 0 < SL\_RTOA ≤ 1 | Tc |
| SL\_RTOA\_985026 | 1 < SL\_RTOA ≤ 2 | Tc |
| SL\_RTOA\_985027 | 2 < SL\_RTOA ≤ 3 | Tc |
| … | … | … |
| SL\_RTOA\_1970048 | 985023 < SL\_RTOA ≤ 985024 | Tc |
| SL\_RTOA\_1970049 | 985024 < SL\_RTOA | Tc |

**Table 10.4A.7.1.1-2: Absolute SL RTOA measurement report mapping for k=1**

|  |  |  |
| --- | --- | --- |
| **Reported Value** | **Measured Quantity Value** | **Unit** |
| SL\_RTOA\_0000 | -985024 > SL\_RTOA | Tc |
| SL\_RTOA\_0001 | -985024 ≤ SL\_RTOA < -985022 | Tc |
| SL\_RTOA\_0002 | -985022 ≤ SL\_RTOA < -985020 | Tc |
| … | … | … |
| SL\_RTOA\_492511 | -4 ≤ SL\_RTOA < -2 | Tc |
| SL\_RTOA\_492512 | -2 ≤ SL\_RTOA ≤ 0 | Tc |
| SL\_RTOA\_492513 | 0 < SL\_RTOA ≤ 2 | Tc |
| SL\_RTOA\_492514 | 2 < SL\_RTOA ≤ 4 | Tc |
| SL\_RTOA\_492515 | 4 < SL\_RTOA ≤ 6 | Tc |
| … | … | … |
| SL\_RTOA\_985024 | 985022 < SL\_RTOA ≤ 985024 | Tc |
| SL\_RTOA\_985025 | 985024 < SL\_RTOA | Tc |

**Table 10.4A.7.1.1-3: Absolute SL RTOA measurement report mapping for k=2**

|  |  |  |
| --- | --- | --- |
| **Reported Value** | **Measured Quantity Value** | **Unit** |
| SL\_RTOA\_0000 | -985024 > SL\_RTOA | Tc |
| SL\_RTOA\_0001 | -985024 ≤ SL\_RTOA < -985020 | Tc |
| SL\_RTOA\_0002 | -985020 ≤ SL\_RTOA < -985018 | Tc |
| … | … | … |
| SL\_RTOA\_246255 | -8 ≤ SL\_RTOA < -4 | Tc |
| SL\_RTOA\_246256 | -4 ≤ SL\_RTOA ≤ 0 | Tc |
| SL\_RTOA\_246257 | 0 < SL\_RTOA ≤ 4 | Tc |
| SL\_RTOA\_246258 | 4 < SL\_RTOA ≤ 8 | Tc |
| SL\_RTOA\_246259 | 8 < SL\_RTOA ≤ 12 | Tc |
| … | … | … |
| SL\_RTOA\_492512 | 985020 < SL\_RTOA ≤ 985024 | Tc |
| SL\_RTOA\_492513 | 985024 < SL\_RTOA | Tc |

**Table 10.4A.7.1.1-4: Absolute SL RTOA measurement report mapping for k=3**

|  |  |  |
| --- | --- | --- |
| **Reported Value** | **Measured Quantity Value** | **Unit** |
| SL\_RTOA\_0000 | -985024 > SL\_RTOA | Tc |
| SL\_RTOA\_0001 | -985024 ≤ SL\_RTOA < -985016 | Tc |
| SL\_RTOA\_0002 | -985016 ≤ SL\_RTOA < -985008 | Tc |
| … | … | … |
| SL\_RTOA\_123127 | -16 ≤ SL\_RTOA < -8 | Tc |
| SL\_RTOA\_123128 | -8 ≤ SL\_RTOA ≤ 0 | Tc |
| SL\_RTOA\_123129 | 0 < SL\_RTOA ≤ 8 | Tc |
| SL\_RTOA\_123130 | 8 < SL\_RTOA ≤ 16 | Tc |
| SL\_RTOA\_123131 | 16 < SL\_RTOA ≤ 24 | Tc |
| … | … | … |
| SL\_RTOA\_246256 | 985016 < SL\_RTOA ≤ 985024 | Tc |
| SL\_RTOA\_246257 | 985024 < SL\_RTOA | Tc |

**Table 10.4A.7.1.1-5: Absolute SL RTOA measurement report mapping for k=4**

|  |  |  |
| --- | --- | --- |
| **Reported Value** | **Measured Quantity Value** | **Unit** |
| SL\_RTOA\_0000 | -985024 > SL\_RTOA | Tc |
| SL\_RTOA\_0001 | -985024 ≤ SL\_RTOA < -985008 | Tc |
| SL\_RTOA\_0002 | -985008 ≤ SL\_RTOA < -984992 | Tc |
| … | … | … |
| SL\_RTOA\_61563 | -32 ≤ SL\_RTOA < -16 | Tc |
| SL\_RTOA\_61564 | -16 ≤ SL\_RTOA ≤ 0 | Tc |
| SL\_RTOA\_61565 | 0 < SL\_RTOA ≤ 16 | Tc |
| SL\_RTOA\_61566 | 16 < SL\_RTOA ≤ 32 | Tc |
| SL\_RTOA\_61567 | 32 < SL\_RTOA ≤ 48 | Tc |
| … | … | … |
| SL\_RTOA\_123128 | 985008 < SL\_RTOA ≤ 985024 | Tc |
| SL\_RTOA\_123129 | 985024 < SL\_RTOA | Tc |

**Table 10.4A.7.1.1-6: Absolute SL RTOA measurement report mapping for k=5**

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

## **--- End of Change #4 ---**

## **--- Start of Change #5 ---**

## 13.1 UL-RTOA

### 13.1.1 Report mapping

The reporting range of UL Relative Time of Arrival (UL-RTOA), as defined in Clause 5.2.2 of TS 38.215 [4], is defined from -985024Tc to +985024×Tc. The reporting resolution is uniform across the reporting range and is defined as T = Tc×2k where k is selected by gNB from the set {-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5}.

Tc is defined in TS 38.211 [6].

LMF provides a recommended resolution parameter, *timingReportingGranularityFactor* [35]. gNB selects parameter k based on *timingReportingGranularityFactor* [35] and informs the LMF.

The mapping of measured quantity for each reporting resolution (k) is defined in Table 13.1.1-1 to Table 13.1.1-12.

Table 13.1.1-1: Measurement report mapping for k = 0.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| UL\_RTOA\_0000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_0000001 | -985024 ≤ UL\_RTOA < -985023 | Tc |
| UL\_RTOA\_0000002 | -985023 ≤ UL\_RTOA < -985022 | Tc |
| … | … | … |
| UL\_RTOA\_0985023 | -2 ≤ UL\_RTOA < -1 | Tc |
| UL\_RTOA\_0985024 | -1 ≤ UL\_RTOA ≤ 0 | Tc |
| UL\_RTOA\_0985025 | 0 < UL\_RTOA ≤ 1 | Tc |
| UL\_RTOA\_0985026 | 1 < UL\_RTOA ≤ 2 | Tc |
| UL\_RTOA\_0985027 | 2 < UL\_RTOA ≤ 3 | Tc |
| … | … | … |
| UL\_RTOA\_1970048 | 985023 < UL\_RTOA ≤ 985024 | Tc |
| UL\_RTOA\_1970049 | 985024 < UL\_RTOA | Tc |

Table 13.1.1-2: Measurement report mapping for k = 1.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| UL\_RTOA\_000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_000001 | -985024 ≤ UL\_RTOA < -985022 | Tc |
| UL\_RTOA\_000002 | -985022 ≤ UL\_RTOA < -985020 | Tc |
| … | … | … |
| UL\_RTOA\_492511 | -4 ≤ UL\_RTOA < -2 | Tc |
| UL\_RTOA\_492512 | -2 ≤ UL\_RTOA ≤ 0 | Tc |
| UL\_RTOA\_492513 | 0 < UL\_RTOA ≤ 2 | Tc |
| UL\_RTOA\_492514 | 2 < UL\_RTOA ≤ 4 | Tc |
| UL\_RTOA\_492515 | 4 < UL\_RTOA ≤ 6 | Tc |
| … | … | … |
| UL\_RTOA\_985024 | 985022 < UL\_RTOA ≤ 985024 | Tc |
| UL\_RTOA\_985025 | 985024 < UL\_RTOA | Tc |

Table 13.1.1-3: Measurement report mapping for k = 2.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| UL\_RTOA\_000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_000001 | -985024 ≤ UL\_RTOA < -985020 | Tc |
| UL\_RTOA\_000002 | -985020 ≤ UL\_RTOA < -985018 | Tc |
| … | … | … |
| UL\_RTOA\_246255 | -8 ≤ UL\_RTOA < -4 | Tc |
| UL\_RTOA\_246256 | -4 ≤ UL\_RTOA ≤ 0 | Tc |
| UL\_RTOA\_246257 | 0 < UL\_RTOA ≤ 4 | Tc |
| UL\_RTOA\_246258 | 4 < UL\_RTOA ≤ 8 | Tc |
| UL\_RTOA\_246259 | 8 < UL\_RTOA ≤ 12 | Tc |
| … | … | … |
| UL\_RTOA\_492512 | 985020 < UL\_RTOA ≤ 985024 | Tc |
| UL\_RTOA\_492513 | 985024 < UL\_RTOA | Tc |

Table 13.1.1-4: Measurement report mapping for k = 3.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| UL\_RTOA\_000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_000001 | -985024 ≤ UL\_RTOA < -985016 | Tc |
| UL\_RTOA\_000002 | -985016 ≤ UL\_RTOA < -985008 | Tc |
| … | … | … |
| UL\_RTOA\_123127 | -16 ≤ UL\_RTOA < -8 | Tc |
| UL\_RTOA\_123128 | -8 ≤ UL\_RTOA ≤ 0 | Tc |
| UL\_RTOA\_123129 | 0 < UL\_RTOA ≤ 8 | Tc |
| UL\_RTOA\_123130 | 8 < UL\_RTOA ≤ 16 | Tc |
| UL\_RTOA\_123131 | 16 < UL\_RTOA ≤ 24 | Tc |
| … | … | … |
| UL\_RTOA\_246256 | 985016 < UL\_RTOA ≤ 985024 | Tc |
| UL\_RTOA\_246257 | 985024 < UL\_RTOA | Tc |

Table 13.1.1-5: Measurement report mapping for k = 4.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| UL\_RTOA\_000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_000001 | -985024 ≤ UL\_RTOA < -985008 | Tc |
| UL\_RTOA\_000002 | -985008 ≤ UL\_RTOA < -984992 | Tc |
| … | … | … |
| UL\_RTOA\_061563 | -32 ≤ UL\_RTOA < -16 | Tc |
| UL\_RTOA\_061564 | -16 ≤ UL\_RTOA ≤ 0 | Tc |
| UL\_RTOA\_061565 | 0 < UL\_RTOA ≤ 16 | Tc |
| UL\_RTOA\_061566 | 16 < UL\_RTOA ≤ 32 | Tc |
| UL\_RTOA\_061567 | 32 < UL\_RTOA ≤ 48 | Tc |
| … | … | … |
| UL\_RTOA\_123128 | 985008 < UL\_RTOA ≤ 985024 | Tc |
| UL\_RTOA\_123129 | 985024 < UL\_RTOA | Tc |

Table 13.1.1-6: Measurement report mapping for k = 5.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| UL\_RTOA\_00000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_00001 | -985024 ≤ UL\_RTOA < -984992 | Tc |
| UL\_RTOA\_00002 | -984992 ≤ UL\_RTOA < -984960 | Tc |
| … | … | … |
| UL\_RTOA\_30781 | -64 ≤ UL\_RTOA < -32 | Tc |
| UL\_RTOA\_30782 | -32 ≤ UL\_RTOA ≤ 0 | Tc |
| UL\_RTOA\_30783 | 0 < UL\_RTOA ≤ 32 | Tc |
| UL\_RTOA\_30784 | 32 < UL\_RTOA ≤ 64 | Tc |
| UL\_RTOA\_30785 | 64 < UL\_RTOA ≤ 96 | Tc |
| … | … | … |
| UL\_RTOA\_61564 | 984992 < UL\_RTOA ≤ 985024 | Tc |
| UL\_RTOA\_61565 | 985024 < UL\_RTOA | Tc |

Table 13.1.1-7: Measurement report mapping for k = -1.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| UL\_RTOA\_0000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_0000001 | -985024 ≤ UL\_RTOA < -985023.5 | Tc |
| UL\_RTOA\_0000002 | -985023.5 ≤ UL\_RTOA < -985023 | Tc |
| … | … | … |
| UL\_RTOA\_1970048 | -0.5 ≤ UL\_RTOA < 0 | Tc |
| UL\_RTOA\_1970049 | 0 ≤ UL\_RTOA < 0.5 | Tc |
| … | … | … |
| UL\_RTOA\_3940095 | 985023 ≤ UL\_RTOA < 985023.5 | Tc |
| UL\_RTOA\_3940096 | 985023.5 ≤ UL\_RTOA < 985024 | Tc |
| UL\_RTOA\_3940097 | 985024 ≤ UL\_RTOA | Tc |

Table 13.1.1-8: Measurement report mapping for k = -2.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| UL\_RTOA\_0000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_0000001 | -985024 ≤ UL\_RTOA < -985023.75 | Tc |
| UL\_RTOA\_0000002 | -985023.75 ≤ UL\_RTOA < -985023.5 | Tc |
| … | … | … |
| UL\_RTOA\_3940096 | -0.25 ≤ UL\_RTOA < 0 | Tc |
| UL\_RTOA\_3940097 | 0 ≤ UL\_RTOA < 0.25 | Tc |
| … | … | … |
| UL\_RTOA\_7880191 | 985023.5 ≤ UL\_RTOA < 985023.75 | Tc |
| UL\_RTOA\_7880192 | 985023.75 ≤ UL\_RTOA < 985024 | Tc |
| UL\_RTOA\_7880193 | 985024 ≤ UL\_RTOA | Tc |

Table 13.1.1-9: Measurement report mapping for k = -3.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| UL\_RTOA\_00000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_00000001 | -985024 ≤ UL\_RTOA < -985023.875 | Tc |
| UL\_RTOA\_00000002 | -985023.875 ≤ UL\_RTOA < -985023.75 | Tc |
| … | … | … |
| UL\_RTOA\_07880192 | -0.125 ≤ UL\_RTOA < 0 | Tc |
| UL\_RTOA\_07880193 | 0 ≤ UL\_RTOA < 0.125 | Tc |
| … | … | … |
| UL\_RTOA\_15760383 | 985023.75 ≤ UL\_RTOA < 985023.875 | Tc |
| UL\_RTOA\_15760384 | 985023.875 ≤ UL\_RTOA < 985024 | Tc |
| UL\_RTOA\_15760385 | 985024 ≤ UL\_RTOA | Tc |

Table 13.1.1-10: Measurement report mapping for k = -4.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| UL\_RTOA\_0000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_0000001 | -985024 ≤ UL\_RTOA < -985023.9375 | Tc |
| UL\_RTOA\_0000002 | -985023.9375 ≤ UL\_RTOA < -985023.875 | Tc |
| … | … | … |
| UL\_RTOA\_15760384 | -0.0625 ≤ UL\_RTOA < 0 | Tc |
| UL\_RTOA\_15760385 | 0 ≤ UL\_RTOA < 0.0625 | Tc |
| … | … | … |
| UL\_RTOA\_31520767 | 985023.875 ≤ UL\_RTOA < 985023.9375 | Tc |
| UL\_RTOA\_31520768 | 985023.9375 ≤ UL\_RTOA < 985024 | Tc |
| UL\_RTOA\_31520769 | 985024 ≤ UL\_RTOA | Tc |

Table 13.1.1-11: Measurement report mapping for k = -5.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| UL\_RTOA\_00000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_00000001 | -985024 ≤ UL\_RTOA < -985023.9688 | Tc |
| UL\_RTOA\_00000002 | -985023.9688 ≤ UL\_RTOA < -985023.9375 | Tc |
| … | … | … |
| UL\_RTOA\_31520768 | -0.0312 ≤ UL\_RTOA < 0 | Tc |
| UL\_RTOA\_31520769 | 0 ≤ UL\_RTOA < 0.0312 | Tc |
| … | … | … |
| UL\_RTOA\_63041535 | 985023.9375 ≤ UL\_RTOA < 985023.9688 | Tc |
| UL\_RTOA\_63041536 | 985023.9688 ≤ UL\_RTOA < 985024 | Tc |
| UL\_RTOA\_63041537 | 985024 ≤ UL\_RTOA | Tc |

Table 13.1.1-12: Measurement report mapping for k = -6.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| UL\_RTOA\_000000000 | -985024 > UL\_RTOA | Tc |
| UL\_RTOA\_000000001 | -985024 ≤ UL\_RTOA < -985023.9844 | Tc |
| UL\_RTOA\_000000002 | -985023.9844 ≤ UL\_RTOA < -985023.9688 | Tc |
| … | … | … |
| UL\_RTOA\_063041536 | -0.0156 ≤ UL\_RTOA < 0 | Tc |
| UL\_RTOA\_063041537 | 0 ≤ UL\_RTOA < 0.0156 | Tc |
| … | … | … |
| UL\_RTOA\_126083071 | 985023.9688 ≤ UL\_RTOA < 985023.9844 | Tc |
| UL\_RTOA\_126083072 | 985023.9844 ≤ UL\_RTOA < 985024 | Tc |
| UL\_RTOA\_126083073 | 985024 ≤ UL\_RTOA | Tc |

### 13.1.1A Additional Path Report Mapping for UL-RTOA

The reporting range of additional path reporting for UL Relative Time of Arrival (UL-RTOA), as defined in Clause 5.2.2 of TS 38.215 [4], is defined from -8175×Tc to +8175×Tc. The reporting resolution is uniform across the reporting range and is defined as T = Tc×2k where k is selected by gNB from the set {-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5}.

Tc is defined in TS 38.211 [6].

LMF provides a recommended resolution parameter, *timingReportingGranularityFactor* [35]. gNB selects parameter k based on *timingReportingGranularityFactor* [35] and informs the LMF.

The mapping of measured quantity for each reporting resolution (k) is defined in Table 13.1.1A-1 to Table 13.1.1A-12.

Table 13.1.1A-1: Measurement report mapping for k = 0.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174 | Tc |
| path\_00002 | -8174 ≤ Δpath < -8173 | Tc |
| … | … | … |
| path\_08175 | -1 ≤ Δpath < 0 | Tc |
| path\_08176 | 0 ≤ Δpath < 1 | Tc |
| … | … | … |
| path\_16349 | 8173 ≤ Δpath < 8174 | Tc |
| path\_16350 | 8174 ≤ Δpath < 8175 | Tc |
| path\_16351 | 8175 ≤ Δpath | Tc |

Table 13.1.1A-2: Measurement report mapping for k = 1.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8175 | Tc |
| path\_0001 | -8175 ≤ Δpath < -8173 | Tc |
| path\_0002 | -8173 ≤ Δpath < -8171 | Tc |
| … | … | … |
| path\_4088 | -1 ≤ Δpath < 1 | Tc |
| … | … | … |
| path\_8174 | 8171 ≤ Δpath < 8173 | Tc |
| path\_8175 | 8173 ≤ Δpath < 8175 | Tc |
| path\_8176 | 8175 ≤ Δpath | Tc |

Table 13.1.1A-3: Measurement report mapping for k = 2.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8174 | Tc |
| path\_0001 | -8174 ≤ Δpath < -8170 | Tc |
| path\_0002 | -8170 ≤ Δpath < -8166 | Tc |
| … | … | … |
| path\_2044 | -2 ≤ Δpath < 2 | Tc |
| … | … | … |
| path\_4086 | 8166 ≤ Δpath < 8170 | Tc |
| path\_4087 | 8170 ≤ Δpath < 8174 | Tc |
| path\_4088 | 8174 ≤ Δpath | Tc |

Table 13.1.1A-4: Measurement report mapping for k = 3.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8172 | Tc |
| path\_0001 | -8172 ≤ Δpath < -8164 | Tc |
| path\_0002 | -8164 ≤ Δpath < -8156 | Tc |
| … | … | … |
| path\_1022 | -4 ≤ Δpath < 4 | Tc |
| … | … | … |
| path\_2042 | 8156 ≤ Δpath < 8164 | Tc |
| path\_2043 | 8164 ≤ Δpath < 8172 | Tc |
| path\_2044 | 8172 ≤ Δpath | Tc |

Table 13.1.1A-5: Measurement report mapping for k = 4.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8168 | Tc |
| path\_0001 | -8168 ≤ Δpath < -8152 | Tc |
| path\_0002 | -8152 ≤ Δpath < -8136 | Tc |
| … | … | … |
| path\_0511 | -8 ≤ Δpath < 8 | Tc |
| … | … | … |
| path\_1020 | 8136 ≤ Δpath < 8152 | Tc |
| path\_1021 | 8152 ≤ Δpath < 8168 | Tc |
| path\_1022 | 8168 ≤ Δpath | Tc |

Table 13.1.1A-6: Measurement report mapping for k = 5.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_000 | Δpath < -8160 | Tc |
| path\_001 | -8160 ≤ Δpath < -8128 | Tc |
| path\_002 | -8128 ≤ Δpath < -8096 | Tc |
| … | … | … |
| path\_256 | 0 ≤ Δpath < 32 | Tc |
| … | … | … |
| path\_509 | 8096 ≤ Δpath < 8128 | Tc |
| path\_510 | 8128 ≤ Δpath < 8160 | Tc |
| path\_511 | 8160 ≤ Δpath | Tc |

Table 13.1.1A-7: Measurement report mapping for k = -1.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.5 | Tc |
| path\_00002 | -8174.5 ≤ Δpath < -8174 | Tc |
| … | … | … |
| path\_16350 | -0.5 ≤ Δpath < 0 | Tc |
| path\_16351 | 0 ≤ Δpath < 0.5 | Tc |
| … | … | … |
| path\_32699 | 8174 ≤ Δpath < 8174.5 | Tc |
| path\_32700 | 8174.5 ≤ Δpath < 8175 | Tc |
| path\_32701 | 8175 ≤ Δpath | Tc |

Table 13.1.1A-8: Measurement report mapping for k = -2.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.75 | Tc |
| path\_00002 | -8174.75 ≤ Δpath < -8174.5 | Tc |
| … | … | … |
| path\_32700 | -0.25 ≤ Δpath < 0 | Tc |
| path\_32701 | 0 ≤ Δpath < 0.25 | Tc |
| … | … | … |
| path\_65399 | 8174.5 ≤ Δpath < 8174.75 | Tc |
| path\_65400 | 8174.75 ≤ Δpath < 8175 | Tc |
| path\_65401 | 8175 ≤ Δpath | Tc |

Table 13.1.1A-9: Measurement report mapping for k = -3.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.875 | Tc |
| path\_000002 | -8174.875 ≤ Δpath < -8174.75 | Tc |
| … | … | … |
| path\_065400 | -0.125 ≤ Δpath < 0 | Tc |
| path\_065401 | 0 ≤ Δpath < 0.125 | Tc |
| … | … | … |
| path\_130799 | 8174.75 ≤ Δpath < 8174.875 | Tc |
| path\_130800 | 8174.875 ≤ Δpath < 8175 | Tc |
| path\_130801 | 8175 ≤ Δpath | Tc |

Table 13.1.1A-10: Measurement report mapping for k = -4.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.9375 | Tc |
| path\_000002 | -8174.9375 ≤ Δpath < -8174.875 | Tc |
| … | … | … |
| path\_130800 | -0.0625 ≤ Δpath < 0 | Tc |
| path\_130801 | 0 ≤ Δpath < 0.0625 | Tc |
| … | … | … |
| path\_261599 | 8174.875 ≤ Δpath < 8174.9375 | Tc |
| path\_261600 | 8174.9375 ≤ Δpath < 8175 | Tc |
| path\_261601 | 8175 ≤ Δpath | Tc |

Table 13.1.1A-11: Measurement report mapping for k = -5.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.9688 | Tc |
| path\_000002 | -8174.9688 ≤ Δpath < -8174.9375 | Tc |
| … | … | … |
| path\_261600 | -0.0312 ≤ Δpath < 0 | Tc |
| path\_261601 | 0 ≤ Δpath < 0.0312 | Tc |
| … | … | … |
| path\_523199 | 8174.9375 ≤ Δpath < 8174.9688 | Tc |
| path\_523200 | 8174.9688 ≤ Δpath < 8175 | Tc |
| path\_523201 | 8175 ≤ Δpath | Tc |

Table 13.1.1A-12: Measurement report mapping for k = -6.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_0000000 | Δpath < -8175 | Tc |
| path\_0000001 | -8175 ≤ Δpath < -8174.9844 | Tc |
| path\_0000002 | -8174.9844 ≤ Δpath < -8174.9688 | Tc |
| … | … | … |
| path\_0523200 | -0.0156 ≤ Δpath < 0 | Tc |
| path\_0523201 | 0 ≤ Δpath < 0.0156 | Tc |
| … | … | … |
| path\_1046399 | 8174.9688 ≤ Δpath < 8174.9844 | Tc |
| path\_1046400 | 8174.9844 ≤ Δpath < 8175 | Tc |
| path\_1046401 | 8175 ≤ Δpath | Tc |

## 13.2 gNB Rx-Tx time difference

### 13.2.1 Report mapping

The reporting range of gNB Rx-Tx time difference, as defined in Clause 5.2.3 of TS 38.215 [4], is defined from -985024Tc to +985024×Tc. The reporting resolution is uniform across the reporting range and is defined as T = Tc×2k where k is selected by gNB from the set {-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5}.

Tc is defined in TS 38.211 [6].

LMF provides a recommended resolution parameter, *timingReportingGranularityFactor* [35]. gNB selects parameter k based on *timingReportingGranularityFactor* [35] and informs the LMF.

The mapping of measured quantity for each reporting resolution (k) is defined in Table 13.2.1-1 to Table 13.2.1-12.

Table 13.2.1-1:Measurement report mapping for k = 0.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| RX-TX\_0000000 | -985024 > RX-TX | Tc |
| RX-TX\_0000001 | -985024 ≤ RX-TX < -985023 | Tc |
| RX-TX\_0000002 | -985023 ≤ RX-TX < -985022 | Tc |
| … | … | … |
| RX-TX\_0985023 | -2 ≤ RX-TX < -1 | Tc |
| RX-TX\_0985024 | -1 ≤ RX-TX ≤ 0 | Tc |
| RX-TX\_0985025 | 0 < RX-TX ≤ 1 | Tc |
| RX-TX\_0985026 | 1 < RX-TX ≤ 2 | Tc |
| RX-TX\_0985027 | 2 < RX-TX ≤ 3 | Tc |
| … | … | … |
| RX-TX\_1970048 | 985023 < RX-TX ≤ 985024 | Tc |
| RX-TX\_1970049 | 985024 < RX-TX | Tc |

Table 13.2.1-2: Measurement report mapping for k = 1.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| RX-TX\_000000 | -985024 > RX-TX | Tc |
| RX-TX\_000001 | -985024 ≤ RX-TX < -985022 | Tc |
| RX-TX\_000002 | -985022 ≤ RX-TX < -985020 | Tc |
| … | … | … |
| RX-TX\_492511 | -4 ≤ RX-TX < -2 | Tc |
| RX-TX\_492512 | -2 ≤ RX-TX ≤ 0 | Tc |
| RX-TX\_492513 | 0 < RX-TX ≤ 2 | Tc |
| RX-TX\_492514 | 2 < RX-TX ≤ 4 | Tc |
| RX-TX\_492515 | 4 < RX-TX ≤ 6 | Tc |
| … | … | … |
| RX-TX\_985024 | 985022 < RX-TX ≤ 985024 | Tc |
| RX-TX\_985025 | 985024 < RX-TX | Tc |

Table 13.2.1-3: Measurement report mapping for k = 2.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| RX-TX\_000000 | -985024 > RX-TX | Tc |
| RX-TX\_000001 | -985024 ≤ RX-TX < -985020 | Tc |
| RX-TX\_000002 | -985020 ≤ RX-TX < -985018 | Tc |
| … | … | … |
| RX-TX\_246255 | -8 ≤ RX-TX < -4 | Tc |
| RX-TX\_246256 | -4 ≤ RX-TX ≤ 0 | Tc |
| RX-TX\_246257 | 0 < RX-TX ≤ 4 | Tc |
| RX-TX\_246258 | 4 < RX-TX ≤ 8 | Tc |
| RX-TX\_246259 | 8 < RX-TX ≤ 12 | Tc |
| … | … | … |
| RX-TX\_492512 | 985020 < RX-TX ≤ 985024 | Tc |
| RX-TX\_492513 | 985024 < RX-TX | Tc |

Table 13.2.1-4: Measurement report mapping for k = 3.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| RX-TX\_000000 | -985024 > RX-TX | Tc |
| RX-TX\_000001 | -985024 ≤ RX-TX < -985016 | Tc |
| RX-TX\_000002 | -985016 ≤ RX-TX < -985008 | Tc |
| … | … | … |
| RX-TX\_123127 | -16 ≤ RX-TX < -8 | Tc |
| RX-TX\_123128 | -8 ≤ RX-TX ≤ 0 | Tc |
| RX-TX\_123129 | 0 < RX-TX ≤ 8 | Tc |
| RX-TX\_123130 | 8 < RX-TX ≤ 16 | Tc |
| RX-TX\_123131 | 16 < RX-TX ≤ 24 | Tc |
| … | … | … |
| RX-TX\_246256 | 985016 < RX-TX ≤ 985024 | Tc |
| RX-TX\_246257 | 985024 < RX-TX | Tc |

Table 13.2.1-5: Measurement report mapping for k = 4.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| RX-TX\_000000 | -985024 > RX-TX | Tc |
| RX-TX\_000001 | -985024 ≤ RX-TX < -985008 | Tc |
| RX-TX\_000002 | -985008 ≤ RX-TX < -984992 | Tc |
| … | … | … |
| RX-TX\_061563 | -32 ≤ RX-TX < -16 | Tc |
| RX-TX\_061564 | -16 ≤ RX-TX ≤ 0 | Tc |
| RX-TX\_061565 | 0 < RX-TX ≤ 16 | Tc |
| RX-TX\_061566 | 16 < RX-TX ≤ 32 | Tc |
| RX-TX\_061567 | 32 < RX-TX ≤ 48 | Tc |
| … | … | … |
| RX-TX\_123128 | 985008 < RX-TX ≤ 985024 | Tc |
| RX-TX\_123129 | 985024 < RX-TX | Tc |

Table 13.2.1-6: Measurement report mapping for k = 5.

|  |  |  |
| --- | --- | --- |
| Reported Value | Measured Quantity Value | Unit |
| RX-TX\_00000 | -985024 > RX-TX | Tc |
| RX-TX\_00001 | -985024 ≤ RX-TX < -984992 | Tc |
| RX-TX\_00002 | -984992 ≤ RX-TX < -984960 | Tc |
| … | … | … |
| RX-TX\_30781 | -64 ≤ RX-TX < -32 | Tc |
| RX-TX\_30782 | -32 ≤ RX-TX ≤ 0 | Tc |
| RX-TX\_30783 | 0 < RX-TX ≤ 32 | Tc |
| RX-TX\_30784 | 32 < RX-TX ≤ 64 | Tc |
| RX-TX\_30785 | 64 < RX-TX ≤ 96 | Tc |
| … | … | … |
| RX-TX\_61564 | 984992 < RX-TX ≤ 985024 | Tc |
| RX-TX\_61565 | 985024 < RX-TX | Tc |

Table 13.2.1-7: Measurement report mapping for k = -1.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_0000000 | -985024 > RX-TX | Tc |
| RX-TX\_0000001 | -985024  RX-TX < -985023.5 | Tc |
| RX-TX\_0000002 | -985023.5  RX-TX < -985023 | Tc |
|  |  | … |
| RX-TX\_1970048 | -0.5  RX-TX < 0 | Tc |
| RX-TX\_1970049 | 0  RX-TX < 0.5 | Tc |
| … | … | … |
| RX-TX\_3940095 | 985023  RX-TX < 985023.5 | Tc |
| RX-TX\_3940096 | 985023.5  RX-TX < 985024 | Tc |
| RX-TX\_3940097 | 985024  RX-TX | Tc |

Table 13.2.1-8: Measurement report mapping for k = -2.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_0000000 | -985024 > RX-TX | Tc |
| RX-TX\_0000001 | -985024  RX-TX < -985023.75 | Tc |
| RX-TX\_0000002 | -985023.75  RX-TX -985023.5 | Tc |
|  |  | … |
| RX-TX\_3940096 | -0.25  RX-TX < 0 | Tc |
| RX-TX\_3940097 | 0  RX-TX < 0.25 | Tc |
| … | … | … |
| RX-TX\_7880191 | 985023.5  RX-TX < 985023.75 | Tc |
| RX-TX\_7880192 | 985023.75  RX-TX < 985024 | Tc |
| RX-TX\_7880193 | 985024  RX-TX | Tc |

Table 13.2.1-9: Measurement report mapping for k = -3.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_0000000 | -985024 > RX-TX | Tc |
| RX-TX\_0000001 | -985024  RX-TX < -985023.875 | Tc |
| RX-TX\_0000002 | -985023.875  RX-TX -985023.75 | Tc |
|  |  | … |
| RX-TX\_7880192 | -0.125  RX-TX < 0 | Tc |
| RX-TX\_7880193 | 0  RX-TX < 0.125 | Tc |
| … | … | … |
| RX-TX\_15760383 | 985023.75  RX-TX < 985023.875 | Tc |
| RX-TX\_15760384 | 985023.875  RX-TX < 985024 | Tc |
| RX-TX\_15760385 | 985024  RX-TX | Tc |

Table 13.2.1-10: Measurement report mapping for k = -4.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_0000000 | -985024 > RX-TX | Tc |
| RX-TX\_0000001 | -985024  RX-TX < -985023.9375 | Tc |
| RX-TX\_0000002 | -985023.9375  RX-TX -985023.875 | Tc |
|  |  | … |
| RX-TX\_15760384 | -0.0625  RX-TX < 0 | Tc |
| RX-TX\_15760385 | 0  RX-TX < 0.0625 | Tc |
| … | … | … |
| RX-TX\_31520767 | 985023.875  RX-TX < 985023.9375 | Tc |
| RX-TX\_31520768 | 985023.9375  RX-TX < 985024 | Tc |
| RX-TX\_31520769 | 985024  RX-TX | Tc |

Table 13.2.1-11: Measurement report mapping for k = -5.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_00000000 | -985024 > RX-TX | Tc |
| RX-TX\_00000001 | -985024  RX-TX < -985023.9688 | Tc |
| RX-TX\_00000002 | -985023.9688  RX-TX -985023.9375 | Tc |
|  |  | … |
| RX-TX\_31520768 | -0.0312  RX-TX < 0 | Tc |
| RX-TX\_31520769 | 0  RX-TX < 0.0312 | Tc |
| … | … | … |
| RX-TX\_63041535 | 985023.9375  RX-TX < 985023.9688 | Tc |
| RX-TX\_63041536 | 985023.9688  RX-TX < 985024 | Tc |
| RX-TX\_63041537 | 985024  RX-TX | Tc |

Table 13.2.1-12: Measurement report mapping for k = -6.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value | Measured Quantity Value | Unit |
| RX-TX\_00000000 | -985024 > RX-TX | Tc |
| RX-TX\_00000001 | -985024  RX-TX < -985023.9844 | Tc |
| RX-TX\_00000002 | -985023.9844  RX-TX -985023.9688 | Tc |
|  |  | … |
| RX-TX\_63041536 | -0.0156  RX-TX < 0 | Tc |
| RX-TX\_63041537 | 0  RX-TX < 0.0156 | Tc |
| … | … | … |
| RX-TX\_126083071 | 985023.9688  RX-TX < 985023.9844 | Tc |
| RX-TX\_126083072 | 985023.9844  RX-TX < 985024 | Tc |
| RX-TX\_126083073 | 985024  RX-TX | Tc |

### 13.2.1A Additional Path Report Mapping for gNB Rx-Tx

The reporting range of additional path for gNB Rx-Tx time difference, as defined in Clause 5.2.3 of TS 38.215 [4], is defined from -8175×Tc to 8175×Tc. The reporting resolution is uniform across the reporting range and is defined as T = Tc×2k where k is selected by gNB from the set {-6, -5, -4, -3, -2, -1, 0, 1, 2, 3, 4, 5}.

Tc is defined in TS 38.211 [6].

LMF provides a recommended resolution parameter, *timingReportingGranularityFactor* [35]. gNB selects parameter k based on *timingReportingGranularityFactor* [35] and informs the LMF.

The mapping of measured quantity for each reporting resolution (k) is defined in Table 13.2.1A-1 to Table 13.2.1A-12.

Table 13.2.1A-1: Measurement report mapping for k = 0.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174 | Tc |
| path\_00002 | -8174 ≤ Δpath < -8173 | Tc |
| … | … | … |
| path\_08175 | -1 ≤ Δpath < 0 | Tc |
| path\_08176 | 0 ≤ Δpath < 1 | Tc |
| … | … | … |
| path\_16349 | 8173 ≤ Δpath < 8174 | Tc |
| path\_16350 | 8174 ≤ Δpath < 8175 | Tc |
| path\_16351 | 8175 ≤ Δpath | Tc |

Table 13.2.1A-2: Measurement report mapping for k = 1.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8175 | Tc |
| path\_0001 | -8175 ≤ Δpath < -8173 | Tc |
| path\_0002 | -8173 ≤ Δpath < -8171 | Tc |
| … | … | … |
| path\_4088 | -1 ≤ Δpath < 1 | Tc |
| … | … | … |
| path\_8174 | 8171 ≤ Δpath < 8173 | Tc |
| path\_8175 | 8173 ≤ Δpath < 8175 | Tc |
| path\_8176 | 8175 ≤ Δpath | Tc |

Table 13.2.1A-3: Measurement report mapping for k = 2.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8174 | Tc |
| path\_0001 | -8174 ≤ Δpath < -8170 | Tc |
| path\_0002 | -8170 ≤ Δpath < -8166 | Tc |
| … | … | … |
| path\_2044 | -2 ≤ Δpath < 2 | Tc |
| … | … | … |
| path\_4086 | 8166 ≤ Δpath < 8170 | Tc |
| path\_4087 | 8170 ≤ Δpath < 8174 | Tc |
| path\_4088 | 8174 ≤ Δpath | Tc |

Table 13.2.1A-4: Measurement report mapping for k = 3.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8172 | Tc |
| path\_0001 | -8172 ≤ Δpath < -8164 | Tc |
| path\_0002 | -8164 ≤ Δpath < -8156 | Tc |
| … | … | … |
| path\_1022 | -4 ≤ Δpath < 4 | Tc |
| … | … | … |
| path\_2042 | 8156 ≤ Δpath < 8164 | Tc |
| path\_2043 | 8164 ≤ Δpath < 8172 | Tc |
| path\_2044 | 8172 ≤ Δpath | Tc |

Table 13.2.1A-5: Measurement report mapping for k = 4.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_0000 | Δpath < -8168 | Tc |
| path\_0001 | -8168 ≤ Δpath < -8152 | Tc |
| path\_0002 | -8152 ≤ Δpath < -8136 | Tc |
| … | … | … |
| path\_511 | -8 ≤ Δpath < 8 | Tc |
| … | … | … |
| path\_1020 | 8136 ≤ Δpath < 8152 | Tc |
| path\_1021 | 8152 ≤ Δpath < 8168 | Tc |
| path\_1022 | 8168 ≤ Δpath | Tc |

Table 13.2.1A-6: Measurement report mapping for k = 5.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
| path\_000 | Δpath < -8160 | Tc |
| path\_001 | -8160 ≤ Δpath < -8128 | Tc |
| path\_002 | -8128 ≤ Δpath < -8096 | Tc |
| … | … | … |
| path\_256 | 0 ≤ Δpath < 32 | Tc |
| … | … | … |
| path\_509 | 8096 ≤ Δpath < 8128 | Tc |
| path\_510 | 8128 ≤ Δpath < 8160 | Tc |
| path\_511 | 8160 ≤ Δpath | Tc |

Table 13.2.1A-7: Measurement report mapping for k = -1.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.5 | Tc |
| path\_00002 | -8174.5 ≤ Δpath < -8174 | Tc |
| … | … | … |
| path\_16350 | -0.5 ≤ Δpath < 0 | Tc |
| path\_16351 | 0 ≤ Δpath < 0.5 | Tc |
| … | … | … |
| path\_32699 | 8174 ≤ Δpath < 8174.5 | Tc |
| path\_32700 | 8174.5 ≤ Δpath < 8175 | Tc |
| path\_32701 | 8175 ≤ Δpath | Tc |

Table 13.2.1A-8: Measurement report mapping for k = -2.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_00000 | Δpath < -8175 | Tc |
| path\_00001 | -8175 ≤ Δpath < -8174.75 | Tc |
| path\_00002 | -8174.75 ≤ Δpath < -8174.5 | Tc |
| … | … | … |
| path\_32700 | -0.25 ≤ Δpath < 0 | Tc |
| path\_32701 | 0 ≤ Δpath < 0.25 | Tc |
| … | … | … |
| path\_65399 | 8174.5 ≤ Δpath < 8174.75 | Tc |
| path\_65400 | 8174.75 ≤ Δpath < 8175 | Tc |
| path\_65401 | 8175 ≤ Δpath | Tc |

Table 13.2.1A-9: Measurement report mapping for k = -3.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.875 | Tc |
| path\_000002 | -8174.875 ≤ Δpath < -8174.75 | Tc |
| … | … | … |
| path\_065400 | -0.125 ≤ Δpath < 0 | Tc |
| path\_065401 | 0 ≤ Δpath < 0.125 | Tc |
| … | … | … |
| path\_130799 | 8174.75 ≤ Δpath < 8174.875 | Tc |
| path\_130800 | 8174.875 ≤ Δpath < 8175 | Tc |
| path\_130801 | 8175 ≤ Δpath | Tc |

Table 13.2.1A-10: Measurement report mapping for k = -4.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.9375 | Tc |
| path\_000002 | -8174.9375 ≤ Δpath < -8174.875 | Tc |
| … | … | … |
| path\_130800 | -0.0625 ≤ Δpath < 0 | Tc |
| path\_130801 | 0 ≤ Δpath < 0.0625 | Tc |
| … | … | … |
| path\_261599 | 8174.875 ≤ Δpath < 8174.9375 | Tc |
| path\_261600 | 8174.9375 ≤ Δpath < 8175 | Tc |
| path\_261601 | 8175 ≤ Δpath | Tc |

Table 13.2.1A-11: Measurement report mapping for k = -5.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.9688 | Tc |
| path\_000002 | -8174.9688 ≤ Δpath < -8174.9375 | Tc |
| … | … | … |
| path\_261600 | -0.0312 ≤ Δpath < 0 | Tc |
| path\_261601 | 0 ≤ Δpath < 0.0312 | Tc |
| … | … | … |
| path\_523199 | 8174.9375 ≤ Δpath < 8174.9688 | Tc |
| path\_523200 | 8174.9688 ≤ Δpath < 8175 | Tc |
| path\_523201 | 8175 ≤ Δpath | Tc |

Table 13.2.1A-12: Measurement report mapping for k = -6.

|  |  |  |
| --- | --- | --- |
| Reported Quantity Value,  path\_i | Measured Quantity Value,  Δpath | Unit |
|
| path\_000000 | Δpath < -8175 | Tc |
| path\_000001 | -8175 ≤ Δpath < -8174.9844 | Tc |
| path\_000002 | -8174.9844 ≤ Δpath < -8174.9688 | Tc |
| … | … | … |
| path\_523200 | -0.0156 ≤ Δpath < 0 | Tc |
| path\_523201 | 0 ≤ Δpath < 0.0156 | Tc |
| … | … | … |
| path\_1046399 | 8174.9688≤ Δpath < 8174.9844 | Tc |
| path\_1046400 | 8174.9844 ≤ Δpath < 8175 | Tc |
| path\_1046401 | 8175 ≤ Δpath | Tc |

## **--- End of Change #5 ---**

## **--- Start of Change #6\_2 ---**

## A.3.31 PRS Configurations

### A.3.31.1. PRS Configurations for FR1

#### A.3.31.1.1. PRS pattern 1 in FR1: SCS=15 kHz

Table A.3.31.1.1-1: PRS.1 FR1: PRS Pattern 1 for SCS=15 kHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| PRS Parameters | Values | | | | | |
| Reference channel | PRS.1.1 FR1 | PRS.1.2 FR1 | PRS.1.3 FR1 | | PRS.1.4 FR1 | |
| Resource index in resource set | 0 | 0 | 0 | 1 | 0 | 1 |
| PRS periodicity | 160ms | | | | | |
| PRS Resource set slot offset Note 1 | 10 ms | | | | | |
| PRS Resource slot offset (slot) Note 1 | 0 | 4 | 0 | | 4 | |
| PRS RE offset Note 1 | 0 | | 0 | 1 | 0 | 1 |
| SCS | 15kHz | | | | | |
| PRS comb size | 2 | 4 | 2 | | 4 | |
| Number of PRS symbol | 4 | 4 | 4 | | 4 | |
| Repetion factor | 2 | 1 | 2 | | 1 | |
| PRS resource time gap (slot) | 1 | 1 | 1 | | 1 | |
| RB numbers containing PRS within channel BW Note 1 | 0-23 | 0-103 | 0-23 | | 0-103 | |
| PRS Start PRB | 0 | | | | | |
| Note 1: Unless otherwise specified in the test case | | | | | | |

#### A.3.31.1.2. PRS pattern 2 in FR1: SCS=30 kHz

Table A.3.31.1.2-1: PRS.2 FR1: PRS Pattern 2 for SCS=30 kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| PRS Parameters | Values | | | | | | |
| Reference channel | PRS.2.1 FR1 | PRS.2.2 FR1 | PRS.2.3 FR1 | | PRS.2.4 FR1 | | PRS.2.5 FR1 |
| Resource index in resource set | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| PRS periodicity | 160 ms | | | | | | |
| PRS Resource set slot offset Note 1 | 10 ms | | | | | | |
| PRS Resource slot offset (slot) Note 1 | 0 | 4 | 0 | | 4 | | 0 |
| PRS RE offset Note 1 | 0 | | 0 | 1 | 0 | 1 | 0 |
| SCS | 30 kHz | | | | | | |
| PRS comb size | 2 | 4 | 2 | | 4 | | 4 |
| Number of PRS symbol | 4 | 4 | 4 | | 4 | | 4 |
| Repetion factor | 2 | 1 | 2 | | 1 | | 1 |
| PRS resource time gap (slot) | 1 | 1 | 1 | | 1 | | 1 |
| RB numbers containing PRS within channel BW Note 1 | 0-23 | 0-131 | 0-23 | | 0-131 | | 0-47 |
| PRS Start PRB | 0 | | | | | | |
| Note 1: Unless otherwise specified in the test case. | | | | | | | |

### A.3.31.2. PRS Configurations for FR2

#### A.3.31.2.1. PRS pattern 1 in FR2: SCS=120 kHz

Table A.3.31.2.1-1: PRS.1 FR2: PRS Pattern 1 for SCS=120 kHz

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| PRS Parameters | Values | | | | | | |
| Reference channel | PRS.1.1 FR2 | PRS.1.2 FR2 | PRS.1.3 FR2 | | PRS.1.4 FR2 | | PRS.1.5 FR2 |
| Resource index in resource set | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| PRS periodicity | 160 ms | | | | | | |
| PRS Resource set slot offset Note 1 | 10 ms | | | | | | |
| PRS Resource slot offset (slot) Note 1 | 0 | 4 | 0 | | 4 | | 0 |
| PRS RE offset Note 1 | 0 | | 0 | 1 | 0 | 1 | 0 |
| SCS | 120 kHz | | | | | | |
| PRS comb size | 2 | 4 | 2 | | 4 | | 4 |
| Number of PRS symbol | 4 | 4 | 4 | | 4 | | 4 |
| Repetion factor | 2 | 1 | 2 | | 1 | | 1 |
| PRS resource time gap (slot) | 1 | 1 | 1 | | 1 | | 1 |
| RB numbers containing PRS within channel BW Note 1 | 0-31 | 0-127 | 0-31 | | 0-127 | | 0-63 |
| PRS Start PRB | 0 | | | | | | |
| Note 1: Unless otherwise specified in the test case. | | | | | | | |

## **--- End of Change #6\_2 ---**

## **--- Start of Change #6\_3 ---**

### A.3.34.2 Test cases in RRC\_INACTIVE state

In Annex A, PRS measurement test cases are defined with 4 samples and with reduced number of samples in RRC\_INACTIVE state. The testing principle for these test cases is as follows:

- A UE capable of *supportedDL-PRS-ProcessingSamples-RRC-Inactive* [34] is only required to pass the test cases with reduced number of samples.

- A UE not capable of *supportedDL-PRS-ProcessingSamples-RRC-Inactive* [34] is required to pass the test cases with 4 samples.

In Annex A, PRS measurement delay test cases are defined for both PRS-RSRP and PRS-RSRPP measurements in RRC\_INACTIVE state when UE is configured with DRX cycle and eDRX cycle > 10.24s for positioning measurements. The testing principle for these test cases is as follows:

* A UE capable of both PRS-RSRP and PRS-RSRPP measurements is required to pass either PRS-RSRP measurement delay test or PRS-RSRPP measurement delay test.

In Annex A, PRS measurement delay test cases are defined for both RSTD and UE Rx-Tx time difference measurements in RRC\_INACTIVE state when UE is configured with DRX cycle and eDRX cycle > 10.24s for positioning measurements. The testing principle for these test cases is as follows:

* A UE capable of both RSTD and UE Rx-Tx time difference measurements is required to pass either RSTD measurement delay test or UE Rx-Tx time difference measurement delay test.

## **--- End of Change #6\_3 ---**

## **--- Start of Change #6\_4 ---**

### A.3.34.X Testing principles for positioning measurements by aggregating PRS resources from multiple PFLs

In Annex A, test cases for measurement delay requirement and accuracy requirement for positioning measurements by aggregating PRS resources from multiple PLFs are defined. While verifying the UE capability to meet the requirements defined for the positioning measurements by aggregating PRS resources from multiple PFLs, a UE capable of both RSTD and UE Rx-Tx time difference measurements by aggregating PRS resources from multiple PFLs is required to pass either PRS aggregation based RSTD measurement delay test or PRS aggregation-based UE Rx-Tx time difference measurement delay test.

### A.3.34.X1 Testing principles for carrier phase measurement for positioning

In Annex A, test cases for measurement delay requirement and accuracy requirement for carrier phase measurement reported together with legacy positioning measurement are defined. While verifying the UE capability to meet the requirements defined for the carrier phase measurement reported together with the legacy positioning measurement, a UE capable of both RSCPD with RSTD and RSCP with UE Rx-Tx time difference measurements is required to pass either RSCPD with RSTD measurement delay test or RSCP with UE Rx-Tx time difference measurement delay test.

### A.3.34.Y Test cases in RRC\_IDLE state

For the measurements supported by the UE in both RRC\_IDLE and RRC\_INACTIVE modes, UE shall pass the test cases for RRC\_IDLE mode and does not need to be tested for the same measurement in RRC\_INACTIVE mode.

## **--- End of Change #6\_4 ---**

## **--- Start of Change #6\_5 ---**

### A.3.35.1 Introduction

This clause defines testing principles which are applicable to test cases verifying RRM requirements for RedCap UE and test cases verifying PRS measurement requirements for RedCap UE.

### A.3.35.2 Principle of testing for FR1

For RedCap UEs supporting 1 Rx branch, all single carrier tests specified in clause A.16 and A.18 except for tests defined for 2 Rx and/or FR2 shall be tested on any band.

For RedCap UEs supporting 2Rx branches, all single carrier tests specified in clause A.16 and A.18 except for tests defined for 1 Rx and/or FR2 shall be tested on any band.

### A.3.35.3 Principle of testing for FR2

For RedCap UEs, all single carrier tests specified in clause A.17 and A.18 except for tests defined for FR1 shall be tested on any band.

### A.3.35.X Principle of testing for PRS measurement

In Annex A, test cases for measurement delay requirement and accuracy requirement for PRS measurement for RedCap UE are defined. The following testing principles are applied while verifying the RedCap UE capability to meet the PRS measurement requirements.

* A UE capable of both PRS-RSRP and PRS-RSRPP measurements is required to pass either PRS-RSRP measurement delay test or PRS-RSRPP measurement delay test.
* A UE capable of both RSTD and UE Rx-Tx time difference measurements is required to pass either RSTD measurement delay test or UE Rx-Tx time difference measurement delay test.
* A UE capable of performing PRS measurement with RX FH is only required to pass the measurement delay test cases for PRS measurement with RX FH.
* For the measurements supported by the UE in both RRC\_IDLE and RRC\_INACTIVE modes, UE shall pass the test cases for RRC\_IDLE mode and does not need to be tested for the same measurement in RRC\_INACTIVE mode.

## **--- End of Change #6\_5 ---**

## **--- Start of Change #6\_6 ---**

## A.3.X NR Sidelink Measurements for Positioning

### A.3.X.1 Introduction

This clause defines the principles and the reference configurations that are applicable to test cases verifying RRM requirements for NR sidelink measurements for positioning.

### A.3.X.2 NR SL-PRS configurations

### A.3.X.2.1 NR SL-PRS configurations for FR1

Table A.3.X.2.1-1: SL PRS.1 FR1: SL-PRS configuration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL PRS Parameters | Values | | | |
| Reference channel | SL PRS.1.1 FR1 | SL PRS.1.2 FR1 | SL PRS.1.3 FR1 | SL PRS.1.4 FR1 |
| SCS | 15kHz, 30kHz | | | |
| SL-PRS comb size | 2 | | 4 | |
| Number of SL-PRS symbols | 4 | | 4 | |
| SL-PRS comb offset Note 1 | [1] | | [1] | |
| SL-PRS resource slot offset (slot) Note 1 | [0] | [4] | [0] | [4] |
| RB numbers containing SL PRS within channel Bandwidth Note 1 | [48] | | [96] | |
| SL-PRS starting PRB | [4] | | [4] | |
| Note 1: Unless otherwise specified in the test case | | | | |

## A.3.Y DL-PRS Measurement Time Window configurations

Table A.3.Y-1: Reference configuration for DL-PRS Measurement Time Window

|  |  |  |  |
| --- | --- | --- | --- |
| DL-PRS Measurement Time Window Parameters | Unit | Values | |
| Reference DL-PRS Measurement Time Window |  | MTW.1 | MTW.2 |
| Number of configuration elements |  | 1 | 1 |
| Start SFN |  | 0 | 0 |
| Periodicity | slot | Note 1 | Note 4 |
| Slot and Symbol Offset | slot | Note 2 | Note 2 |
| Duration | slot | 4 | 4 |
| Associated PFL index |  | 0 | 0 |
| Associated PRS resource set index |  | Note 3 | Note 3 |
| Note 1: Same as 2\*(PRS resource set periodicity as used in the test case).  Note 2: Same as PRS resource with smallest slot and symbol offset as used in the test case.  Note 3: Include all PRS resource sets of all TRPs used in the test case.  Note 4: Same as 2\*(DRX cycle as used in the test case). | | | |

## **--- End of Change #6\_6 ---**

## **--- Start of Change #6\_7 ---**

A.6.2.2.1 Cell reselection to FR1 intra-frequency NR case with RRC\_ INACTIVE eDRX and positioning SRS

A.6.2.2.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra-frequency NR cell reselection requirements specified in clause 5.6.1A.2, when UE is in RRC\_INACTIVE and configured with eDRX and to transmit SRS for positioning.

A.6.2.2.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.6.2.2.1.2-1, A.6.2.2.1.2-2 and A.6.2.2.1.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2. UE is configured with transmit SRS for positioning in cell 1.

**Table A.6.2.2.1.2-1: Supported test configurations**

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

**Table A.6.2.2.1.2-2: General test parameters for intra frequency NR cell re-selection test case**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | | **Unit** | **Test configuration** | **Value** | **Comment** |
|  | |  |
| Initial condition | Active cell |  | 1, 2, 3 | Cell1 |  |
| T2 end condition | Active cell |  | 1, 2, 3 | Cell2 |  |
| Neighbour cells |  | 1, 2, 3 | Cell1 |  |
| RF Channel Number | |  | 1, 2, 3 | 1 |  |
| Time offset between cells | |  | 1 | 3 ms | Asynchronous cells |
|  | |  | 2 | 3 μs | Synchronous cells |
|  | |  | 3 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2, 3 | Not Sent | No additional delays in random access procedure. |
| SSB configuration | |  | 1 | SSB.1 FR1 |  |
|  | |  | 2 | SSB.1 FR1 |  |
|  | |  | 3 | SSB.2 FR1 |  |
| SMTC configuration | |  | 1 | SMTC.2 | Configured in SIB2 of Cell 1 |
| SMTC.6 | Configured in SIB2 of Cell 2 |
| 2 | SMTC.1 |  |
| 3 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2, 3 | 1.28 | The value shall be used for all cells in the test. |
| CN and RAN eDRX configuration | |  | Config 1 | eDRX cycle = 40.96s  PTW length = 1.28s |  |
| PRACH configuration index | |  | 1, 2, 3 | 102 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2, 3 | Not configured |  |
| T1 | | s | 1, 2, 3 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 1, 2, 3 | 120 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

**Table A.6.2.2.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  |  | **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC |  | 1 | SR.1.1 FDD | | SR.1.1 FDD | |
| configuration |  | 2 | SR.1.1 TDD | | SR.1.1 TDD | |
|  |  | 3 | SR.2.1 TDD | | SR.2.1 TDD | |
| RMSI CORESET |  | 1 | CR.1.1 FDD | | CR.1.1 FDD | |
| RMC configuration |  | 2 | CR.1.1 TDD | | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | | CR.2.1 TDD | |
| Dedicated CORESET |  | 1 | CCR.1.1 FDD | | CCR.1.1 FDD | |
| RMC configuration |  | 2 | CCR.1.1 TDD | | CCR.1.1 TDD | |
|  |  | 3 | CCR.2.1 TDD | | CCR.2.1 TDD | |
| OCNG Pattern |  | 1, 2, 3 | OP.1 defined in A.3.2.1 | | OP.1 defined in A.3.2.1 | |
| Initial DL BWP configuration |  | 1, 2, 3 | DLBWP.0.1 | | DLBWP.0.1 | |
| Initial UL BWP configuration |  | 1, 2, 3 | ULBWP.0.1 | | ULBWP.0.1 | |
| RLM-RS |  | 1, 2, 3 | SSB | | SSB | |
| Periodicity of SRS for positioning | s | 1, 2, 3 | 5.12 | | N/A | |
| Qrxlevmin | dBm/SCS | 1, 2 | -130 | | -130 | |
|  |  | 3 | -127 | | -127 | |
| Pcompensation | dB | 1, 2, 3 | 0 | | 0 | |
| Qhysts | dB | 1, 2, 3 | 0 | | 0 | |
| Qoffsets, n | dB | 1, 2, 3 | 0 | | 0 | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2, 3 | SS-RSRP | | SS-RSRP | |
|  | dB | 1 | 16 | -3.11 | -infinity | 2.79 |
|  |  | 2 |  |  |
|  |  | 3 |  |  |
| Note2 | dBm/SCS | 1 | -98 | | | |
|  |  | 2 | -98 | | | |
|  |  | 3 | -95 | | | |
| Note2 | dBm/15 kHz | 1 | -98 | | | |
|  |  | 2 |  | | | |
|  |  | 3 |  | | | |
|  | dB | 1 | 16 | 13 | -infinity | 16 |
|  |  | 2 |  |  |
|  |  | 3 |  |  |
| SS-RSRP Note3 | dBm/SCS | 1 | -82 | -85 | -infinity | -82 |
|  |  | 2 | -82 | -85 | -infinity | -82 |
|  |  | 3 | -79 | -82 | -infinity | -79 |
| Io | dBm/9.36 MHz | 1 | -53.94 | -52.21 | Same as parameters specified in Cell 1 columns- | |
|  | dBm/9.36 MHz | 2 | -53.94 | -52.21 |  | |
|  | dBm/38.16 MHz | 3 | -47.85 | -46.12 |  | |
| Treselection | s | 1, 2, 3 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2, 3 | 60 | | 60 | |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

A.6.2.2.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration update on Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 119 s.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect, NR\_Intra + TSI-NR,

Where:

Tdetect, NR\_Intra See Table 5.6.1A.2-1 in clause 5.6.1A.2

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

This gives a total of 119.04 s, allow 120 s for the cell re-selection delay to a newly detectable cell.

**--- other sections ---**

##### A.6.6.12.X NR RSTD measurement reporting delay test case for PRS aggregation in FR1 SA in RRC\_CONNECTED mode

###### A.6.6.12.X.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement by aggregating PRS resources from multiple positioning frequency layers (PFLs) meets the measurement period requirements specified in Clause 9.9.2.10 in an environment with AWGN propagation conditions in FR1.

The supported test configurations are specified in Table A.6.6.12.X.1-1.

Table A.6.6.12.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth per PFL, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth per PFL, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth per PFL, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells.

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 resources on multiple positioning frequency layers 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 6.5.10], shall be provided to the UE during T1. The UE is capable of performing RSTD measurements by aggregating PRS resources from multiple PFLs and is configured by the LMF to perform measurements by aggregating the PRS resources from multiple positioning frequency layers via *jointMeasurementsReq*. The resources to be aggregated for RSTD measurement are indicated by the LMF to the UE via *nr-DL-PRS-JointMeasurementRequestedPFL-List*.

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 measurement gap instance containing the PRS resources.

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

The general test parameters are listed in Table A.6.6.12.X.1-2, and cell specific test parameters are listed in Table A.6.6.12.X.1-3.

Table A.6.6.12.X.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 place in the respective neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.1.1 TDD |  |
| Config 3 |  | CCR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Config 1,2,3 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Config 1,2,3 |  | ULBWP.1.1 |  |
| PRS Configuration per PFL | Config 1 |  | PRS.1.2 FR1 | As specified in clause A.3.31. |
| Config 2 |  | PRS.1.2 FR1 |
| Config 3 |  | PRS.2.2 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2) mod 6=0  and  (PCI of Cell 1 – PCI of Cell 3) mod 6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| 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 expected RSTD 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 | |  | 4 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to *NR-MutingPattern* defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

Table A.6.6.X.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 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | N/A | N/A |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  19.08MHz | -56.54 | -56.54 | -66.96 |
| Config 2 | dBm/  19.08MHz | -56.54 | -56.54 | --66.96 |
| Config 3 | dBm/  47.88MHz | -52.56 | -52.56 | -62.97 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

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

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| NR RF Channel Number Note 5 | |  | 1,2 | 1,2 | 1,2 |
| Positiong frequency layer (PFL) | |  | 1,2 | 1,2 | 1,2 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| EPRE ratio of PRS to SSS | |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1 | dB | -5.7 | -11.9 | -13 |
| Config 2 | dB | -5.7 | -11.9 | -13 |
| Config 3 | dB | -5.7 | -11.9 | -13 |
| Io Note 4 | Config 1 | dBm/  19.08MHz per PFL | -65.70 | -65.70 | -66.74 |
| Config 2 | dBm/  19.08MHz per PFL | -65.70 | -65.70 | -66.74 |
| Config 3 | dBm/  47.88MHz per PFL | -61.72 | -61.72 | -62.76 |
| PRS | | dB | -6 | -13 | -13 |
| 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.  Note 5: Carriers are intra-band and contiguous. | | | | | | |

###### A.6.6.X.2.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 9.9.2.10.

The UE shall perform and report the RSTD measurements by aggregating PRS resources from multiple positioning frequency layers for Cell 2 and Cell 3 with respect to the reference cell in the DL-TDOA assistance data, Cell 1, within the time duration specified in section 9.9.2.10 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 10.1.x.x, i.e., between RSTD\_000000000 and RSTD\_126083073.

##### A.6.6.12.X NR RSCPD with RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_CONNECTED state

###### A.6.6.12.X.1 Test Purpose and Environment

The purpose of the test is to verify that the DL RSCPD measurement reported together with the RSTD measurement meets the requirements specified in Clause 9.9.7 in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured to the UE.

The supported test configurations are specified in Table A.6.6.12.X.1-1.

Table A.6.6.12.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall 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 6.5.10], shall be provided to the UE during T1. In *nr-DL-TDOA-RequestLocationInformation,* the UE is configured to perform DL RSCPD measurement via *nr-DL-PRS-RSCPD-Request*. The UE is configured to perform both RSCPD and RSTD measurements within the time window indicated to UE via *nr-DL-PRS-MeasurementTimeWindowsConfig*. 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 to be measured within the configured time window.

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

The general test parameters are listed in Table A.6.6.12.X.1-2, and cell specific test parameters are listed in Table A.6.6.12.X.1-3.

Table A.6.6.12.X.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 RSCPD and RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CCR.1.1 FDD |  |
| Config 2 |  | CCR.1.1 TDD |  |
| Config 3 |  | CCR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Config 1,2,3 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Config 1,2,3 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.1 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2) mod 6=0  and  (PCI of Cell 1 – PCI of Cell 3) mod 6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | |  | OFF |  |
| Measurement gap | |  | GP#24 or GP#0 | GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured |
| Time window configuration | |  | MTW.1 | As specified in clause A.3.Y |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance ta specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 4 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to *NR-MutingPattern* defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

Table A.6.6.12.X.1-3: Cell-specific test parameters for RSCPD with RSTD measurement reporting delay during T1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| EPRE ratio of PSS to SSS | | dB | 0 | N/A | N/A |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 2 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 3 | dBm/  47.88MHz | -52.56 | -52.56 | -52.56 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

Table A.6.6.12.X.1-4: Cell-specific test parameters for RSCPD with RSTD measurement reporting delay during T2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| EPRE ratio of PSS to SSS | | dB | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | |
| EPRE ratio of PBCH to PBCH DMRS | |
| EPRE ratio of PDCCH DMRS to SSS | |
| EPRE ratio of PDCCH to PDCCH DMRS | |
| EPRE ratio of PDSCH DMRS to SSS | |
| EPRE ratio of PDSCH to PDSCH DMRS | |
| EPRE ratio of OCNG DMRS to SSSNote 1 | |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| SSB | Config 1~3 | dB | 10 | 3 | 3 |
| Io Note 4 | Config 1 | dBm/  19.08MHz | -65.43 | -65.43 | -65.43 |
| Config 2 | dBm/  19.08MHz | -65.43 | -65.43 | -65.43 |
| Config 3 | dBm/  47.88MHz | -61.44 | -61.44 | -61.44 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -95 | -95 |
| Config 2 | dBm/SCS | -88 | -95 | -95 |
| Config 3 | dBm/SCS | -85 | -92 | -92 |
| PRS | | dB | -6.00 | -12.98 | -12.98 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells 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.6.6.12.X.2 Test Requirements

The RSCPD reported together with RSTD measurement time fulfils the requirements specified in the clause 9.9.7.

The UE shall perform and report the RSCPD and 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 9.9.7 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 DL RSCPD measurement for each neighbour cell observed during the repeated tests shall be at least 90%. The reported DL RSCPD measurement shall be within the DL RSCPD reporting range specified in the Clause 10.1.Y1 and the reported RSTD measurement shall be within the RSTD reporting range specified in the Clause 10.1.23.

#### A.6.6.14.X UE Rx-Tx time difference measurements with PRS bandwidth aggregation in FR1 SA

##### A.6.6.14.X.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 9.9.4.9 for UE Rx-Tx measurements with PRS bandwidth aggregation. The tests are conducted under AWGN propagation condition with the UE operating in FR1 stand-alone mode and configured to perform UE Rx-Tx measurements by aggregating two intra-band contiguous positioning frequency layers (PFLs) in FR1.

The supported test configurations in listed in Table A.6.6.14.X.1-1.

Table A.6.6.14.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| PCell configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are two cells in the test: Cell 1 (PCell) and Cell 2 (neighbor cell). Each cell is sssociated with a different TRP/DL PRS ID in the *NR-DL-PRS-AssistanceData* [34]. Cell 1 transmissions other than DL PRS are allocated in RF channel #1. In addition, both cells/TRPs transmit DL PRS in two intra-band contiguous PFLs in RF channel #1 and RF channel #2.. PFL1 is allocated within RF channel #1 and PFL2 is allocated within RF channel #2. Except for the frequency offset between them, both PFLs have identical PRS configuration.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 transmit PRS only during the second time interval of duration T2. Similarly, the UE is configured to transmit positioning SRS during only during the second time interval of duration T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *NR-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE during T1. The last TTI of the last message shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The *NR-Multi-RTT-ProvideAssistanceData* message provided to the UE must include *NR-DL-PRS-AggregationInfo-r18* linking each PRS resource in PFL1 to the corresponding PRS resource in PFL2.

The *NR-Multi-RTT-RequestLocationInformation* message provided to the UE must request bandwidth aggregated measurements via *jointMeasurementsReq* and *nr-DL-PRS-JointMeasurementRequestedPFL-List****.***

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

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

The general test parameters and cell specific test parameters are as given in Table A.6.6.14.X.1-2 and Table A.6.6.14.X.1-3 respectively.

Table A.6.6.14.X.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For both Cell 1 and Cell 2, all signals/channels except PRS in PFL2 are allocated within this channel. |
| 2 | For both Cell 1 and Cell 2, only PRS in PFL2 is allocated within this channel. |
| BWchannel | MHz | 1 | 20: NRB,c = 106 | For both RF channels |
| 2 | 20: NRB,c = 106 |
| 3 | 50: NRB,c = 133 |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells/TRPs |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 10 |  |
| Note 1: GP#24 is configured if the UE supports it, otherwise GP#0 is configured. | | | | |

Table A.6.6.14.X.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns Note 1 |  | 1, 2, 3 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1,4 |
| EPRE ratio of OCNG to OCNG DMRS Note 1, 4 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration (for both PFL1 and PFL2) |  | 1 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 2 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 3 | PRS.2.2 FR1 | | PRS.2.2 FR1 | |
| PRS muting info (*dl-PRS-MutingOption1*  for both PFL1 and PFL2) |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.1 | | N/A | |
|  | 2 | POS-SRS.1 | | N/A | |
|  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -111 |
|  | 2 | -Infinity | -101 | -Infinity | -111 |
|  | 3 | -Infinity | -98 | -Infinity | -108 |
| Io Note 3 (on symbols where PRS is not allocated) | dBm/19.08 MHz | 1 | N/A | -65.05 | N/A | -65.05 |
| dBm/19.08 MHz | 2 | -65.05 | -65.05 |
| dBm/47.88 MHz | 3 | -61.06 | -61.06 |
| Propagation Condition |  | 1, 2, 3 | 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 on all OFDM symbols except those in which PRS is allocated.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters and they are provided for information only. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |

##### A.6.6.14.X.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.9.

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

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause [10.1.25.3.1].

**--- other sections ---**

#### A.6.6.X PRS-RSRP measurement delay test case for RedCap positioning without Rx FH in RRC\_CONNECTED state in FR1

#### A.6.6.X.1 DL RSCP with UE Rx-Tx time difference measurement for single positioning frequency layer in FR1 SA

##### A.6.6.X.1.1 Test purpose and environment

The purpose of the test is to verify that the DL RSCP and UE Rx-Tx time difference measurements meet the requirements specified in clause 9.9.8.5 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured for both DL RSCP measurement and UE Rx-Tx time difference measurement.

The supported test configurations are listed in Table A.6.6.X.1.1-1.

Table A.6.6.X.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

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

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

The *NR-Multi-RTT-ProvideAssistanceData* message and *NR-Multi-RTT-RequestLocationInformation* message as defined in TS 37.355 [34], shall be provided to the UE during T1. In *NR-Multi-RTT-RequestLocationInformation,* the UE is configured to perform DL RSCP measurement via *nr-DL-PRS-RSCP-Request*. The UE is configured to perform both DL RSCP and UE Rx-Tx time difference measurements within the time window indicated to UE via *nr-DL-PRS-MeasurementTimeWindowsConfig*. The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources to be measured within the configured time window.

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

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are listed in Table A.6.6.X.1.1-2 and Table A.6.6.X.1.1-3.

Table A.6.6.X.1.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 20: NRB,c = 106 |  |
| 2 | 20: NRB,c = 106 |  |
| 3 | 50: NRB,c = 133 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX |  | 1, 2, 3 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Time window configuration |  | 1, 2, 3 | MTW.1 | As specified in clause A.3.Y |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 10 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

Table A.6.6.X.1.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 2 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 3 | PRS.2.2 FR1 | | PRS.2.2 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.1 | | N/A | |
|  | 2 | POS-SRS.1 | | N/A | |
|  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 | -Infinity | -108 |
|  | 2 | -Infinity | -100 | -Infinity | -108 |
|  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/19.08 MHz | 1 | N/A | -64.57 | N/A | -64.57 |
| dBm/19.08 MHz | 2 | -64.57 | -64.57 |
| dBm/47.88 MHz | 3 | -60.59 | -60.59 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.X.1.2 Test requirements

The DL RSCP with UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.8 with Nsample=4 for UE Rx-Tx time difference.

The UE shall perform and report the DL RSCP and UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified DL RSCP with UE Rx-Tx time difference measurement time specified in clause 9.9.8 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%. The reported DL RSCP measurement shall be within the DL RSCP reporting range specified in clause 10.1.Z1 and the reported UE Rx-Tx measurement shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.

#### A.6.6.X.1 PRS-RSRP measurement delay test case for single positioning frequency layer

##### A.6.6.X.1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement meets the delay requirements specified in clause 9.9.3.5 in an environment with AWGN propagation conditions. The test is applicable to 1 Rx or 2 Rx RedCap UE.

The supported test configurations are specified in Table A.6.6.X.1.1-1.

Table A.6.6.X.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 two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1. The test consists of two consecutive time intervals, with duration of T1 and T2. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. The 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 PRS-RSRP measurement with RX FH via *NR-DL-AoD-RequestLocationInformation* or the UE is configured by the LMF to perform PRS-RSRP measurement with RX FH but reports the PRS-RSRP measurement based on the single hop in *NR-DL-AoD-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

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

The general test parameters are listed in Table A.6.6.X.1.1-2, and cell specific test parameters are listed in Table A.6.6.X.1.1-3.

Table A.6.6.X.1.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Reference cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1, 2, 4 | 10: NRB,c = 52 |  |
| 3 | 20: NRB,c = 51 |  |
| SSB configuration |  | 1, 2, 4 | SSB.1 FR1 |  |
|  |  | 3 | SSB.1 RedCap FR1 |  |
| SMTC configuration |  | 1, 2, 3, 4 | SMTC.1 RedCap |  |
| Measurement gap |  | 1, 2, 3, 4 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX |  | 1, 2, 3, 4 | NA | OFF |
| Time offset between serving and neighbour cells | ms | 1, 2, 3, 4 | 3 | Synchronous cells |
| Expected RSTD | ms | 1, 2, 3, 4 | 3 |  |
| Expected RSTD uncertainty | ms | 1, 2, 3, 4 | 5 |  |
| T1 | s | 1, 2, 3, 4 | 2 |  |
| T2 | s | 1, 2, 3, 4 | 5 |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

Table A.6.6.X.1.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |
|  | 3 | SR.2.1.TDD | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1.TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1, 4 | TRS.1.1 FDD | | N/A | |
| 2 | TRS.1.1 TDD | |
| 3 | TRS.2.1 TDD | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3, 4 | DLBWP.1.1  RedCap | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3, 4 | ULBWP.1.1  RedCap | | N/A | |
| PRS configuration |  | 1, 4 | PRS.1.3 FR1 | | PRS.1.3 FR1 | |
|  | 2 | PRS.1.3 FR1 | | PRS.1.3 FR1 | |
|  | 3 | PRS.2.3 FR1 | | PRS.2.3 FR1 | |
| PRS muting info |  | 1, 2, 3, 4 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/9.36 MHz | 1, 4 | N/A | -66.22 | N/A | -66.22 |
|  | dBm/9.36 MHz | 2 | -66.22 | -66.22 |
|  | dBm/18.72 MHz | 3 | -63.22 | -63.22 |
| Propagation Condition |  | 1, 2, 3, 4 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.6.X.1.2 Test Requirements

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

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

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

**--- other sections ---**

##### A.6.7.13.X NR RSTD measurement accuracy test case for PRS aggregation in FR1 SA in RRC\_CONNECTED mode

###### A.6.7.13.X.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement by aggregating PRS resoureces from multiple positioning frequency layers (PFLs) meets the measurement accuracy requirements specified in clause 10.1.x.x in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.7.13.X.1-1.

Table A.6.7.13.X.1-1: Supported test configurations for PRS aggregation.

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth per PFL, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth per PFL, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth per PFL, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

Table A.6.7.13.X.1-2: RSTD accuracy test parameters for PRS aggregation.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Cell 1 | Cell 2 | |
| PRS ARFCN | 1~3 |  | freq1, freq2 | freq1, freq2 | |
| BWchannel per carrier | 1 | MHz | 20: NRB,c = 106 | | |
| 2 | 20: NRB,c = 106 | | |
| 3 | 50: NRB,c = 133 | | |
| Duplex mode | 1 |  | FDD | | |
| 2 | TDD | | |
| 3 | TDD | | |
| TDD configuration | 1 |  | N/A | | |
| 2 | TDDConf.1.1 | | |
| 3 | TDDConf.2.1 | | |
| Measurement gap | 1, 2, 3 |  | GP#24 or GP#0 | | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | | - |
| 2 | SR.1.1 TDD | |  |
| 3 | SR.2.1 FDD | |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | | - |
| 2 | CR.1.1 TDD | | - |
| 3 | CR.2.1 FDD | | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | | - |
| 2 | CCR.1.1 TDD | | - |
| 3 | CCR.2.1 TDD | | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | |
| 2 | SSB.1 FR1 | | |
| 3 | SSB.2 FR1 | | |
| OCNG Patterns | 1~3 |  | OP.1 | | |
| TRS configuration | 1 |  | TRS.1.1 FDD | | - |
| 2 | TRS.1.1 TDD | |  |
| 3 | TRS.1.2 TDD | |  |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 | | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 | | |
| Time offset with Cell 1 | 1 | μs | - | | 3 |
| 2,3 | - | | 3 |
| SMTC configuration | 1 |  | SMTC.2 | | |
| 2,3 | SMTC.1 | | |
| PRS configuration | 1 |  | PRS.1.2 FR1 | | |
| 2 | PRS.1.2 FR1 | | |
| 3 | PRS.2.2 FR1 | | |
| PRS Resource slot offset | 1, 2, 3 | slot | 0 | | 4 |
| Expected RSTD | 1, 2, 3 | μs | N/A | | 3 |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSS |
| EPRE ratio of OCNG to OCNG DMRS |
| EPRE ratio of PRS to SSS | 1~3 | dB | 0 | | 0 |
| Note2 | 1,2 | dBm/ SCS | -98 | | |
| 3 | -95 | | |
| PRS | 1~3 | dB | -6 | | -13 |
| PRP | 1,2 | dBm/SCS | -103.7 | | -109.9 |
| 3 | -100.7 | | -106.9 |
| Io | 1,2 | dBm/  19.08MHz per PFL | -65.70 | | -65.70 |
| 3 | dBm/  47.88MHz per PFL | -61.72 | | -61.72 |
| PRS | 1~3 | dB | -65.70 | | -65.70 |
| SSB | 1~3 | dB | -5.7 | | |
| Propagation condition | 1~3 | - | AWGN | | |

###### A.6.7.13.X.2 Test Requirements

The RSTD measurement accuracy shall fulfil the requirements defined in clause 10.1.x.x.

### A.6.7.x RSCP with UE Rx-Tx time difference measurements

#### A.6.7.x.1 RSCP with UE Rx-Tx time difference measurement accuracy in FR1 SA

##### A.6.7.x.2.1 Test purpose and environment

The purpose of the test is to verify that RSCP with UE Rx-Tx time difference measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.Z1.2. The test is conducted in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.6.7.x.2.1-1.

Table A.6.7.x.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

The *NR-Multi-RTT-ProvideAssistanceData* , *NR-Multi-RTT-RequestLocationInformation* with *nr-DL-PRS-RSCP-Request* from LMF via LPP [34] and *NR-Multi-RTT-MeasurementCapability* as defined in TS 37.355 [34, clause 6.5.12.] to enable UE to perform and report RSCP in RRC CONNECTED, shall be provided to the UE before the start of the test.

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

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

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

##### A.6.7.x.2.2 Test parameters

The RSCP with UE Rx-Tx time difference accuracy test parameters are given in Table A.6.7.x.2.2-1.

Table A.6.7.x.2.2-1: RSCP with UE Rx-Tx time difference measurement accuracy test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Test 1** | |
|  |  | Cell 1 | Cell 2 |
| RF Channel Number |  | 1,2,3 | 1 | 1 |
| Measurement gap |  | 1,2,3 | GP#24 or GP#0 Note 4 | |
| DRX |  | 1,2,3 | OFF | |
| Time offset with Cell 1 | μs | 1, 2, 3 | N/A | 3 |
| TDD configuration |  | 1 | N/A | N/A |
|  | 2 | TDDConf.1.1 | TDDConf.1.1 |
|  |  | 3 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | N/A |
|  | 2 | SR.1.1 TDD |  |
|  | 3 | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | N/A |
|  | 2 | CR.1.1 TDD |
|  |  | 3 | CR.2.1 TDD |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | N/A |
|  | 2 | CCR.1.1 TDD |
|  | 3 | CCR.2.1 TDD |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | N/A |
|  | 2 | TRS.1.1 TDD |
|  | 3 | TRS.1.2 TDD |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | N/A |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | N/A |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | N/A |
| PRS configuration |  | 1 | PRS.1.1 FR1 | PRS.1.1 FR1 |
|  |  | 2 | PRS.1.1 FR1 | PRS.1.1 FR1 |
|  |  | 3 | PRS.2.1 FR1 | PRS.2.1 FR1 |
| PRS BW |  | 1 | 52 PRBs | 52 PRBs |
|  | 2 | 52 PRBs | 52 PRBs |
|  | 3 | 48 PRBs | 48 PRBs |
| PRS Resource slot offset | slot | 1, 2, 3 | 0 | 4 |
| SRS configuration |  | 1 | POS-SRS.1 | N/A |
|  |  | 2 | POS-SRS.1 | N/A |
|  |  | 3 | POS-SRS.2 | N/A |
| Note 2 | dBm/SCS | 1 | -98 | |
|  | 2 | -98 | |
|  | 3 | -95 | |
| Note 2 | dBm/15 kHz | 1 | -98 | |
|  | 2 |  | |
|  | 3 |  | |
| PRS | dB | 1 | 0 | -6 |
|  | 2 |  |  |
|  |  | 3 |  |  |
| PRS | dB | 1 | 2.23 | -1.73 |
|  | 2 |  |  |
|  |  | 3 |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -95.77 | -99.73 |
|  | 2 | -95.77 | -99.73 |
|  | 3 | -92.77 | -96.73 |
| Io | dBm/19.08 MHz | 1 | -61.71 | -61.71 |
| dBm/19.08 MHz | 2 | -61.71 | -61.71 |
| dBm/47.88 MHz | 3 | -57.73 | -57.73 |
| Propagation Condition |  | 1, 2, 3 | AWGN | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

##### A.6.7.x.2.3 Test requirements

The RSCP with UE Rx-Tx time difference measurement fulfils RSCP with UE Rx-Tx measurement accuracy specified in clause 10.1.Z1.2 for both Cell 1 and Cell 2.

**--- other sections ---**

##### A.6.8.1.X NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_INACTIVE state when eDRX cycle > 10.24s for non-RedCap UE

###### A.6.8.1.X.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement meets the requirements specified in Clause 5.6.2.5 when the configured eDRX cycle is longer than 10.24s in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in Table A.6.8.1.X.1-1.

Table A.6.8.1.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

The test consists of two consecutive time intervals, with duration of T1 and T2. During time duration T1, the UE shall be in RRC\_CONNECTED state and shall not have any timing information of Cell 2 and Cell 3. During T2 UE shall be in RRC\_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 6.5.10], shall be provided to the UE during T1. The UE is configured to report positioning measurements every 20s via *reportingInterval* in *nr-DL-TDOA-RequestLocationInformation* such the value of *reportingInterval* is set to "*ri20*". The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the DL-TDOA assistance data and location information request.

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

The UE is configured with eDRX cycle of 40.96s.

The general test parameters are listed in Table A.6.8.1.X.1-2, and cell specific test parameters are listed in Table A.6.8.1.X.1-3 and Table A.6.8.1.X.1-4.

Table A.6.8.1.X.1-2: General test parameters for RSTD measurement reporting delay.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active UL BWP configuration | Config 1,2,3 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.2 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2) mod 6 = 0  and  (PCI of Cell 1 – PCI of Cell 3) mod 6 = 0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 1.28 |  |
| CN and RAN eDRX configuration | | s | eDRX length = 40.96  PTW length = 10.24 |  |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance ta specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 4 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to *NR-MutingPattern* defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.6.8.1.X.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 2 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 3 | dBm/  47.88MHz | -52.56 | -52.56 | -52.56 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

Table A.6.8.1.X.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| Io Note 4 | Config 1 | dBm/  19.08MHz | -65.43 | -65.43 | -65.43 |
| Config 2 | dBm/  96.48MHz | -65.43 | -65.43 | -65.43 |
| Config 3 | dBm/  47.88MHz | -61.44 | -61.44 | -61.44 |
| PRS | | dB | -6 | -13 | -13 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T2) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled. | | | | | |

###### A.6.8.1.X.2 Test Requirements

The RSTD measurement time fulfils the requirements specified in Clause 5.6.2.5.

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 5.6.2.5 starting from the beginning of time interval T2.

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

The rate of the correct events for each neighbour cell observed during the repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in the Clause 10.1.23.3, i.e., between RSTD\_000000000 and RSTD\_126083073.

**--- other sections ---**

#### A.6.8.2.X PRS-RSRP reporting delay test case in RRC\_INACTIVE state in FR1 for case 2 when eDRX cycle > 10.24s

##### A.6.8.2.X.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement in RRC\_INACTIVE with eDRX meets the delay requirements specified in clause 5.6.3.5 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.8.2.X.1-1.

Table A.6.8.2.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

During T1 UE is in RRC\_CONNECTED, the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In the next DL slot after slot #n, UE is released into RRC\_INACTIVE.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The general test parameters are listed in Table A.6.8.2.X.1-2, and cell specific test parameters are listed in Table A.6.8.2.X.1-3.

Table A.6.8.2.X.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1 | 20: NRB,c = 106 |  |
| 2 | 20: NRB,c = 106 |  |
| 3 | 50: NRB,c = 133 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX | s | 1, 2, 3 | 1.28 |  |
| eDRX cycle length (for both RAN and CN) | s | 1, 2, 3 | 40.96 |  |
| PTW window length | s | 1, 2, 3 | 1.28 |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 10 |  |

Table A.6.8.2.X.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 2 | PRS.1.4 FR1 | | PRS.1.4 FR1 | |
|  | 3 | PRS.2.4 FR1 | | PRS.2.4 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1 | -88 | -88 | -Infinity | -88 |
| 2 | -88 | -88 | -Infinity | -88 |
| 3 | -85 | -85 | -Infinity | -85 |
| Io | dBm/19.08 MHz | 1 | N/A | -64.57 | N/A | -64.57 |
|  | dBm/19.08 MHz | 2 | -64.57 | -64.57 |
|  | dBm/47.88 MHz | 3 | -60.59 | -60.59 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.6.8.2.X.2 Test Requirements

The UE shall perform and report the PRS-RSRP measurements for Cell 1 and Cell 2, within the time limit specified in clause 5.6.3.5, starting from the beginning of time interval T2.

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

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

**--- other sections ---**

#### A.6.8.3.X UE Rx-Tx time difference measurement for single positioning frequency layer with eDRX > 10.24s in FR1 SA

##### A.6.8.3.X.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 5.6.4.5 for UE Rx-Tx measurements in RRC\_INACTIVE with eDRX. The tests are conducted under AWGN propagation condition with the UE operating in FR1 stand-alone mode and configured to perform UE Rx-Tx measurements on a single positioning frequency layer (PFL) in FR1.

The supported test configuration in listed in Table A.6.8.3.X.1-1.

Table A.6.8.3.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 15 kHz SSB and PRS SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB and PRS SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB and PRS SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and in RRC\_INACTIVE state during T2. Cell 1 and Cell 2 transmit PRS only during the second time interval of duration T2. Similarly, the UE is configured to transmit positioning SRS during only during the second time interval of duration T2.

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

The beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

The general test parameters and cell specific test parameters are as given in Table A.6.8.3.X.1-2 and Table A.6.8.3.X.1-3 respectively.

Table A.6.8.3.X.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 20: NRB,c = 106 |  |
| 2 | 20: NRB,c = 106 |  |
| 3 | 50: NRB,c = 133 |  |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX cycle |  | 1, 2, 3 | 1.28s |  |
| eDRX cycle length (for both RAN and CN) | s | 1 | 40.96 |  |
| PTW window length | s | 1 | 1.28 |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells |
| Expected RSTD | μs | 1 | 3 |  |
| Expected RSTD uncertainty | μs | 1 | 5 |  |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 10 |  |

Table A.6.8.3.X.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 2 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 3 | PRS.2.2 FR1 | | PRS.2.2 FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.1 | | N/A | |
|  |  | 2 | POS-SRS.1 | | N/A | |
|  |  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -100 | -Infinity | -108 |
|  | 2 | -Infinity | -100 | -Infinity | -108 |
|  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/19.08 MHz | 1 | N/A | -64.57 | N/A | -64.57 |
| dBm/19.08 MHz | 2 | -64.57 | -64.57 |
| dBm/47.88 MHz | 3 | -60.59 | -60.59 |
| Propagation Condition |  | 1, 2, 3 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |

##### A.6.8.3.X.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 5.6.4.5.

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

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.

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

**--- other sections ---**

#### A.6.8.3.X UE Rx-Tx time difference measurements with PRS bandwidth aggregation in FR1 SA

##### A.6.8.3.X.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 5.6.4.6 for UE Rx-Tx measurements with PRS bandwidth aggregation. The tests are conducted under AWGN propagation condition with the UE operating in FR1 stand-alone mode and configured to perform UE Rx-Tx measurements by aggregating two intra-band contiguous positioning frequency layers (PFLs) in FR1.

The supported test configurations in listed in Table A.6.8.3.X.1-1.

Table A.6.8.3.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| PCell configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are two cells in the test: Cell 1 (PCell) and Cell 2 (neighbor cell). Each cell is sssociated with a different TRP/DL PRS ID in the *NR-DL-PRS-AssistanceData* [34]. Cell 1 transmissions other than DL PRS are allocated in RF channel #1. In addition, both cells/TRPs transmit DL PRS in two intra-band contiguous PFLs in RF channel #1 and RF channel #2.. PFL1 is allocated within RF channel #1 and PFL2 is allocated within RF channel #2. Except for the frequency offset between them, both PFLs have identical PRS configuration.

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and in RRC\_INACTIVE state during T2. Cell 1 and Cell 2 transmit PRS only during the second time interval of duration T2. Similarly, the UE is configured to transmit positioning SRS during only during the second time interval of duration T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *NR-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE during T1. The last TTI of the last message shall be provided to the UE at least ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

The *NR-Multi-RTT-ProvideAssistanceData* message provided to the UE must include *NR-DL-PRS-AggregationInfo-r18* linking each PRS resource in PFL1 to the corresponding PRS resource in PFL2.

The *NR-Multi-RTT-RequestLocationInformation* message provided to the UE must request bandwidth aggregated measurements via *jointMeasurementsReq* and *nr-DL-PRS-JointMeasurementRequestedPFL-List****.***

The general test parameters and cell specific test parameters are as given in Table A.6.8.3.X.1-2 and Table A.6.8.3.X.1-3 respectively.

Table A.6.8.3.X.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2, 3 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3 | 1 | For both Cell 1 and Cell 2, all signals/channels except PRS in PFL2 are allocated within this channel. |
| 2 | For both Cell 1 and Cell 2, only PRS in PFL2 is allocated within this channel. |
| BWchannel | MHz | 1 | 20: NRB,c = 106 | For both RF channels |
| 2 | 20: NRB,c = 106 |
| 3 | 50: NRB,c = 133 |
| SSB configuration |  | 1 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 FR1 |  |
| SMTC configuration |  | 1 | SMTC.2 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3 | Normal |  |
| DRX cycle | s | 1, 2, 3 | 1.28 |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3 | 3 | Synchronous cells/TRPs |
| Expected RSTD | μs | 1, 2, 3 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3 | 5 |  |
| T1 | s | 1, 2, 3 | 5 |  |
| T2 | s | 1, 2, 3 | 10 |  |

Table A.6.8.3.X.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns Note 1 |  | 1, 2, 3 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1,4 |
| EPRE ratio of OCNG to OCNG DMRS Note 1, 4 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 | | N/A | |
| PRS configuration (for both PFL1 and PFL2) |  | 1 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 2 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 3 | PRS.2.2 FR1 | | PRS.2.2 FR1 | |
| PRS Resource slot offset | slots | 1, 2, 3 | 0 | | 0 | |
| PRS muting info (*dl-PRS-MutingOption1*  for both PFL1 and PFL2) |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.1 | | N/A | |
|  | 2 | POS-SRS.1 | | N/A | |
|  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -101 | -Infinity | -111 |
|  | 2 | -Infinity | -101 | -Infinity | -111 |
|  | 3 | -Infinity | -98 | -Infinity | -108 |
| Io Note 3 (on symbols where PRS is not allocated) | dBm/19.08 MHz | 1 | N/A | -65.05 | N/A | -65.05 |
| dBm/19.08 MHz | 2 | -65.05 | -65.05 |
| dBm/47.88 MHz | 3 | -61.06 | -61.06 |
| Propagation Condition |  | 1, 2, 3 | 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 on all OFDM symbols except those in which PRS is allocated.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters and they are provided for information only. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |

##### A.6.8.3.X.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 5.6.4.6.

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

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.

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause [10.1.25.3.1].

### A.6.8.X RSTD measurements with PRS aggregation

#### A.6.8.X.1 NR RSTD measurement reporting delay test case for PRS aggregation in FR1 SA in RRC\_INACTIVE state

##### A.6.8.X.1.1 Test purpose and environment

The purpose of the test is to verify that the RSTD measurement with PRS aggregation in RRC\_INACTIVE state meets the requirements specified in clause 5.6.2.6 in AWGN propagation condition in FR1 in standalone scenario when two intra-band contiguous positioning frequency layers (PFL) are configured.

The supported test configurations are listed in Table A.6.8.X.1.1-1.

Table A.6.8.X.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are 6 synchronous cells in the test: Cell 1, Cell 2, Cell 3 Cell 4, Cell 5 and Cell 6. Cell 1 is the PCell on NR RF channel 1 in FR1. Cell 2 and Cell 3 are neighbour cells on the same RF channel as Cell 1. Cell 4, Cell 5 and Cell 6 are the neighbour cells on a different NR RF channel, i.e., RF channel 2, in FR1. Cell 1 and Cell 4, Cell 2 and Cell 5, Cell 3 and Cell 6 are respectively intra-band contiguous and PRS resources are transmitted by the same Tx chain for each combination.

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, Cell 3, Cell 4, Cell 5 and Cell 6. During T2 UE shall be in RRC\_INACTIVE state and all 6 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.

In *NR-TDOA-ProvideAssistanceData*, there are three *NR-linkedDL-PRS-ResourceSetID-PRS-AggregationList*. The first list indicates aggregation of PRS resource sets from Cell 1 and Cell 4, and the second list indicates aggregation of PRS resource sets from Cell 2 and Cell 5. The third list indicates aggregation of PRS resource sets from Cell 3 and Cell 6. In *NR-TDOA-RequestLocationInformation*, the IE *nr-DL-PRS-JointMeasurementRequestedPFL-List* is included and indicates aggregation of PFLs on RF channel 1 and RF channel 2.

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 given in Table A.6.8.X.1.1-2, and cell specific test parameters for T1 and T2 are listed in Table A.6.8.X.1.1-3 and A.6.8.X.1.1-4 respectively.

Table A.6.8.X.1.1-2: General test parameters for RSTD measurement

with PRS aggregation reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1, Cell 4 | Reference cells are the cells 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 1 is the PCell in this test case. |
| Neighbor cells | |  | Cell 2, Cell 3, Cell 4, Cell 5 and Cell 6 | Cell 2, Cell 3, Cell 4, Cell 5 and Cell 6 appear at the first, second, third, fourth and fifth places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active UL BWP configuration | Config 1,2,3 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.2 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0  and  (PCI of Cell 1 – PCI of Cell 4)mod6=0  and  (PCI of Cell 1 – PCI of Cell 5)mod6=0  and  (PCI of Cell 1 – PCI of Cell 6)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, Cell 4, Cell 5 to Cell 1: 0  Cell 3, Cell 6 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2 to Cell 6: 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 | |  | 6 | Including the reference cells |
| PRS muting info | |  | Cell 1, Cell 4: ‘10’  Cell 2, Cell 5: ‘01’  Cell 3, Cell 6: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1, Cell 4: 0  Cell 2, Cell 5: 0  Cell 3, Cell 6: 1 | Cell 1, Cell 2, Cell 3, Cell 4, Cell 5 and Cell 6 |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.6.8.X.1.1-3: Cell-specific test parameters for RSTD measurement

with PRS aggregation reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1, Cell 4 | Cell 2, Cell 5 | Cell 3, Cell 6 |
| NR RF Channel Number # | |  | 1, 2 | 1, 2 | 1, 2 |
| Positiong frequency layer | |  | PFL 1, 2 | PFL 1, 2 | PFL 1, 2 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1Note 1 | |  | OP.1 | N/A | N/A |
| Note 3, 5 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB  Note 5 | | dB | 10 | -Infinity | -Infinity |
| Io Note 4, 5 | Config 1 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 2 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 3 | dBm/  47.88MHz | -52.56 | -52.56 | -52.56 |
| SSB RP Note4, 5 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters.  Note 5: The values are defined separately for the cells from which the transmitted PRS resources are aggregated. | | | | | |

Table A.6.8.1.1.1-4: Cell-specific test parameters for RSTD measurement

with PRS aggregation reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1, Cell 4 | Cell 2, Cell 5 | Cell 3, Cell 6 |
| T2 | T2 | T2 |
| NR RF Channel Number # | |  | 1, 2 | 1, 2 | 1, 2 |
| Positiong frequency layer | |  | PFL 1, 2 | PFL 1, 2 | PFL 1, 2 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3, 4 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS  Note 4 | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| Io Note 3, 4 | Config 1 | dBm/  19.08MHz | -65.43 | -65.43 | -65.43 |
| Config 2 | dBm/  96.48MHz | -65.43 | -65.43 | -65.43 |
| Config 3 | dBm/  47.88MHz | -61.44 | -61.44 | -61.44 |
| PRS  Note 4 | | dB | -6 | -13 | -13 |
| 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 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.  Note 4: The values are defined separately for the cells from which the transmitted PRS resources are aggregated. | | | | | |

##### A.6.8.x.1.2 Test requirements

The RSTD measurement time with PRS aggregation in RRC\_INACTIVE state fulfils the requirements specified in clause 5.6.2.6.

The UE shall perform and report the RSTD measurements by aggregating PRS resources from Cell 2 and Cell 5, Cell 3 and Cell 6 respectively with respect to the Cell 1 and Cell 4 from which the transmitted PRS resources are also aggregated, within the time duration specified in section 5.6.2.6 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 observed during repeated tests shall be at least 90%, where the reported RSTD measurement with PRS aggregation for each correct event shall be within the RSTD reporting range specified in clause 10.1.X.X.X.

### A.6.8.X DL RSCPD reported with RSTD measurements

#### A.6.8.X.1 DL RSCPD reported with RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_INACTIVE state

##### A.6.8.X.1.1 Test Purpose and Environment

The purpose of the test is to verify that the DL RSCPD reported with RSTD measurement meets the requirements specified in Clause 5.6.7.5 in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured.

The test environment is the same as in A.6.8.1.1 with the following additional configuration in Table A.6.8.X.1.1-1 and description.

In *nr-DL-TDOA-RequestLocationInformation,* the UE is configured to perform DL RSCPD measurement via *nr-DL-PRS-RSCPD-Request*. The UE also is configured to perform both RSCPD and RSTD measurements within the time window indicated to UE via *nr-DL-PRS-MeasurementTimeWindowsConfig*.

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

**Table A.6.8.X.1.1-1: Time window configuration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Indicated time window configuration | Config 1,2,3 |  | MTW.1 | As specified in clause A.3.Y |

##### A.6.8.X.1.2 Test Requirements

The DL RSCPD reported with RSTD measurement time fulfils the requirements specified in Clause 5.6.7.5.

The UE shall perform and report the DL RSCPD and DL 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 5.6.7.5 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 10.1.23.3 and the reported RSCPD measurement for each correct event shall be within the RSCPD reporting range specified in Clause 10.1.Y1.3.

#### A.6.9.1.X RSTD measurement accuracy TC for PRS aggregation in FR1 in RRC\_INACTIVE state

##### A.6.9.1.X.1 Test purpose and Environment

The purpose of the test is to verify that the RSTD measurement with PRS aggregation on two PFLs meets the accuracy requirements specified in clause 10.1.X.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.6.9.1.X.1-1.

Table A.6.9.1.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

In the test there are four synchronous cells: Cell 1, Cell 2, Cell 3 and Cell 4. Cell 1 is the reference as well as the PCell on NR RF channel #1 in FR1. Cell 2 is a neighbour cell on the same NR RF channel as Cell 1. Cell 3 and Cell 4 are neighbor cells in a different NR RF channel #2 in FR1. Cell 1 and Cell 3 are intra-band contiguous, and PRS resources from Cell 1 and Cell 3 are transmitted by the same Tx chain. Cell 2 and Cell 4 are intra-band contiguous, and PRS resources from Cell 2 and Cell 4 are transmitted by the same Tx chain.

GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured.

The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9.2.

In *NR-TDOA-ProvideAssistanceData*, there are two *NR-linkedDL-PRS-ResourceSetID-PRS-AggregationList*. The first list indicates aggregation of resource sets from Cell 1 and Cell 3, and the second list indicates aggregation of resource sets from Cell 2 and Cell 4. In *NR-TDOA-RequestLocationInformation*, *nr-DL-PRS-JointMeasurementRequestedPFL-List* is included, and indicates aggregation of PFLs on NR RF channel #1 and NR RF channel #2.

Table A.6.9.1.X.1-2: RSTD accuracy test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Cell 1 | Cell 2 | Cell 3 | Cell 4 |
| PRS ARFCN | 1~3 |  | freq1 | freq1 | freq2 | freq2 |
| BWchannel | 1 | MHz | 20: NRB,c = 106 | | | |
| 2 | 20: NRB,c = 106 | | | |
| 3 | 50: NRB,c = 133 | | | |
| Duplex mode | 1 |  | FDD | | | |
| 2 | TDD | | | |
| 3 | TDD | | | |
| TDD configuration | 1 |  | N/A | | | |
| 2 | TDDConf.1.1 | | | |
| 3 | TDDConf.2.1 | | | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - | - | - |
| 2 | SR.1.1 TDD | - | - |  |
| 3 | SR.2.1 FDD | - | - |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - | - | - |
| 2 | CR.1.1 TDD | - | - | - |
| 3 | CR.2.1 FDD | - | - | - |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - | - | - |
| 2 | CCR.1.1 TDD | - | - | - |
| 3 | CCR.2.1 TDD | - | - | - |
| SSB configuration | 1 |  | SSB.1 FR1 | | | |
| 2 | SSB.1 FR1 | | | |
| 3 | SSB.2 FR1 | | | |
| OCNG Patterns | 1~3 |  | OP.1 | | | |
| TRS configuration | 1 |  | TRS.1.1 FDD | - | - | - |
| 2 | TRS.1.1 TDD | - | - | - |
| 3 | TRS.1.2 TDD | - | - | - |
| Initial BWP Configuration | 1~3 |  | DLBWP.0.1  ULBWP.0.1 |  |  | |
| Dedicated BWP configuration | 1~3 |  | DLBWP.1.1  ULBWP.1.1 |  |  | |
| Time offset with Cell 1 | 1 | μs | - | 3 | 0 | 3 |
| 2,3 | - | 3 | 0 | 3 |
| PRS configuration | 1 |  | PRS.1.2 FR1 | | | |
| 2 | PRS.1.2 FR1 | | | |
| 3 | PRS.2.2 FR1 | | | |
| PRS Resource slot offset | 1, 2, 3 | slot | 0 | 4 | 0 | 4 |
| Expected RSTD | 1, 2, 3 | μs | N/A | 3 | 0 | 3 |
| Expected RSTD uncertainty | 1, 2, 3 | μs | N/A | 5 | 0 | 5 |
| EPRE ratio of PSS to SSS | 1~3 | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS | 1~3 | dB | 0 | 0 | 0 | 0 |
| Note2 | 1,2 | dBm/ SCS | -98 | | -98 | |
| 3 | -95 | | -95 | |
| PRS | 1~3 | dB | -6 | -13 | -6 | -13 |
| PRPNote3 | 1,2 | dBm/SCS | -104 | -111 | -104 | -111 |
| 3 | -101 | -108 | -101 | -108 |
| IoNote3 | 1,2 | dBm/  19.08MHz | -65.98 | -66.74 | -65.98 | -66.74 |
| 3 | dBm/  47.88MHz | -62.00 | -62.76 | -62.00 | -62.76 |
| PRS | 1~3 | dB | -6 | -13 | -6 | -13 |
| Propagation condition | 1~3 | - | AWGN | | AWGN | |
| Antenna configuration | 1~3 |  | 1x2 | | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. The Io is calculated based only on the symbols in which PRS is transmitted.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | | | |

##### A.6.9.1.X.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1.X.2.

## **--- End of Change #6\_7 ---**

## **--- Start of Change #6\_8 ---**

#### A.7.2.2.1 Cell reselection to FR2 intra-frequency NR case with RRC\_ INACTIVE eDRX and positioning SRS

##### A.7.2.2.1.1 Test Purpose and Environment

This test is to verify the requirement for the intra-frequency NR cell reselection requirements specified in clause 5.6.1A.2, when UE is in RRC\_INACTIVE and configured with eDRX and to transmit SRS for positioning.

##### A.7.2.2.1.2 Test Parameters

The test scenario comprises of 1 NR carrier and 2 cells as given in tables A.7.2.2.1.2-1, A.7.2.2.1.2-2 and A.7.2.2.1.2-3. The test consists of two successive time periods, with time duration of T1 and T2 respectively. Only cell 1 is already identified by the UE prior to the start of the test. Cell 1 and cell 2 belong to different tracking areas. Furthermore, UE has not registered with network for the tracking area containing cell 2. UE is configured with transmit SRS for positioning in cell 1.

Table A.7.2.2.1.2-1: Supported test configurations

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

Table A.7.2.2.1.2-2: General test parameters for intra frequency NR cell re-selection test case

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Value | Comment |
| Initial condition | Active cell |  | 1, 2 | Cell1 |  |
| T2 end condition | Active cell |  | 1, 2 | Cell2 |  |
| Neighbour cell |  | 1, 2 | Cell1 |  |
| RF Channel Number | |  | 1, 2 | 1 |  |
| Time offset between cells | |  | 1, 2 | 3 μs | Synchronous cells |
| Access Barring Information | | - | 1, 2 | Not Sent | No additional delays in random access procedure. |
| SMTC configuration | |  | 1, 2 | SMTC.1 |  |
| DRX cycle length | | s | 1, 2 | 1.28 | The value shall be used for all cells in the test. |
| CN and RAN eDRX configuration | |  | Config 1 | eDRX cycle = 40.96s  PTW length = 1.28s |  |
| PRACH configuration index | |  | 1, 2 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell | |  | 1, 2 | Not configured |  |
| T1 | | s | 1, 2 | >7 | During T1, Cell 2 shall be powered off, and during the off time the physical cell identity shall be changed, The intention is to ensure that Cell 2 has not been detected by the UE prior to the start of period T2 |
| T2 | | s | 1, 2 | 355 | T2 needs to be defined so that cell re-selection reaction time is taken into account. |

Table A.7.2.2.1.2-3: Cell specific test parameters for intra frequency NR cell re-selection test case in AWGN

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | | Cell 2 | | |
|  |  | T1 | T2 | T3 | T1 | T2 | T3 |
| TDD configuration |  | 1, 2 | TDDConf.3.1 | | | TDDConf.3.1 | | |
| PDSCH RMC |  | 1 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| configuration |  | 2 | SR.3.1 TDD | | | SR.3.1 TDD | | |
| RMSI CORESET |  | 1 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| RMC configuration |  | 2 | CR.3.1 TDD | | | CR.3.1 TDD | | |
| Dedicated CORESET |  | 1 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| RMC configuration |  | 2 | CCR.3.1 TDD | | | CCR.3.1 TDD | | |
| SSB configuration |  | 1 | SSB.3 FR2 | | | SSB.7 FR2 | | |
|  |  | 2 | SSB.4 FR2 | | | SSB.8 FR2 | | |
| OCNG Pattern |  | 1, 2 | OP.4 | | | OP.4 | | |
| BWchannel | MHz | 1, 2 | 100: NRB,c = 66 | | | 100: NRB,c = 66 | | |
| Data RBs allocated |  | 1, 2 | 66 | | | 66 | | |
| Initial DL BWP configuration |  | 1, 2 | DLBWP.0.1 | | | DLBWP.0.1 | | |
| Initial UL BWP configuration |  | 1, 2 | ULBWP.0.1 | | | ULBWP.0.1 | | |
| RLM-RS |  | 1, 2 | SSB | | | SSB | | |
| Periodicity of SRS for positioning | s | 1, 2 | 5.12 | | | N/A | | |
| Qrxlevmin | dBm/SCS | 1 | -138 | | | -138 | | |
|  |  | 2 | -135 | | | -135 | | |
| Pcompensation | dB | 1, 2 | 0 | | | 0 | | |
| Qhysts | dB | 1, 2 | 0 | | | 0 | | |
| Qoffsets, n | dB | 1, 2 | 0 | | | 0 | | |
| Cell\_selection\_and\_  reselection\_quality\_measurement |  | 1, 2 | SS-RSRP | | | SS-RSRP | | |
| AoA setup |  | 1, 2 | Setup 1 defined in A.3.15.1 | | | Setup 1 defined in A.3.15.1 | | |
| Beam assumptionNote 4 |  | 1,2 | Rough | | | Rough | | |
| Note 5 | dB | 1 | 7.45 | -3.55 | 0.95 | -infinity | 0.95 | -3.55 |
|  |  | 2 |
| Note2 | dBm/SCS | 1 | -93 | | | | | |
|  |  | 2 | -90 | | | | | |
| Note2 | dBm/15 kHz | 1 | -102 | | | | | |
|  |  | 2 |  | | | | | |
|  | dB | 1 | 8 | -3 | 1.5 | -infinity | 1.5 | -3 |
|  |  | 2 |
| SS-RSRP Note3 | dBm/SCS | 1 | -85 | -96 | -91.5 | -infinity | -91.5 | -96 |
|  |  | 2 | -82 | -93 | -88.5 | -infinity | -88.5 | -93 |
| Io on SSB symbols of each cell | dBm/95.04 MHz | 1 | -60.53 | -67.40 | -65.34 | -69.17 | -65.34 | -67.40 |
| 2 | -57.52 | -64.39 | -62.33 | -66.16 | -62.33 | -64.39 |
| Treselection | s | 1, 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| SintrasearchP | dB | 1, 2 | 50 | | | 50 | | |
| Propagation Condition |  | 1, 2 | AWGN | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 5: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | | | | | |

##### A.7.2.2.1.3 Test Requirements

The cell reselection delay to a newly detectable cell is defined as the time from the beginning of time period T2, to the moment when the UE camps on Cell 2, and starts to send preambles on the PRACH for sending the *RRCSetupRequest* message to perform a Registration procedure for mobility and periodic registration updateon Cell 2.

The cell re-selection delay to a newly detectable cell shall be less than 355 s.

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

NOTE: The cell re-selection delay to a newly detectable cell can be expressed as: Tdetect, NR\_Intra + TSI-NR,

Where:

Tdetect, NR\_Intra See Table 5.6.1A.2-2 in clause 5.6.1A.2

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

This gives a total of 354.56 s, allow 355 s for the cell re-selection delay to a newly detectable cell.

**--- other sections ---**

#### A.7.6.11.X UE Rx-Tx time difference measurements with PRS bandwidth aggregation in FR2 SA

##### A.7.6.11.X.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 9.9.4.9 for UE Rx-Tx measurements with PRS bandwidth aggregation. The tests are conducted under AWGN propagation condition with the UE operating in FR2 stand-alone mode and configured to perform UE Rx-Tx measurements by aggregating two intra-band contiguous positioning frequency layers (PFLs) in FR2.

The supported test configurations in listed in Table A.7.6.11.X.1-1.

Table A.7.6.11.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| PCell configuration | Description |
| 1 | 120 kHz SSB and PRS SCS, 200 MHz bandwidth, TDD duplex mode |

There are two cells in the test: Cell 1 (PCell) and Cell 2 (neighbor cell). Each cell is sssociated with a different TRP/DL PRS ID in the *NR-DL-PRS-AssistanceData* [34]. Cell 1 transmissions other than DL PRS are allocated in RF channel #1. In addition, both cells/TRPs transmit DL PRS in two intra-band contiguous PFLs in RF channel #1 and RF channel #2.. PFL1 is allocated within RF channel #1 and PFL2 is allocated within RF channel #2. Except for the frequency offset between them, both PFLs have identical PRS configuration.

The test consists of two consecutive time intervals, with duration of T1 and T2. Cell 1 and Cell 2 transmit PRS only during the second time interval of duration T2. Similarly, the UE is configured to transmit positioning SRS during only during the second time interval of duration T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *NR-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE during T1. The last TTI of the last message shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The *NR-Multi-RTT-ProvideAssistanceData* message provided to the UE must include *NR-DL-PRS-AggregationInfo-r18* linking each PRS resource in PFL1 to the corresponding PRS resource in PFL2.

The *NR-Multi-RTT-RequestLocationInformation* message provided to the UE must request bandwidth aggregated measurements via *jointMeasurementsReq* and *nr-DL-PRS-JointMeasurementRequestedPFL-List****.***

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

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

The general test parameters and cell specific test parameters are as given in Table A.7.6.11.X.1-2 and Table A.7.6.11.X.1-3 respectively.

Table A.7.6.11.X.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2, all signals/channels except PRS in PFL2 are allocated within this channel. |
| 2 | For both Cell 1 and Cell 2, only PRS in PFL2 is allocated within this channel. |
| BWchannel | MHz | 1 | 200: NRB,c = 132 | For both RF channels |
| SSB configuration |  | 1 | SSB.2 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 1 |  |
| CP length |  | 1 | Normal |  |
| DRX |  | 1 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells/TRPs |
| Expected RSTD | μs | 1 | 3 |  |
| Expected RSTD uncertainty | μs | 1 | 5 |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 20 |  |
| Note 1: GP#24 is configured if the UE supports it, otherwise GP#13 is configured. | | | | |

Table A.7.6.11.X.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 5 |  | 1 | Rough | | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| OCNG PatternsNote 1 |  | 1 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1, 4 |
| EPRE ratio of OCNG to OCNG DMRS Note 1, 4 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | | N/A | |
| PRS configuration (for both PFL1 and PFL2) |  | 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting info (*dl-PRS-MutingOption1*  for both PFL1 and PFL2) |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -92 | -Infinity | -102 |
| Io Note 3 (on symbols where PRS is not allocated) | dBm/190.08 MHz | 1 | N/A | -55.10 | N/A | -55.10 |
| Propagation Condition |  | 1 | 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 on all OFDM symbols except those in which PRS is allocated.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters and they are provided for information only. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 6: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  [Note 7: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone]  [Note 8: As observed with 0 dBi gain antenna at the centre of the quiet zone] | | | | | | |

##### A.7.6.11.X.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.4.9.

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

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause [10.1.25.3.1].

A.7.6.X DL RSCP with UE Rx-Tx time difference measurements in FR2 SA

A.7.6.X.1 DL RSCP with UE Rx-Tx time difference measurements for single positioning frequency layer in FR2 SA

A.7.6.X.1.1 Test purpose and environment

The purpose of the test is to verify that the DL RSCP and UE Rx-Tx time difference measurements meet the requirements specified in clause 9.9.8.5 in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured for both DL RSCP measurement and UE Rx-Tx time difference measurement.

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

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

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

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

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

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

The *NR-Multi-RTT-ProvideAssistanceData* message and *NR-Multi-RTT-RequestLocationInformation* message as defined in TS 37.355 [34], shall be provided to the UE during T1. In *NR-Multi-RTT-RequestLocationInformation,* the UE is configured to perform DL RSCP measurement via *nr-DL-PRS-RSCP-Request*. The UE is configured to perform both DL RSCP and UE Rx-Tx time difference measurements within the time window indicated to UE via *nr-DL-PRS-MeasurementTimeWindowsConfig*. The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources to be measured within the configured time window.

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

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are listed in Table A.7.6.X.1.1-2 and Table A.7.6.X.1.1-3.

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in NR-Multi-RTT-ProvideAssistanceData [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in NR-Multi-RTT-ProvideAssistanceData [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 200: NRB,c = 132 |  |
| SSB configuration |  | 1 | SSB.2 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 1 |  |
| CP length |  | 1 | Normal |  |
| DRX |  | 1 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells |
| Time window configuration |  | 1 | MTW.1 | As specified in clause A.3.Y |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 20 |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | |

**Table A.7.6.X.1.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 |  | 1 | Rough | | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| OCNG Patterns |  | 1 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting info |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 | -Infinity | -99 |
| Io | dBm/190.08 MHz | 1 | N/A | -54.62 | N/A | -54.62 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: 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.7.6.X.1.2 Test requirements

The DL RSCP with UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9.8 with Nsample=4 for UE Rx-Tx time difference.

The UE shall perform and report the DL RSCP and UE Rx-Tx time difference measurements for Cell 1 and Cell 2 within the specified DL RSCP with UE Rx-Tx time difference measurement time specified in clause 9.9.8 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%. The reported DL RSCP measurement shall be within the DL RSCP reporting range specified in clause 10.1.Z1 and the reported UE Rx-Tx measurement shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.

**--- other sections ---**

### A.7.7.x RSCP with UE Rx-Tx time difference measurements

#### A.7.7.x.2 RSCP with UE Rx-Tx time difference measurement accuracy in FR2 SA

##### A.7.7.x.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx time difference measurement accuracy is within the specified limits. This test will verify the requirements in clause 10.1.Z1.2. The test is conducted in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configuration is listed in Table A.7.7.x.2.1-1.

**Table A.7.7.12.2.1-1: Supported test configurations**

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

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

The *NR-Multi-RTT-ProvideAssistanceData* , *NR-Multi-RTT-RequestLocationInformation* with *nr-DL-PRS-RSCP-Request* from LMF via LPP [34] and *NR-Multi-RTT-MeasurementCapability* as defined in TS 37.355 [34, clause 6.5.12.] to enable UE to perform and report RSCP in RRC CONNECTED, shall be provided to the UE before the start of the test.

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

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

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

##### A.7.7.x.2.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.7.7.x.2.2-1.

Table A.7.7.x.2.2-1: RSCP with UE Rx-Tx time difference measurement accuracy test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Test 1 | |
|  | Cell 1 | Cell 2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | |
| Beam AssumptionNote 7 |  | 1 | Rough | Rough |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 8 | |
| DRX |  | 1 | OFF | |
| Time offset with Cell 1 | μs | 1 | N/A | 3 |
| TDD configuration |  | 1 | TDDConf.3.1 | TDDConf.3.1 |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | N/A |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | N/A |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | N/A |
| OCNG Patterns |  | 1 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | N/A |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | N/A |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | N/A |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | N/A |
| PRS configuration |  | 1 | PRS.1.1 FR2 | PRS.1.1 FR2 |
| PRS BW |  | 1 | 64 PRBs | 64 PRBs |
| PRS Resource slot offset | slot | 1 | 0 | 4 |
| SRS configuration |  | 1 | POS-SRS.3 | N/A |
| Note 2 | dBm/SCS | 1 | -89 | |
| Note 2 | dBm/15 kHz | 1 | -98 | |
| PRS | dB | 1 | 0 | -6 |
| PRS | dB | 1 | 2.23 | -1.73 |
| PRP Note 3 | dBm/SCS kHz | 1 | -86.77 | -90.73 |
| Io | dBm/190.08 MHz | 1 | -51.76 | -51.76 |
| Propagation Condition |  | 1 | AWGN | |
| Note 1: Void.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured.  Note 9: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4. | | | | |

##### A.7.7.x.2.3 Test requirements

The RSCP with UE Rx-Tx time difference measurements fulfils the RSCP measurement accuracy requirements specified in clause 10.1.Z1.2 for both Cell 1 and Cell 2.

**--- other sections ---**

#### A.7.8.2.X PRS-RSRP reporting delay in RRC\_INACTIVE with eDRX

##### A.7.8.2.X.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements specified in Clause 5.6.3.5 for single positioning frequency layer under AWGN propagation conditions in RRC\_INACTIVE when configured with eDRX. Supported test configurations are shown in table A.7.8.2.X.1-1.

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

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

During T1 UE is in RRC\_CONNECTED, the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In the next DL slot after slot #n, UE is released into RRC\_INACTIVE.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The test parameters are as given in table A.7.8.2.X.1-2, and table A.7.8.2.X.1-3.

Table A.7.8.2.X.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2

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

Table A.7.8.2.X.1-2: General test parameters for PRS RSRP measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | Config 1 | NR cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| SMTC parameters |  | Config 1 | SMTC.1 | As specified in clause A.3.11 |
| SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | 0.64s |  |
| CN and RAN eDRX configuration |  | Config 1 | eDRX cycle = 40.96s  PTW length = 1.28s |  |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| Expected RSTD | μs | Config 1 | 3 |  |
| Expected RSTD uncertainty | μs | Config 1 | 5 |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | [41] |  |

Table A.7.8.2.X.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | 200: NRB,c = 132 | | 200: NRB,c = 132 | |
| BWP BW | | MHz | Config 1 | 200: NRB,c = 132 | | 200: NRB,c = 132 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PRS configuration | |  | Config 1 | PRS.1.2 FR2 | | PRS.1.2 FR2 | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -98 | | -98 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -89 | | -89 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -91 | -91 | -Infinity | -99 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -91 | -Infinity | -99 |
| PRS | | dB | Config 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | | dB | Config 1 | -Infinity | -2 | -Infinity | -10 |
| IoNote3 | | dBm/190.08 MHz Note5 | Config 1 | -54.62 | | -54.62 | |
| Propagation Condition | |  | Config 1 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

##### A.7.8.2.X.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 5.6.3.5. The UE shall perform and report the PRS RSRP measurements for Cell 2 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in section 5.6.3.5 with Tavailable\_PRS = 0.64s starting from the beginning of time interval T2.

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

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

**--- other sections ---**

#### A.7.8.3.X UE Rx-Tx time difference measurements for single positioning frequency layer with eDRX > 10.24s in FR2 SA

##### A.7.8.3.X.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 5.6.4.5 for UE Rx-Tx measurements in RRC\_INACTIVE with eDRX. The tests are conducted under AWGN propagation condition with the UE operating in FR2 stand-alone mode and configured to perform UE Rx-Tx measurements on a single positioning frequency layer (PFL) in FR2.

The supported test configurations in listed in Table A.7.8.3.X.1-1.

Table A.7.8.3.X.1-1: Supported test configurations

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

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

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and in RRC\_INACTIVE state during T2. Cell 1 and Cell 2 transmit PRS only during the second time interval of duration T2. Similarly, the UE is configured to transmit positioning SRS during only during the second time interval of duration T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *NR-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE during T1. The last TTI of the last message shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

The general test parameters and cell specific test parameters are as given in Table A.7.8.3.X.1-2 and Table A.7.8.3.X.1-3 respectively.

Table A.7.8.3.X.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | 100: NRB,c = 66 |  |
| SSB configuration |  | 1 | SSB.3 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| CP length |  | 1 | Normal |  |
| DRX | s | 1 | 0.64 |  |
| eDRX cycle length (for both RAN and CN) | s | 1 | 40.96 |  |
| PTW length (for both RAN and CN) | s | 1 | 1.28 |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells |
| Expected RSTD | μs | 1 | 3 |  |
| Expected RSTD uncertainty | μs | 1 | 5 |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 20 |  |

Table A.7.8.3.X.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 5 |  | 1 | Rough | | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| OCNG PatternsNote 1 |  | 1 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1, 4 |
| EPRE ratio of OCNG to OCNG DMRS Note 1, 4 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | | N/A | |
| PRS configuration |  | 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting info (*dl-PRS-MutingOption1*) |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -92 | -Infinity | -102 |
| Io Note 3 (on symbols where PRS is not allocated) | dBm/95.04 MHz | 1 | N/A | -58.11 | N/A | -58.11 |
| Propagation Condition |  | 1 | 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 on all OFDM symbols except those in which PRS is allocated.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters and they are provided for information only. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 6: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  [Note 7: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone]  [Note 8: As observed with 0 dBi gain antenna at the centre of the quiet zone] | | | | | | |

##### A.7.8.3.X.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 5.6.4.5.

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

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.

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

#### A.7.8.3.X UE Rx-Tx time difference measurements with PRS bandwidth aggregation in FR2 SA

##### A.7.8.3.X.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 5.6.4.6 for UE Rx-Tx measurements with PRS bandwidth aggregation. The tests are conducted under AWGN propagation condition with the UE operating in FR2 stand-alone mode and configured to perform UE Rx-Tx measurements by aggregating two intra-band contiguous positioning frequency layers (PFLs) in FR2.

The supported test configurations in listed in Table A.7.8.3.X.1-1.

Table A.7.8.3.X.1-1: Supported test configurations

|  |  |
| --- | --- |
| PCell configuration | Description |
| 1 | 120 kHz SSB and PRS SCS, 200 MHz bandwidth, TDD duplex mode |

There are two cells in the test: Cell 1 (PCell) and Cell 2 (neighbor cell). Each cell is sssociated with a different TRP/DL PRS ID in the *NR-DL-PRS-AssistanceData* [34]. Cell 1 transmissions other than DL PRS are allocated in RF channel #1. In addition, both cells/TRPs transmit DL PRS in two intra-band contiguous PFLs in RF channel #1 and RF channel #2.. PFL1 is allocated within RF channel #1 and PFL2 is allocated within RF channel #2. Except for the frequency offset between them, both PFLs have identical PRS configuration.

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and in RRC\_INACTIVE state during T2. Cell 1 and Cell 2 transmit PRS only during the second time interval of duration T2. Similarly, the UE is configured to transmit positioning SRS during only during the second time interval of duration T2.

The *NR-Multi-RTT-ProvideAssistanceData* and *NR-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE during T1. The last TTI of the last message shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the multi-RTT assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

The *NR-Multi-RTT-ProvideAssistanceData* message provided to the UE must include *NR-DL-PRS-AggregationInfo-r18* linking each PRS resource in PFL1 to the corresponding PRS resource in PFL2.

The *NR-Multi-RTT-RequestLocationInformation* message provided to the UE must request bandwidth aggregated measurements via *jointMeasurementsReq* and *nr-DL-PRS-JointMeasurementRequestedPFL-List****.***

The general test parameters and cell specific test parameters are as given in Table A.7.8.3.X.1-2 and Table A.7.8.3.X.1-3 respectively.

Table A.7.8.3.X.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2, all signals/channels except PRS in PFL2 are allocated within this channel. |
| 2 | For both Cell 1 and Cell 2, only PRS in PFL2 is allocated within this channel. |
| BWchannel | MHz | 1 | 200: NRB,c = 132 | For both RF channels |
| SSB configuration |  | 1 | SSB.2 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| CP length |  | 1 | Normal |  |
| DRX | s | 1 | 0.64 |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells/TRPs |
| Expected RSTD | μs | 1 | 3 |  |
| Expected RSTD uncertainty | μs | 1 | 5 |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 20 |  |

Table A.7.8.3.X.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 5 |  | 1 | Rough | | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| OCNG PatternsNote 1 |  | 1 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1, 4 |
| EPRE ratio of OCNG to OCNG DMRS Note 1, 4 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 | | N/A | |
| PRS configuration (for both PFL1 and PFL2) |  | 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting info (*dl-PRS-MutingOption1*  for both PFL1 and PFL2) |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
| PRS | dB | 1 | -Infinity | -3 | -Infinity | -13 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -92 | -Infinity | -102 |
| Io Note 3 (on symbols where PRS is not allocated) | dBm/190.08 MHz | 1 | N/A | -55.10 | N/A | -55.10 |
| Propagation Condition |  | 1 | 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 on all OFDM symbols except those in which PRS is allocated.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters and they are provided for information only. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 5: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 6: Calculation of Es/Iot includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 38.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  [Note 7: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone]  [Note 8: As observed with 0 dBi gain antenna at the centre of the quiet zone] | | | | | | |

##### A.7.8.3.X.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 5.6.4.6.

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

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.

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause [10.1.25.3.1].

### A.7.8.X RSTD measurements with PRS aggregation

#### A.7.8.X.1 NR RSTD measurement reporting delay test case for PRS aggregation in FR2 SA in RRC\_INACTIVE state

##### A.7.8.X.1.1 Test purpose and environment

The purpose of the test is to verify that the RSTD measurement with PRS aggregation in RRC\_INACTIVE state meets the requirements specified in clause 5.6.2.6 in AWGN propagation condition in FR2 in standalone scenario when two intra-band contiguous positioning frequency layers (PFL) are configured.

The supported test configurations are listed in Table A.7.8.X.1.1-1.

Table A.7.8.X.1.1-1: Supported test configurations

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

There are 6 synchronous cells in the test: Cell 1, Cell 2, Cell 3 Cell 4, Cell 5 and Cell 6. Cell 1 is the PCell on NR RF channel 1 in FR2. Cell 2 and Cell 3 are neighbour cells on the same RF channel as Cell 1. Cell 4, Cell 5 and Cell 6 are the neighbour cells on a different NR RF channel, i.e., RF channel 2, in FR2. Cell 1 and Cell 4, Cell 2 and Cell 5, Cell 3 and Cell 6 are respectively intra-band contiguous and PRS resources are transmitted by the same Tx chain for each combination.

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, Cell 3, Cell 4, Cell 5 and Cell 6. During T2 UE shall be in RRC\_INACTIVE state and all 6 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.

In *NR-TDOA-ProvideAssistanceData*, there are three *NR-linkedDL-PRS-ResourceSetID-PRS-AggregationList*. The first list indicates aggregation of PRS resource sets from Cell 1 and Cell 4, and the second list indicates aggregation of PRS resource sets from Cell 2 and Cell 5. The third list indicates aggregation of PRS resource sets from Cell 3 and Cell 6. In *NR-TDOA-RequestLocationInformation*, the IE *nr-DL-PRS-JointMeasurementRequestedPFL-List* is included and indicates aggregation of PFLs on RF channel 1 and RF channel 2.

The UE is configured with DRX cycle of 0.64s.

The general test parameters are given in Table A.7.8.X.1.1-2, and cell specific test parameters for T1 and T2 are listed in Table A.7.8.X.1.1-3 and A.7.8.X.1.1-4 respectively.

Table A.7.8.X.1.1-2: General test parameters for RSTD measurement

with PRS aggregation reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1, Cell 4 | 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, Cell 3, Cell 4, Cell 5 and Cell 6 | Cell 2, Cell 3, Cell 4, Cell 5 and Cell 6 appear at the first, second, third, fourth and fifth places in the neighbour cell list in the DL-TDOA assistance data. |
| BWchannel | | MHz | 200: NRB,c = 132 |  |
| 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.1.4. 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  and  (PCI of Cell 1 – PCI of Cell 4)mod6=0  and  (PCI of Cell 1 – PCI of Cell 5)mod6=0  and  (PCI of Cell 1 – PCI of Cell 6)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, Cell 4, Cell 5 to Cell 1: 0  Cell 3, Cell 6 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2 to 6: 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 | |  | 6 | Including the reference cells |
| PRS muting info | |  | Cell 1, Cell 4: ‘10’  Cell 2, Cell 5: ‘01’  Cell 3, Cell 6: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1, Cell 4: 0  Cell 2, Cell 5: 0  Cell 3, Cell 6: 1 |  |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.7.8.X.1.1-3: Cell-specific test parameters for RSTD measurement

with PRS aggregation reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1, Cell 4 | Cell 2, Cell 5 | Cell 3, Cell 6 |
| NR RF Channel Number | |  | 1, 2 | 1, 2 | 1, 2 |
| Positiong frequency layer | |  | PFL 1, 2 | PFL 1, 2 | PFL 1, 2 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1Note 1 | |  | OP.5 FDD | N/A | N/A |
| Note 3, 5 | Config 1 | dBm/SCS | -89 | | |
| PRS  Note 5 | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4, 5 | Config 1 | dBm/  190.08MHz | -54.00 | -54.00 | -54.00 |
| SSB RP Note4, 5 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
| Note 5 |  | 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.  Note 5: The values are defined separately for the cells from which the transmitted PRS resources are aggregated. | | | | | |

Table A.7.8.X.1.1-4: Cell-specific test parameters for RSTD measurement

with PRS aggregation reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1, Cell 4 | Cell 2, Cell 5 | Cell 3, Cell 6 |
|  | |  | T2 | T2 | T2 |
| RF Channel Number | |  | 1, 2 | 1, 2 | 1, 2 |
| Positiong frequency layer | |  | PFL 1, 2 | PFL 1, 2 | PFL 1, 2 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3, 4 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS  Note 4 | Config 1 | dB | -5.44 | -11.67 | -11.67 |
| Io Note 4 | Config 1 | dBm/  19.08MHz | -55.48 | -55.48 | -55.48 |
| PRS  Note 4 | | dB | -6 | -13 | -13 |
| 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 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: The values are defined separately for the cells from which the transmitted PRS resources are aggregated. | | | | | |

##### A.7.8.x.1.2 Test requirements

The RSTD measurement time with PRS aggregation in RRC\_INACTIVE state fulfils the requirements specified in clause 5.6.2.6.

The UE shall perform and report the RSTD measurements by aggregating PRS resources from Cell 2 and Cell 5, Cell 3 and Cell 6 respectively with respect to the Cell 1 and Cell 4 from which the transmitted PRS resources are also aggregated, within the time duration specified in section 5.6.2.6 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 observed during repeated tests shall be at least 90%, where the reported RSTD measurement with PRS aggregation for each correct event shall be within the RSTD reporting range specified in clause 10.1.X.X.X.

### A.7.8.X DL RSCPD reported with RSTD measurements

#### A.7.8.X.1 DL RSCPD reported with RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA in RRC\_INACTIVE state

##### A.7.8.X.1.1 Test Purpose and Environment

The purpose of the test is to verify that the DL RSCPD reported with RSTD measurement meets the requirements specified in Clause 5.6.7.5 in an environment with AWGN propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

The test environment is the same as in A.7.8.1.1 with the following additional configuration in Table A.7.8.X.1.1-1 and description.

In *nr-DL-TDOA-RequestLocationInformation,* the UE is configured to perform DL RSCPD measurement via *nr-DL-PRS-RSCPD-Request*. The UE also is configured to perform both RSCPD and RSTD measurements within the time window indicated to UE via *nr-DL-PRS-MeasurementTimeWindowsConfig*.

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

**Table A.7.8.X.1.1-1: Time window configuration**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Indicated time window configuration | Config 1 |  | MTW.1 | As specified in clause A.3.Y |

##### A.7.8.X.1.2 Test Requirements

The DL RSCPD reported with RSTD measurement time fulfils the requirements specified in Clause 5.6.7.5.

The UE shall perform and report the DL RSCPD and DL 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 5.6.7.5 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 10.1.23.3 and the reported RSCPD measurement for each correct event shall be within the RSCPD reporting range specified in Clause 10.1.Y1.3.

**--- other sections ---**

#### A.7.X.X PRS-RSRP measurement delay test case for RedCap positioning without Rx FH in RRC\_CONNECTED state in FR2

#### A.7.X.X.1 PRS-RSRP measurement delay test case for single positioning frequency layer

##### A.7.X.X.1.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements specified in Clause 9.9.3.5 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.X.X.1.1-1

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

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

The *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. The 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 PRS-RSRP measurement with RX FH via *NR-DL-AoD-RequestLocationInformation* or the UE is configured by the LMF to perform PRS-RSRP measurement with RX FH but reports the PRS-RSRP measurement based on the single hop in *NR-DL-AoD-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

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

The test parameters are as given in table A.7.X.X.1.1-2, and table A.7.X.X.1.1-3.

Table A.7.X.X.1.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2

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

Table A.7.X.X.1.1-2: General test parameters for PRS RSRP measurement reporting delay

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

Table A.7.X.X.1.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | 1 | Rough | | Rough | |
| TDD configuration | |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | 1 | TDD | | TDD | |
| BWchannel | | MHz | 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | 1 | CCR.3.1 TDD | | - | |
| TRS configuration | |  | 1 | TRS.2.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1 | 120 | | 120 | |
| PRS configuration | |  | 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting configuration | |  | 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | | dB |  |  | |  | |
| 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 | | 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -98 | | -98 | |
| Note2 | | dBm/SCS Note4 | 1 | -89 | | -89 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | 1 | -91 | -91 | -Infinity | -99 |
| PRP Note 3 | | dBm/SCS Note5 | 1 | -Infinity | -91 | -Infinity | -99 |
| PRS | | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | | dB | 1 | -Infinity | -2 | -Infinity | -10 |
| SSB | | dB | 1 | -2 | -2 | -Infinity | -10 |
| IoNote3 | | dBm/95.04 MHz Note5 | 1 | -57.89 | -57.63 | -57.89 | -57.63 |
| Propagation Condition | |  | 1 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP/PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: 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.7.X.X.1.2 Test Requirements

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

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

#### A.7.X.X.2 PRS-RSRP measurement delay test case for dual positioning frequency layer

##### A.7.X.X.2.1 Test Purpose and Environment

The purpose of the test is to verify the PRS RSRP measurement requirements specified in Clause 9.9.3.5 for dual positioning frequency layers under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.7.X.X.2.1-1

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

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

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

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

The test parameters are as given in table A.7.X.X.2.1-2, and table A.7.X.X.2.1-3.

Table A.7.X.X.2.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2

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

Table A.7.X.X.2.1-2: General test parameters for PRS RSRP measurement reporting delay

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

Table A.7.X.X.2.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | 1 | Rough | | Rough | |
| NR RF Channel Number | |  | 1 | 1 | | 2 | |
| TDD configuration | |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | 1 | TDD | | TDD | |
| BWchannel | | MHz | 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | 1 | CCR.3.1 TDD | | - | |
| TRS configuration | |  | 1 | TRS.2.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | 1 | 120 | | 120 | |
| PRS configuration | |  | 1 | PRS.1.1 FR2 | | PRS.1.2 FR2 | |
| PRS muting configuration | |  | 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | | dB |  |  | |  | |
| 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 | | 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -98 | | -98 | |
| Note2 | | dBm/SCS Note4 | 1 | -89 | | -89 | |
| SSB\_RP Note 3 | | dBm/SCS Note5 | 1 | -92 | -92 | -Infinity | -102 |
| PRP Note 3 | | dBm/SCS Note5 | 1 | -Infinity | -92 | -Infinity | -102 |
| PRS | | dB | 1 | -Infinity | -3 | -Infinity | -13 |
| PRS | | dB | 1 | -Infinity | -3 | -Infinity | -13 |
| SSB | | dB | 1 | -3 | -3 | -Infinity | -13 |
| IoNote3 | | dBm/95.04 MHz Note5 | 1 | -58.25 | -58.25 | -60.01 | -59.80 |
| Propagation Condition | |  | 1 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SSB\_RP/PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: 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.7.X.X.2.2 Test Requirements

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

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

## **--- End of Change #6\_8 ---**

## **--- Start of Change #7 ---**

# A.9A Tests for NR Sidelink Measurements for Positioning

## A.9A.1 Tests for NR Sidelink Measurements for Positioning in FR1

#### A.9A.1.1 Measurement delay tests

### A.9A.1.1.3 NR SL AoA measurements reporting delay test in FR1 SA

##### A.9A.1.1.3.1 Test Purpose and Environment

The purpose of the test is to verify that the SL AoA measurement meets the requirements specified in Clause 12A.6 in an environment with AWGN propagation conditions in FR1 in NR Uu standalone scenario, when a single frequency layer is configured for SL positioning.

The test is applicable for UEs supporting NR Uu and V2X or 5G ProSe operation, which are capable of performing SL AoA measurements.

The supported NR Uu test configurations are specified in Table A.9A.1.1.3.1-1.

The supported NR SL test configurations are specified in Table A.9A.1.1.3.1-2.

**Table A.9A.1.1.3.1-1: Supported Test Configurations for FR1 NR cell**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: 15 kHz SSB SCS, 20 MHz BW, FDD duplex mode |
| 2 | NR Uu: 15 kHz SSB SCS, 20 MHz BW, TDD duplex mode |
| 3 | NR Uu: SSB SCS 30 kHz, 40 MHz BW, TDD duplex mode |
| Note 1: The UE is only required to pass in one of the supported test configurations in FR1. | |

Table A.9A.1.1.X.1-2: Supported test configurations for NR SL UEs

|  |  |
| --- | --- |
| NR SL configuration | Description |
| SL\_conf1 | NR SL: 15 kHz SSB SCS, 10 MHz bandwidth, HD duplex mode |
| SL\_conf2 | NR SL: 30 kHz SSB SCS, 10 MHz bandwidth, HD duplex mode |
| SL\_conf3 | NR SL: 30 kHz SSB SCS, 20 MHz bandwidth, HD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

In the test there is one target UE receiving SL-PRS and performing SL AoA measurements and two anchor UEs (anchor UE 1, anchor UE 2) transmitting SL-PRS for the SL AoA measurements. The target UE and all the anchor UEs are in RRC\_CONNECTED state, with Cell 1 as their PCell in FR1. Cell 1 is also the synchronization source of the target UE and all anchor UEs in the test.

The test consists of two consecutive time intervals, with the duration of T1 and T2. During the duration T1, the target UE shall not have any timing information of anchor UE 1 and anchor UE 2. All two anchor UEs transmit SL-PRS during T2.

The *SL-AOA-ProvideAssistanceData* and *SL-AOA-RequestLocationInformation* as defined in TS 38.355 [37], shall be provided to the target UE via Cell 1 during T1. The last TTI containing the two messages shall be provided to the target UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *SL-AOA assistance* data and location information request.

The general test parameters are listed in Table A.9A.1.1.3.1-3. NR Uu specific test parameters for Cell 1 and NR Uu UE-specific test parameters for all UEs in the test are listed in Table A.9A.1.1.3.1-4 and A.9A.1.1.3.1-5, respectively. Anchor UE specific test parameters for SL AoA measurement reporting delay during T1 and T2 are listed in Table A.9A.1.1.3.1-6.

Table A.9A.1.1.3.1-3: General test parameters for SL AoA measurement reporting delay

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Serving cell |  | Cell 1 | NR PCell of the target UE and all anchor UEs (anchor UE 1, anchor UE 2), in FR1 on NR Uu RF channel 1. This cell is also the synchronization source for SL operation for all UEs in the test. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| Measurement gap |  | OFF |  |
| Target UE |  | UE 0 | The performing SL AoA measurements based on SL-PRS transmissions from anchor UEs |
| Other anchor UEs |  | UE 1 and UE 2 | Anchor UE 1 and Anchor UE 2 appear at the first and second places in the anchor UE list in the SL-AOA assistance data. |
| Number of anchor UEs provided in SL-AOA assistance data |  | 3 | Including the target UE |
| Sidelink communication configuration |  | As specified in Table A.3.21.2-2 |  |
| Target UE antenna configuration |  | 1 x 2 |  |
| Timing offset between the anchor UEs at the target UE antenna connector | μs | UE 1 to UE 0: 0  UE 2 to UE 1: 3 | Synchronous transmissions |
| 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.9A.1.1.3.1-4: NR Uu specific test parameters for Cell 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table A.9A.1.1.X.1-4: NR Uu specific test parameters for Cell 1Parameter | | Unit | Value | Comment |
| NR Uu RF channel number | |  | 1 | RF channel of Cell 1. |
| SSB configuration | Uu\_conf1 |  | SSB.1 FR1 | SSB configuration of Cell 1. |
| Uu\_conf2 |  | SSB.1 FR1 |
| Uu\_conf3 |  | SSB.2 FR1 |
| SMTC configuration | Uu\_conf1 |  | SMTC.2 | SMTC configuration of Cell 1. |
| Uu\_conf2 |  | SMTC.1 |
| Uu\_conf3 |  | SMTC.1 |
| PDSCH RMC configuration | Uu\_conf1 |  | SR.1.1 FDD |  |
| Uu\_conf2 |  | SR.1.1 TDD |  |
| Uu\_conf3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Uu\_conf1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Uu\_conf2 |  | CR.1.1 TDD |  |
| Uu\_conf3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Uu\_conf1 |  | CCR.1.1 FDD |  |
| Uu\_conf2 |  | CCR.1.1 TDD |  |
| Uu\_conf3 |  | CCR.2.1 TDD |  |
| Initial BWP configuration | Uu\_conf1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Uu\_conf1,2,3 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Uu\_conf1,2,3 |  | ULBWP.1.1 |  |

Table A.9A.1.1.3.1-5: NR Uu UE-specific test parameters for UE 0, UE 1, and UE 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR Uu RF channel number | |  | 1 | RF channel of Cell 1. |
| DRX | |  | OFF |  |
| OCNG Patterns | |  | OP.1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 |  |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |
| Note2 | Config 1,2,3 | dBm/15 kHz | -110 |  |
| Config 1, 2 | dBm /SCS | -110 |  |
| Config 3 | -107 |  |
|  | dB |  | 4.5 |  |
|  | dB |  | 4.5 |  |
| SS-RSRPNote3 | Config 1,2 | dBm /SCS | -105.5 |  |
|  | Config 3 | -102.5 |  |
| IoNote3 | Config 1,2 | dBm /9.36MHz | -76.2 |  |
| Config 3 | dBm/ 38.16MHz | -70.1 |  |
| Propagation condition | |  | AWGN |  |
| NOTE 1: OCNG shall be used such that cell 1 is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

Table A.9A.1.1.3.1-6: Anchor UE specific test parameters on the SL carrier

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Anchor UE 1 | | Anchor UE 2 | | | Comment |
| T1 | T2 | T1 | T2 | |  |
| SL RF Channel number | |  | 2 | | 2 | | |  |
| SL DRX | |  | OFF | | OFF | | |  |
| networkControlledSyncTx | |  | ON | | ON | | |  |
| inCoverage (in MIB-SL) | |  | TRUE | | TRUE | | |  |
| SL pool configuration | SL\_conf1 |  | N/A | TBD | N/A | | TBD |  |
| SL\_conf2 |  |
| SL\_conf3 |  |
| SL-PRS configuration | SL\_conf1 |  | N/A | TBD | N/A | | TBD | As specified in Table A.3.X.2.1-1 |
| SL\_conf2 |
| SL\_conf3 |
| PSCCH RMC (defined in TBD) | |  | TBD | TBD | TBD | | TBD |  |
| PSSCH RMC (defined in A.3.21.3) | |  | TBD | TBD | TBD | | TBD |  |
| Note 2 | | dBm/SCS | -98 | | | | |  |
| SL-PRS | | dB | -Infinity | TBD | -Infinity | | TBD |  |
| PSCCH | | dB | TBD | TBD | TBD | | TBD |  |
| Io Note 3 | SL\_conf1 | dBm/BW | TBD | TBD | TBD | | TBD |  |
| SL\_conf2 |  |
| SL\_conf3 |  |
| SL PRS-RSRP Note3 | | dBm/SCS | -Infinity | TBD | -Infinity | | TBD |  |
| Propagation Condition | |  | AWGN | | | | |  |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SL PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io level is based on the allocated RBs for SL PRS symbols.  Note 3: The UE is only required to be tested in one of the supported test configurations. | | | | | | | |  |

##### A.9A.1.1.3.2 Test Requirements

The SL AoA measurement time fulfils the requirements specified in clause 12A.2.6.

The UE shall perform and report to LMF the SL AoA measurements for the anchor UE 1 and anchor UE 2, within the time duration specified in clause 12A.6 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 anchor UE observed during repeated tests shall be at least 90%, where the reported SL AoA measurement for each correct event shall be within the SL AoA reporting range specified in clause 10.4A.6.1.1, i.e., between A\_AoA\_0 and SL\_AoA\_3599, and between Z\_AoA\_0 and Z\_AoA\_1799.

### A.9A.1.1.4 NR SL RTOA measurements reporting delay test in FR1 SA

##### A.9A.1.1.4.1 Test Purpose and Environment

The purpose of the test is to verify that the SL RTOA measurement meets the requirements specified in Clause 12A.7 in an environment with AWGN propagation conditions in FR1 in NR Uu standalone scenario, when a single frequency layer is configured for SL positioning.

The test is applicable for UEs supporting NR Uu and V2X or 5G ProSe operation, which are capable of performing SL AoA measurements.

The supported NR Uu test configurations are specified in Table A.9A.1.1.4.1-1.

The supported NR SL test configurations are specified in Table A.9A.1.1.4.1-2.

Table A.9A.1.1.4.1-1: Supported test configurations for FR1 NR Cell 1

|  |  |
| --- | --- |
| NR Uu configuration | Description |
| Uu\_conf1 | NR Uu: 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| Uu\_conf2 | NR Uu: 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| Uu\_conf3 | NR Uu: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

Table A.9A.1.1.X.1-2: Supported test configurations for NR SL UEs

|  |  |
| --- | --- |
| NR SL configuration | Description |
| SL\_conf1 | NR SL: 15 kHz SSB SCS, 10 MHz bandwidth, HD duplex mode |
| SL\_conf2 | NR SL: 30 kHz SSB SCS, 10 MHz bandwidth, HD duplex mode |
| SL\_conf3 | NR SL: 30 kHz SSB SCS, 20 MHz bandwidth, HD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

In the test there is one target UE transmitting SL-PRS and performing SL RTOA measurements and one anchor UE (anchor UE 1) receiving SL-PRS for the SL RTOA measurements. The target UE and all the anchor UEs are in RRC\_CONNECTED state, with Cell 1 as their PCell in FR1. Cell 1 is also the synchronization source of the target UE and all anchor UEs in the test.

The test consists of two consecutive time intervals, with the duration of T1 and T2. During the duration T1, the target UE shall not have any timing information of anchor UE 1 and anchor UE 2. All two anchor UEs transmit SL-PRS during T2.

The *SL-TOA-ProvideAssistanceData* and *SL-TOA-RequestLocationInformation* as defined in TS 38.355 [37], shall be provided to the target UE via Cell 1 during T1. The last TTI containing the two messages shall be provided to the target UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *SL-TOA assistance* data and location information request.

The general test parameters are listed in Table A.9A.1.1.4.1-3. NR Uu specific test parameters for Cell 1 and NR Uu UE-specific test parameters for all UEs in the test are listed in Table A.9A.1.1.4.1-4 and A.9A.1.1.4.1-5, respectively. Anchor UE specific test parameters for SL RTOA measurement reporting delay during T1 and T2 are listed in Table A.9A.1.1.4.1-6.

Table A.9A.1.1.4.1-3: General test parameters for SL RTOA measurement reporting delay

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Serving cell |  | Cell 1 | NR PCell of the target UE and all anchor UEs (anchor UE 1), in FR1 on NR Uu RF channel 1. This cell is also the synchronization source for SL operation for all UEs in the test. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| Measurement gap |  | OFF |  |
| Target UE |  | UE 0 | The performing SL RTOA measurements based on SL-PRS receiving from anchor UEs |
| Other anchor UEs |  | UE 1 | Anchor UE 1 appear at the first place in the anchor UE list SL-TOA assistance data. |
| Number of anchor UEs provided in SL-TOA assistance data |  | 2 | Including the target UE |
| Sidelink communication configuration |  | As specified in Table A.3.21.2-2 |  |
| Target UE antenna configuration |  | 1 x 2 |  |
| Timing offset between the anchor UEs at the target UE antenna connector | μs | Anchor UE 1 to target UE 1: 0 | Synchronous transmissions |
| 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.9A.1.1.4.1-4: NR Uu specific test parameters for Cell 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table A.9A.1.1.X.1-4: NR Uu specific test parameters for Cell 1Parameter | | Unit | Value | Comment |
| NR Uu RF channel number | |  | 1 | RF channel of Cell 1. |
| SSB configuration | Uu\_conf1 |  | SSB.1 FR1 | SSB configuration of Cell 1. |
| Uu\_conf2 |  | SSB.1 FR1 |
| Uu\_conf3 |  | SSB.2 FR1 |
| SMTC configuration | Uu\_conf1 |  | SMTC.2 | SMTC configuration of Cell 1. |
| Uu\_conf2 |  | SMTC.1 |
| Uu\_conf3 |  | SMTC.1 |
| PDSCH RMC configuration | Uu\_conf1 |  | SR.1.1 FDD |  |
| Uu\_conf2 |  | SR.1.1 TDD |  |
| Uu\_conf3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Uu\_conf1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Uu\_conf2 |  | CR.1.1 TDD |  |
| Uu\_conf3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Uu\_conf1 |  | CCR.1.1 FDD |  |
| Uu\_conf2 |  | CCR.1.1 TDD |  |
| Uu\_conf3 |  | CCR.2.1 TDD |  |
| Initial BWP configuration | Uu\_conf1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Uu\_conf1,2,3 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Uu\_conf1,2,3 |  | ULBWP.1.1 |  |

Table A.9A.1.1.4.1-5: NR Uu UE-specific test parameters for UE 0 and UE 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR Uu RF channel number | |  | 1 | RF channel of Cell 1. |
| DRX | |  | OFF |  |
| OCNG Patterns | |  | OP.1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 |  |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |
| Note2 | Config 1,2,3 | dBm/15 kHz | -110 |  |
| Config 1, 2 | dBm /SCS | -110 |  |
| Config 3 | -107 |  |
|  | dB |  | 4.5 |  |
|  | dB |  | 4.5 |  |
| SS-RSRPNote3 | Config 1,2 | dBm /SCS | -105.5 |  |
|  | Config 3 | -102.5 |  |
| IoNote3 | Config 1,2 | dBm /9.36MHz | -76.2 |  |
| Config 3 | dBm/ 38.16MHz | -70.1 |  |
| Propagation condition | |  | AWGN |  |
| NOTE 1: OCNG shall be used such that cell 1 is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

Table A.9A.1.1.4.1-6: Anchor UE specific test parameters on the SL carrier

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Anchor UE 1 | |
| T1 | T2 |
| SL RF Channel number | |  | 2 | |
| SL DRX | |  | OFF | |
| networkControlledSyncTx | |  | ON | |
| inCoverage (in MIB-SL) | |  | TRUE | |
| SL pool configuration | SL\_conf1 |  | N/A | TBD |
| SL\_conf2 |
| SL\_conf3 |
| SL-PRS configuration | SL\_conf1 |  | N/A | TBD |
| SL\_conf2 |
| SL\_conf3 |
| PSCCH RMC (defined in TBD) | |  | TBD | TBD |
| PSSCH RMC (defined in A.3.21.3) | |  | TBD | TBD |
| Note 2 | | dBm/SCS | -98 | |
| SL-PRS | | dB | -Infinity | TBD |
| PSCCH | | dB | TBD | TBD |
| Io Note 3 | SL\_conf1 | dBm/BW | TBD | TBD |
| SL\_conf2 |
| SL\_conf3 |
| SL PRS-RSRP Note3 | | dBm/SCS | -Infinity | TBD |
| Propagation Condition | |  | AWGN | |
| NOTE 1: The resources for NR Uu uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other UEs 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 3: SL PRS-RSRP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | |

##### A.9A.1.1.4.2 Test Requirements

The SL RTOA measurement time fulfils the requirements specified in clause 12A.2.7.

The UE shall perform and report to LMF the SL RTOA measurements for the anchor UE 1, within the time duration specified in clause 12A.7 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 anchor UE observed during repeated tests shall be at least 90%, where the reported SL RTOA measurement for each correct event shall be within the SL RTOA reporting range specified in clause 10.4A.7.1.1, i.e., between SL\_RTOA\_0 and SL\_RTOA\_985024.

#### A.9A.1.1.X NR SL RSTD measurement reporting delay test case in FR1 SA

##### A.9A.1.1.X.1 Test Purpose and Environment

The purpose of the test is to verify that the SL RSTD measurement meets the requirements specified in clause 12A.2 in an environment with AWGN propagation conditions in FR1 in standalone NR scenario, with additionally configured single frequency layer for SL positioning.

This test is applicable for UEs supporting NR Uu and V2X or 5G ProSe operation, which are capable of performing SL RSTD measurements.

The supported NR Uu test configurations are specified in Table A.9A.1.1.X.1-1.

Table A.9A.1.1.X.1-1: Supported test configurations for FR1 NR Cell 1

|  |  |
| --- | --- |
| NR Uu configuration | Description |
| Uu\_conf1 | NR Uu: 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| Uu\_conf2 | NR Uu: 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| Uu\_conf3 | NR Uu: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

The supported NR SL test configurations are specified in Table A.9A.1.1.X.1-2.

Table A.9A.1.1.X.1-2: Supported test configurations for NR SL UEs

|  |  |
| --- | --- |
| NR SL configuration | Description |
| SL\_conf1 | NR SL: 15 kHz SSB SCS, 10 MHz bandwidth, HD duplex mode |
| SL\_conf2 | NR SL: 30 kHz SSB SCS, 10 MHz bandwidth, HD duplex mode |
| SL\_conf3 | NR SL: 30 kHz SSB SCS, 20 MHz bandwidth, HD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

In the test, there is one target UE receiving SL-PRS and performing SL RSTD measurements and three anchor UEs (anchor UE 1, anchor UE 2, and anchor UE 3) transmitting SL-PRS for the SL RSTD measurements on NR SL RF channel 2. Anchor UE 1 is the reference anchor UE for the measurements. The target UE and all the anchor UEs are in RRC\_CONNECTED state, with Cell 1 as their PCell in FR1 on NR Uu RF channel 1. Cell 1 is also the synchronization source of the target UE and all anchor UEs in the test.

The test consists of two consecutive time intervals, with duration of T1 and T2. Before T2 starts, the UEs have been synchronized to Cell 1. During time duration T1, the target UE shall not have any timing information of anchor UE 2 and anchor UE 3. All three anchor UEs transmit SL-PRS during T2.

The *SL-TDOA-ProvideAssistanceData* and *SL-TDOA-RequestLocationInformation* as defined in TS 38.355 [37, clause 6.9], shall be provided to the target UE via Cell 1 during T1. The last TTI containing the two messages shall be provided to the target UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *SL-TDOA assistance* data and location information request.

The general test parameters are listed in Table A.9A.1.1.X.1-3. NR Uu specific test parameters for Cell 1 and NR Uu UE-specific test parameters for all UEs in the test are listed in Table A.9A.1.1.X.1-4 and A.9A.1.1.X.1-5, respectively. Anchor UE specific test parameters for SL RSTD measurement reporting delay during T1 and T2 are listed in Table A.9A.1.1.X.1-6.

Table A.9A.1.1.X.1-3: General test parameters for SL RSTD measurement reporting delay

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Serving cell |  | Cell 1 | NR PCell of the target UE and all anchor UEs (anchor UE 1, anchor UE 2, anchor UE 3), in FR1 on NR Uu RF channel 1. This cell is also the synchronization source for SL operation for all UEs in the test. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| Measurement gap |  | OFF |  |
| Target UE |  | UE 0 | The performing SL RSTD measurements based on SL-PRS transmissions from anchor UEs |
| Reference anchor UE |  | UE 1 | Reference anchor UE is the UE in the SL-TDOA assistance data with respect to which the SL RSTD measurement is defined, as specified in TS 38.215 [4] and TS 38.355 [37]. The reference anchor UE is UE 1 in this test case. |
| Other anchor UEs |  | UE 2 and UE 3 | Anchor UE 2 and Anchor UE 3 appear at the first and second places in the anchor UE list SL-RTD-Info in the SL-TDOA assistance data. |
| Number of anchor UEs provided in SL-TDOA assistance data |  | 4 | Including the reference anchor UE |
| Sidelink communication configuration |  | As specified in Table A.3.21.2-2 |  |
| Target UE antenna configuration |  | 1 x 2 |  |
| Timing offset between the anchor UEs at the target UE antenna connector | μs | UE 2 to UE 1: 0  UE 3 to UE 1: 3 | Synchronous transmissions |
| 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.9A.1.1.X.1-4: NR Uu specific test parameters for Cell 1Parameter | | Unit | Value | Comment |
| NR Uu RF channel number | |  | 1 | RF channel of Cell 1. |
| SSB configuration | Uu\_conf1 |  | SSB.1 FR1 | SSB configuration of Cell 1. |
| Uu\_conf2 |  | SSB.1 FR1 |
| Uu\_conf3 |  | SSB.2 FR1 |
| SMTC configuration | Uu\_conf1 |  | SMTC.2 | SMTC configuration of Cell 1. |
| Uu\_conf2 |  | SMTC.1 |
| Uu\_conf3 |  | SMTC.1 |
| PDSCH RMC configuration | Uu\_conf1 |  | SR.1.1 FDD |  |
| Uu\_conf2 |  | SR.1.1 TDD |  |
| Uu\_conf3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Uu\_conf1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Uu\_conf2 |  | CR.1.1 TDD |  |
| Uu\_conf3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Uu\_conf1 |  | CCR.1.1 FDD |  |
| Uu\_conf2 |  | CCR.1.1 TDD |  |
| Uu\_conf3 |  | CCR.2.1 TDD |  |
| Initial BWP configuration | Uu\_conf1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Uu\_conf1,2,3 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Uu\_conf1,2,3 |  | ULBWP.1.1 |  |

Table A.9A.1.1.X.1-5: NR Uu UE-specific test parameters for UE 0, UE 1, UE 2, and UE 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR Uu RF channel number | |  | 1 | RF channel of Cell 1. |
| DRX | |  | OFF |  |
| OCNG Patterns | |  | OP.1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 |  |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |
| Note2 | Config 1,2,3 | dBm/15 kHz | -110 |  |
| Config 1, 2 | dBm /SCS | -110 |  |
| Config 3 | -107 |  |
|  | dB |  | 4.5 |  |
|  | dB |  | 4.5 |  |
| SS-RSRPNote3 | Config 1,2 | dBm /SCS | -105.5 |  |
|  | Config 3 | -102.5 |  |
| IoNote3 | Config 1,2 | dBm /9.36MHz | -76.2 |  |
| Config 3 | dBm/ 38.16MHz | -70.1 |  |
| Propagation condition | |  | AWGN |  |
| NOTE 1: OCNG shall be used such that cell 1 is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

Table A.9A.1.1.X.1-6: Anchor UE specific test parameters on the SL carrier

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Anchor UE 1 | | Anchor UE 2 | | | Anchor UE 3 | | |
| T1 | T2 | T1 | T2 | | T1 | T2 | |
| SL RF Channel number | |  | 2 | | 2 | | | 2 | | |
| SL DRX | |  | OFF | | OFF | | | OFF | | |
| networkControlledSyncTx | |  | ON | | ON | | | ON | | |
| inCoverage (in MIB-SL) | |  | TRUE | | TRUE | | | TRUE | | |
| SL pool configuration | SL\_conf1 |  | N/A | TBD | N/A | | TBD | N/A | | TBD |
| SL\_conf2 |
| SL\_conf3 |
| SL-PRS configuration | SL\_conf1 |  | N/A | TBD | N/A | | TBD | N/A | | TBD |
| SL\_conf2 |
| SL\_conf3 |
| PSCCH RMC (defined in TBD) | |  | TBD | TBD | TBD | | TBD | TBD | | TBD |
| PSSCH RMC (defined in A.3.21.3) | |  | TBD | TBD | TBD | | TBD | TBD | | TBD |
| Note 2 | | dBm/SCS | -98 | | | | | | | |
| SL-PRS | | dB | -Infinity | TBD | -Infinity | | TBD | -Infinity | | TBD |
| PSCCH | | dB | TBD | TBD | TBD | | TBD | TBD | | TBD |
| Io Note 3 | SL\_conf1 | dBm/BW | TBD | TBD | TBD | | TBD | TBD | | TBD |
| SL\_conf2 |
| SL\_conf3 |
| SL PRS-RSRP Note3 | | dBm/SCS | -Infinity | TBD | -Infinity | | TBD | -Infinity | | TBD |
| Propagation Condition | |  | AWGN | | | | | | | |
| NOTE 1: The resources for NR Uu uplink transmission are assigned to the UE prior to the start of time period T2.  NOTE 2: Interference from other UEs 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 3: SL PRS-RSRP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | | | | | | |

##### A.9A.1.1.X.2 Test Requirements

The SL RSTD measurement time fulfils the requirements specified in clause 12A.2.5.

The UE shall perform and report to LMF the SL RSTD measurements for anchor UE 2 and anchor UE 3 with respect to the reference anchor UE 1, within the time duration specified in clause 12A.2.5 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 anchor UE observed during repeated tests shall be at least 90%, where the reported SL RSTD measurement for each correct event shall be within the SL RSTD reporting range specified in clause 10.4A.2.1.1, i.e., between SL\_RSTD\_000000 and SL\_RSTD\_492513.

#### A.9A.1.1.X SL Rx-Tx measurement delay tests

##### A.9A.1.1.X.1 Test Purpose and Environment

The purpose of the test is to verify that the SL Rx-Tx measurement meets the requirements specified in clause 12A.2 in an environment with AWGN propagation conditions in FR1 in standalone NR scenario, with additionally configured single frequency layer for SL positioning.

This test is applicable for UEs supporting NR Uu and V2X or 5G ProSe operation, which are capable of performing SL Rx-Tx measurements.

The supported NR Uu test configurations in FR1 are shown in Table A.9A.1.1.X.1-1.

**Table A.9A.1.1.X.1-1: Supported Test Configurations for FR1 NR cell**

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR Uu: 15 kHz SSB SCS, 20 MHz BW, FDD duplex mode |
| 2 | NR Uu: 15 kHz SSB SCS, 20 MHz BW, TDD duplex mode |
| 3 | NR Uu: SSB SCS 30 kHz, 40 MHz BW, TDD duplex mode |
| Note 1: The UE is only required to pass in one of the supported test configurations in FR1. | |

The supported NR SL test configurations are specified in Table A.9A.1.1.X.1-2.

Table A.9A.1.1.X.1-2: Supported test configurations for NR SL UEs

|  |  |
| --- | --- |
| NR SL configuration | Description |
| SL\_conf1 | NR SL: 15 kHz SSB SCS, 10 MHz bandwidth, HD duplex mode |
| SL\_conf2 | NR SL: 30 kHz SSB SCS, 10 MHz bandwidth, HD duplex mode |
| SL\_conf3 | NR SL: 30 kHz SSB SCS, 20 MHz bandwidth, HD duplex mode |
| NOTE: The UE is only required to be tested in one of the supported test configurations. | |

There is one NR active cell (Cell 1) and three active UEs (one target UE and two anchor UEs for SL positioning measurement) in this test. The target UE receives SL-PRS and performs the SL Rx-Tx time difference measurement. The two anchor UEs transmit the SL-PRS for the SL Rx-Tx time difference measurement on NR SL RF channel 2. The target UE and all anchor UEs are in RRC\_CONNECTED state, with Cell 1 as their PCell in FR1 on NR Uu RF channel 1.

The test consists of two successive time periods, with time duration of T1 and T2 respectively. Before T2 starts, the UEs have been synchronized to the NR serving cell. And during T2, two anchor UEs transmit SL-PRS for positioning measurements.

The *SL-TDOA-ProvideAssistanceData* and *SL-TDOA-RequestLocationInformation* as defined in TS 38.355 [37, clause 6.9], shall be provided to the target UE via Cell 1 during T1. The last TTI containing the two messages shall be provided to the target UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the *SL-TDOA assistance* data and location information request.

The test parameters are given in Table A.9A.1.1.X.1-3, A.9A.1.1.X.1-4, A.9A.1.1.X.1-5 and Table A.9A.1.1.X.1-6 below.

Table A.9A.1.1.X.1-3: General Test Parameters for SL Rx-Tx measurement reporting delay

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Serving cell |  | Cell 1 | NR PCell of the target UE and all anchor UEs (anchor UE 1, anchor UE 2), in FR1 on NR Uu RF channel 1. This cell is also the synchronization source for SL operation for all UEs in the test. |
| CP length |  | Normal |  |
| DRX |  | OFF |  |
| Measurement gap |  | OFF |  |
| Target UE |  | UE 0 | The performing SL Rx-Tx measurements based on SL-PRS transmissions from anchor UEs |
| Other anchor UEs |  | UE 1 and UE 2 | Anchor UE 1 and Anchor UE 2 appear at the first and second places in the anchor UE list SL-RTD-Info in the SL-TDOA assistance data. |
| Number of anchor UEs provided in SL-TDOA assistance data |  | 3 | Including the target UE |
| Sidelink communication configuration |  | As specified in Table A.3.21.2-2 |  |
| Target UE antenna configuration |  | 1 x 2 |  |
| Timing offset between the anchor UEs at the target UE antenna connector | μs | UE 2 to UE 1: 0  UE 3 to UE 1: 3 | Synchronous transmissions |
| 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.9A.1.1.X.1-4: NR Uu specific test parameters for Cell 1Parameter | | Unit | Value | Comment |
| NR Uu RF channel number | |  | 1 | RF channel of Cell 1. |
| SSB configuration | Uu\_conf1 |  | SSB.1 FR1 | SSB configuration of Cell 1. |
| Uu\_conf2 |  | SSB.1 FR1 |
| Uu\_conf3 |  | SSB.2 FR1 |
| SMTC configuration | Uu\_conf1 |  | SMTC.2 | SMTC configuration of Cell 1. |
| Uu\_conf2 |  | SMTC.1 |
| Uu\_conf3 |  | SMTC.1 |
| PDSCH RMC configuration | Uu\_conf1 |  | SR.1.1 FDD |  |
| Uu\_conf2 |  | SR.1.1 TDD |  |
| Uu\_conf3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Uu\_conf1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Uu\_conf2 |  | CR.1.1 TDD |  |
| Uu\_conf3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Uu\_conf1 |  | CCR.1.1 FDD |  |
| Uu\_conf2 |  | CCR.1.1 TDD |  |
| Uu\_conf3 |  | CCR.2.1 TDD |  |
| Initial BWP configuration | Uu\_conf1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active DL BWP configuration | Uu\_conf1,2,3 |  | DLBWP.1.1 |  |
| Active UL BWP configuration | Uu\_conf1,2,3 |  | ULBWP.1.1 |  |

Table A.9A.1.1.X.1-5: NR Uu UE-specific test parameters for UE 0, UE 1 and UE 2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| NR Uu RF channel number | |  | 1 | RF channel of Cell 1. |
| DRX | |  | OFF |  |
| OCNG Patterns | |  | OP.1 |  |
| EPRE ratio of PSS to SSS | | dB | 0 |  |
| EPRE ratio of PBCH DMRS to SSS | |  |
| EPRE ratio of PBCH to PBCH DMRS | |  |
| EPRE ratio of PDCCH DMRS to SSS | |  |
| EPRE ratio of PDCCH to PDCCH DMRS | |  |
| EPRE ratio of PDSCH DMRS to SSS | |  |
| EPRE ratio of PDSCH to PDSCH | |  |
| EPRE ratio of OCNG DMRS to SSS Note 1 | |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 | |  |
| Note2 | Config 1,2,3 | dBm/15 kHz | -110 |  |
| Config 1, 2 | dBm /SCS | -110 |  |
| Config 3 | -107 |  |
|  | dB |  | 4.5 |  |
|  | dB |  | 4.5 |  |
| SS-RSRPNote3 | Config 1,2 | dBm /SCS | -105.5 |  |
|  | Config 3 | -102.5 |  |
| IoNote3 | Config 1,2 | dBm /9.36MHz | -76.2 |  |
| Config 3 | dBm/ 38.16MHz | -70.1 |  |
| Propagation condition | |  | AWGN |  |
| NOTE 1: OCNG shall be used such that cell 1 is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  NOTE 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  NOTE 3: SS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  NOTE 4: SS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | |

Table A.9A.1.1.X.1-6: Anchor V2X UE specific test parameters for SL Rx-Tx measurement

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Anchor UE 1 | | Anchor UE 2 | | | Comment |
| T1 | T2 | T1 | T2 | |  |
| SL RF Channel number | |  | 2 | | 2 | | |  |
| SL DRX | |  | OFF | | OFF | | |  |
| networkControlledSyncTx | |  | ON | | ON | | |  |
| inCoverage (in MIB-SL) | |  | TRUE | | TRUE | | |  |
| SL pool configuration | SL\_conf1 |  | N/A | TBD | N/A | | TBD |  |
| SL\_conf2 |  |
| SL\_conf3 |  |
| SL-PRS configuration | SL\_conf1 |  | N/A | TBD | N/A | | TBD | As specified in Table A.3.X.2.1-1 |
| SL\_conf2 |
| SL\_conf3 |
| PSCCH RMC (defined in TBD) | |  | TBD | TBD | TBD | | TBD |  |
| PSSCH RMC (defined in A.3.21.3) | |  | TBD | TBD | TBD | | TBD |  |
| Note 2 | | dBm/SCS | -98 | | | | |  |
| SL-PRS | | dB | -Infinity | TBD | -Infinity | | TBD |  |
| PSCCH | | dB | TBD | TBD | TBD | | TBD |  |
| Io Note 3 | SL\_conf1 | dBm/BW | TBD | TBD | TBD | | TBD |  |
| SL\_conf2 |  |
| SL\_conf3 |  |
| SL PRS-RSRP Note3 | | dBm/SCS | -Infinity | TBD | -Infinity | | TBD |  |
| Propagation Condition | |  | AWGN | | | | |  |
| Note 1: Interference from other UEs and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: SL PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. Io level is based on the allocated RBs for SL PRS symbols.  Note 3: The UE is only required to be tested in one of the supported test configurations. | | | | | | | |  |

##### A.9A.1.1.X.2 Test Requirements

The SL Rx-Tx time difference measurement time fulfils the requirements specified in clause 12A.4.5.

The UE shall perform and report the SL Rx-Tx time difference measurements for anchor UE 1 and anchor UE 2 within the specified SL Rx-Tx time difference measurement time 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 anchor UE observed during repeated tests shall be at least 90%, where the reported SL Rx-Tx measurement for each correct event shall be within the SL Rx-Tx reporting range specified in clause 10.4A.4.1.

#### A.9A.1.2 Measurement accuracy tests

## **--- End of Change #7 ---**

## **--- Start of Change #7\_001 ---**

### A.16.6.X RSTD measurements

#### A.16.6.X.1 NR RSTD measurement reporting delay test case for RedCap UE without FH in FR1 SA

##### A.16.6.X.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.X.1.1-1.

Table A.16.6.X.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.X.1.1-2, and cell specific test parameters are listed in Table A.16.6.X.1.1-3.

Table A.16.6.X.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 | |  | 4 | 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.X.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.X.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 1~4 | 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.X.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.X.3, i.e., between RSTD\_0000000 and RSTD1970049.

#### A.16.6.X.2 NR RSTD measurement reporting delay test case with PRS frequency hopping

##### A.16.6.X.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.X.2.1-1.

Table A.16.6.X.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 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.X.2.1-2, and cell specific test parameters are listed in Table A.16.6.X.2.1-3.

Table A.16.6.X.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 |  | TBD | PRS configured with frequency hopping as specified in clause A.3.31 |
| Config 2 |  | TBD |
| Config 3 |  | TBD |
| 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 | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |

Table A.16.6.X.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.X.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 1~4 | 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.X.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 10.1.23.3, i.e., between RSTD\_0000000 and RSTD1970049

## **--- End of Change #7\_001 ---**

## **--- Start of Change #7\_002 ---**

##### A.16.6.X1.1 UE Rx-Tx measurement reporting delay test case for single positioning frequency layer in FR1 SA for RedCap UE without RX FH in RRC\_CONNECTED mode

###### A.16.6.X1.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement without RX FH reported by the RedCap UE meets the requirements specified in clause 9.9A.4.5 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured. The measurement reporting delay test defined in this clause is valid for both 1Rx and 2Rx RedCap UEs.

The supported test configurations in listed in Table A.16.6.X1.1.1-1.

Table A.16.6.X1.1.1-1: 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. | |

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

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

The *NR-Multi-RTT-ProvideAssistanceData* and *NR-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the 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 UE Rx-Tx time difference measurement with RX FH via *NR-Multi-RTT-RequestLocationInformation* or the UE is configured by the LMF to perform UE Rx-Tx time difference measurement with RX FH via *NR-Multi-RTT-RequestLocationInformation* but reports the UE Rx-Tx time difference measurement based on the single hop in *NR-Multi-RTT-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 multi-RTT assistance data and location information request. The beginning of the time interval T2 shall be aligned with the beginning of the first MG instance containing the PRS resources.

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

The RedCap UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.16.6.X1.1.1-2 and Table A.16.6.X1.1.1-3 respectively.

Table A.16.6.X1.1.1-2: General test parameters.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1,2,3,4 | Cell 1 | Cell 1 is the reference cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1,2,3,4 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1,2,3,4 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 20: NRB,c = 52 |  |
| SSB configuration |  | 1,4 | SSB.4 RedCap FR1 |  |
|  |  | 2 | SSB.4 RedCap FR1 |  |
|  |  | 3 | SSB.5 RedCap FR1 |  |
| SMTC configuration |  | 1,4 | SMTC.1 RedCap |  |
|  |  | 2 | SMTC.1 RedCap |  |
|  |  | 3 | SMTC.1 RedCap |  |
| Measurement gap |  | 1,2,3,4 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1,2,3,4 | Normal |  |
| DRX |  | 1,2,3,4 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1,2,3,4 | 3 | Synchronous cells |
| T1 | s | 1,2,3,4 | 5 |  |
| T2 | s | 1,2,3,4 | 10 |  |
| Note 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

Table A. A.16.6.X1.1.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | | |
|  |  | T1 | T2 | T1 | T2 | |
| TDD configuration |  | 1,4 | N/A | | N/A | | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | | |
| PDSCH RMC configuration |  | 1,4 | SR.1.1 FDD | | N/A | | |
|  | 2 | SR.1.1 TDD | |  | | |
|  | 3 | SR.2.1 TDD | |  | | |
| RMSI CORESET RMC configuration |  | 1,4 | CR.1.1 FDD | | N/A | | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1,4 | CCR.1.1 FDD | | N/A | | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1,2,3,4 | OP.1 | | OP.1 | | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4 | 0 | | 0 | | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD | | N/A | | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1,2,3,4 | DLBWP.0.1 ULBWP.0.1 | | N/A | | |
| Active DL BWP configuration |  | 1,2,3,4 | DLBWP.1.1 RedCap | | N/A | | |
| Active UL BWP configuration |  | 1, 2, 3 | ULBWP.1.1 RedCap | | N/A | | |
| PRS configuration |  | 1,4 | PRS.1.1 FR1 | | PRS.1.1 FR1 | | |
| 2 | PRS.1.1 FR1 | | PRS.1.1 FR1 | | |
| 3 | PRS.2.1 FR1 | | PRS.2.1 FR1 | | |
| PRS muting info |  | 1,2,3,4 | ‘10’ | | ‘01’ | | |
| SRS configuration |  | 1,4 | POS-SRS.1 | | N/A | | |
| 2 | POS-SRS.1 | | N/A | | |
| 3 | POS-SRS.2 | | N/A | | |
| Note 2 | dBm/SCS | 1,4 | -98 | | | | |
|  | 2 | -98 | | | | |
|  | 3 | -95 | | | | |
| PRS | dB | 1,4 | -Infinity | -2.41 | -Infinity | | -12.12 |
|  | 2 |  |  |  | |  |
|  |  | 3 |  |  |  | |  |
| PRS | dB | 1,4 | -Infinity | -2 | -Infinity | | -10 |
|  | 2 |  |  |  | |  |
|  | 3 |  |  |  | |  |
| PRP Note 3 | dBm/SCS kHz | 1,4 | -Infinity | -100 | -Infinity | | -108 |
|  | 2 | -Infinity | -100 | -Infinity | | -108 |
|  | 3 | -Infinity | -97 | -Infinity | | -105 |
| Io | dBm/9.36 MHz | 1,4 | N/A | -66.22 | N/A | | -66.22 |
| dBm/9.36 MHz | 2 | -66.22 | -66.22 |
| dBm/18.72 MHz | 3 | -63.22 | -63.22 |
| Propagation Condition |  | 1,2,3,4 | AWGN | | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: 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 subframes with transmitted PRS. | | | | | | | |

###### A.16.6.X1.1.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9A.4.5.

The UE shall perform and report the UE Rx-Tx time difference measurements without RX FH for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time 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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.

#### A.16.6.X1.2 UE Rx-Tx time difference measurement with Rx FH for single positioning frequency layer in FR1 SA in RRC\_CONNECTED state

##### A.16.6.X1.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement with Rx FH in RRC\_CONNECTED state meets the requirements specified in clause 9.9A.4.8 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are listed in Table A.16.6.X1.2.1-1.

Table A.16.6.X1.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, [10] MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, [10] MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, [20] MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, [10] MHz bandwidth, HD-FDD duplex mode |
| Note: The RedCap UE is only required to be tested in one of the supported test configurations. | |

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

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

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

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

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

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.16.6.X1.2.1-2 and Table A.16.6.X1.2.1-3 respectively.

Table A.16.6.X1.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3, 4 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1, 2, 4 | [10: NRB,c = 52] |  |
| 3 | [20: NRB,c = 51] |  |
| SSB configuration |  | 1, 2, 4 | SSB.1 FR1 |  |
|  |  | 3 | SSB.1 RedCap FR1 |  |
| SMTC configuration |  | 1, 2, 3, 4 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3, 4 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX |  | 1, 2, 3, 4 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| PRS RX hopping request |  | 1, 2, 3, 4 | requested |  |
| T1 | s | 1, 2, 3, 4 | 5 |  |
| T2 | s | 1, 2, 3, 4 | 10 |  |
| Note 1: GP#24 is configured if RedCap UE supports MG#24, otherwise GP#0 is configured. | | | | |

Table A.16.6.X1.2.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1, 4 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1  ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3, 4 | DLBWP.1.1 RedCap | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3, 4 | ULBWP.1.1 RedCap | | N/A | |
| PRS configuration |  | 1, 4 | PRS.X.X FR1 | | PRS.X.X FR1 | |
|  | 2 | PRS.X.X FR1 | | PRS.X.X FR1 | |
|  | 3 | PRS.X.X FR1 | | PRS.X.X FR1 | |
| PRS muting info |  | 1, 2, 3, 4 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1, 4 | POS-SRS.1 | | N/A | |
|  | 2 | POS-SRS.1 | | N/A | |
|  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  | 2 | -Infinity | -100 | -Infinity | -108 |
|  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/19.08 MHz | 1, 4 | N/A | -64.57 | N/A | -64.57 |
| dBm/19.08 MHz | 2 | -64.57 | -64.57 |
| dBm/47.88 MHz | 3 | -60.59 | -60.59 |
| Propagation Condition |  | 1, 2, 3, 4 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the RedCap UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.16.6.X1.2.2 Test requirements

The UE Rx-Tx time difference measurement time in RRC\_CONNECTED state fulfils the requirements specified in clause 9.9A.4.8.

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

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.X.X.X.

## **--- End of Change #7\_002 ---**

## **--- Start of Change #7\_004 ---**

#### A.16.6.X2.2 PRS-RSRP measurement delay with FH in RRC\_CONNECTED state in FR1

##### A.16.6.X2.2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement withFH by a RedCap UE meets the delay requirements specified in clause 9.9A.3.6 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.16.6.X2.2.1-1.

Table A.16.6.X2.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, [10 MHz] bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, [10 MHz] bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, [20 MHz] bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, [10 MHz] bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

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

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

The general test parameters are listed in Table A.16.6.X2.2.1-2, and cell specific test parameters are listed in Table A.16.6.X2.2.1-3.

Table A.16.6.X2.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Reference cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1, 2, 4 | [10: NRB,c = 52] |  |
| 3 | [20: NRB,c = 51] |  |
| SSB configuration |  | 1, 2, 4 | SSB.1 FR1 |  |
|  |  | 3 | SSB.1 RedCap FR1 |  |
| SMTC configuration |  | 1, 2, 3, 4 | SMTC.1 RedCap |  |
| Measurement gap |  | 1, 2, 3, 4 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX |  | 1, 2, 3, 4 | NA | OFF |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3, 4 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3, 4 | 5 |  |
| PRS RX hopping request |  | 1, 2, 3, 4 | Present |  |
| T1 | s | 1, 2, 3, 4 | 2 |  |
| T2 | s | 1, 2, 3, 4 | 5 |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

Table A.16.6.X2.2.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1, 4 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3, 4 | DLBWP.1.1 RedCap | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3, 4 | ULBWP.1.1 RedCap | | N/A | |
| PRS configuration |  | 1, 4 | PRS.1.X FR1 | | PRS.1.X FR1 | |
|  | 2 | PRS.1.X FR1 | | PRS.1.X FR1 | |
|  | 3 | PRS.2.X FR1 | | PRS.2.X FR1 | |
| PRS muting info |  | 1, 2, 3, 4 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/9.36 MHz | 1, 4 | -70.05 | -67.67 | -70.05 | -67.67 |
|  | dBm/9.36 MHz | 2 | -70.05 | -67.67 | -70.05 | -67.67 |
|  | dBm/18.36 MHz | 3 | -67.13 | -64.75 | -67.13 | -64.75 |
| Propagation Condition |  | 1, 2, 3, 4 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: 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 subframes with transmitted PRS. | | | | | | |

##### A.16.6.X2.2.2 Test Requirements

The UE shall perform and report the PRS-RSRP measurements for Cell 1 and Cell 2, within the time limit specified in clause 9.9A.3.6, 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 limit above because of TTI insertion uncertainty of the measurement report in DCCH.

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

## **--- End of Change #7\_004 ---**

## **--- Start of Change #7\_005 ---**

#### A.16.6.X3.1 PRS-RSRPP measurement delay without FH in RRC\_CONNECTED state in FR1

##### A.16.6.X3.1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement without FH by a RedCap UE meets the delay requirements specified in clause 9.9A.5.5 in an environment with a 2-tap channel propagation condition.

The supported test configurations are specified in Table A.16.6.X3.1.1-1.

Table A.16.6.X3.1.11: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

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

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

The general test parameters are listed in Table A.16.6.X3.1.1-2, and cell specific test parameters are listed in Table A.16.6.X3.1.1-3.

Table A.16.6.X3.1.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Reference cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1, 2, 4 | 10: NRB,c = 52 |  |
| 3 | 20: NRB,c = 51 |  |
| SSB configuration |  | 1, 2, 4 | SSB.1 FR1 |  |
|  | 3 | SSB.1 RedCap FR1 |  |
| SMTC configuration |  | 1, 2, 3, 4 | SMTC.1 RedCap |  |
| Measurement gap |  | 1, 2, 3, 4 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX |  | 1, 2, 3, 4 | NA | OFF |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3, 4 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3, 4 | 5 |  |
| PRS RX hopping request |  | 1, 2, 3, 4 | NOT present |  |
| T1 | s | 1, 2, 3, 4 | 2 |  |
| T2 | s | 1, 2, 3, 4 | 5 |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

Table A.16.6.X3.1.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration |  | 1, 4 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3, 4 | DLBWP.1.1 RedCap | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3, 4 | ULBWP.1.1 RedCap | | N/A | |
| PRS configuration |  | 1, 4 | PRS.1.3 FR1 | | PRS.1.3 FR1 | |
|  | 2 | PRS.1.3 FR1 | | PRS.1.3 FR1 | |
|  | 3 | PRS.2.3 FR1 | | PRS.2.3 FR1 | |
| PRS muting info |  | 1, 2, 3, 4 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -88 | -88 | -Infinity | -88 |
| 2 | -88 | -88 | -Infinity | -88 |
| 3 | -85 | -85 | -Infinity | -85 |
| Io | dBm/9.36 MHz | 1, 4 | -70.05 | -67.67 | -70.05 | -67.67 |
|  | dBm/9.36 MHz | 2 | -70.05 | -67.67 | -70.05 | -67.67 |
|  | dBm/18.36 MHz | 3 | -67.13 | -64.75 | -67.13 | -64.75 |
| Propagation Condition |  | 1, 2, 3, 4 | Two-tap channel defined in 38.101-4 Annex B.2.4,  *a* = 1, µs and Hz | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: 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 subframes with transmitted PRS. | | | | | | |

##### A.16.6.X3.1.2 Test Requirements

The UE shall perform and report the PRS-RSRPP measurements for Cell 1 and Cell 2, within the time limit specified in clause 9.9A.5.5, 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 correct events observed during repeated tests shall be at least 90%.

#### A.16.6.X3.2 PRS-RSRPP measurement with Rx FH reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_CONNECTED state

##### A.16.6.X3.2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement with Rx FH in RRC\_CONNECTED state meets the delay requirements specified in clause 9.9A.5.8 in an environment with two-tap channel 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.X3.2.1-1.

Table A.16.6.X3.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 15 kHz SSB SCS, [10] MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, [10] MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, [20] MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, [10] MHz bandwidth, HD-FDD duplex mode |
| Note: The RedCap UE is only required to be tested in one of the supported test configurations. | |

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

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

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

The general test parameters are listed in Table A.16.6.X3.2.1-2, and cell specific test parameters are listed in Table A.16.6.X3.2.1-3.

Table A.16.6.X3.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Reference cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1, 4 | [10: NRB,c = 52] |  |
| 2 | [10: NRB,c = 52] |  |
| 3 | [20: NRB,c = 51] |  |
| SSB configuration |  | 1, 4 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.1 RedCap FR1 |  |
| SMTC configuration |  | 1, 4 | SMTC.1 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| Measurement gap |  | 1, 2, 3, 4 | GP#24 or GP#0 Note 1 |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX |  | 1, 2, 3, 4 | NA | OFF |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| PRS RX hopping request |  | 1, 2, 3, 4 | Requested |  |
| Expected RSTD | μs | 1, 2, 3, 4 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3, 4 | 5 |  |
| T1 | s | 1, 2, 3, 4 | 5 |  |
| T2 | s | 1, 2, 3, 4 | 10 |  |
| NOTE 1: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | |

Table A.16.6.X3.2.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
| T1 | T2 | T1 | T2 |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration |  | 1, 4 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1, 2, 3 | DLBWP.1.1 RedCap | | N/A | |
| Active UL BWP configuration |  | 1, 2, 3, 4 | ULBWP.1.1 RedCap | | N/A | |
| PRS configuration |  | 1, 4 | [PRS.1.3 FR1] | | [PRS.1.3 FR1] | |
|  | 2 | [PRS.1.3 FR1] | | [PRS.1.3 FR1] | |
|  | 3 | [PRS.2.3 FR1] | | [PRS.2.3 FR1] | |
| PRS muting info |  | 1, 2, 3, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -88 | -88 | -Infinity | -88 |
| 2 | -88 | -88 | -Infinity | -88 |
| 3 | -85 | -85 | -Infinity | -85 |
| Io | dBm/9.36 MHz | 1, 4 | N/A | -67.92 | N/A | -69.63 |
|  | dBm/9.36 MHz | 2 |  | -67.92 |  | -69.63 |
|  | dBm/18.36 MHz | 3 |  | -65.01 |  | -66.72 |
| Propagation Condition |  | 1, 2, 3, 4 | Two-tap channel defined in 38.101-4 Annex B.2.4,  *a* = 1, µs and Hz | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.16.6.X3.2.2 Test Requirements

The UE shall perform and report the PRS-RSRPP measurements for Cell 1 and Cell 2, within the time limit specified in clause 9.9A.5.8, 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 cell observed during repeated tests shall be at least 90%, where the reported PRS-RSRPP measurement for each correct event shall be within the PRS-RSRPP reporting range specified in Clause 10.1.38, i.e., between PRS RSRPP\_0 and PRS RSRPP\_126.

## **--- End of Change #7\_005 ---**

## **--- Start of Change #7\_006 ---**

### A.16.7.X RSTD measurements

#### A.16.7.X.1 RSTD measurement accuracy test case for RedCap UE without FH

##### A.16.7.X.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 accuracy requirements specified in clause 10.1A.X.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.16.7.X.1.1-1.

Table A.16.7.X.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 two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cells. Both cells are on the same NR RF channel in FR1. GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the RedCap UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 9.9A.2.

The RSTD measurement accuracy 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].

Table A.16.7.X.1.1-2: RSTD accuracy test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | |
| Cell 1 | Cell 2 |
| PRS ARFCN | 1~4 |  | freq1 | Freq1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | |
| 2 | 10: NRB,c = 52 | |
| 3 | 20: NRB,c = 51 | |
| 4 | 10: NRB,c = 52 | |
| Duplex mode | 1 |  | FDD | |
| 2 | TDD | |
| 3 | TDD | |
| 4 | HD-FDD | |
| TDD configuration | 1 |  | N/A | |
| 2 | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | |
| 4 | N/A | |
| Measurement gap | 1, 2, 3, 4 |  | GP#24 or GP#0 | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD |  |
| 3 | SR.2.1 TDD |  |
| 4 | SR.1.1 FDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - |
| 3 | CR.2.1 TDD | - |
| 4 | CR.1.1 FDD |  |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - |
| 2 | CCR.1.1 TDD | - |
| 3 | CCR.2.1 TDD | - |
| 4 | CCR.1.1 FDD |  |
| SSB configuration | 1 |  | SSB.1 FR1 | |
| 2 | SSB.1 FR1 | |
| 3 | SSB.1 RedCap FR1 | |
| 4 | SSB.1 FR1 | |
| OCNG Patterns | 1~4 |  | OP.1 | |
| TRS configuration | 1 |  | TRS.1.1 FDD | - |
| 2 | TRS.1.1 TDD |  |
| 3 | TRS.1.2 TDD |  |
| 4 | TRS.1.1 FDD |  |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 | |
| Dedicated BWP configuration | 1~4 |  | DLBWP.1.1  ULBWP.1.1 | |
| Time offset with Cell 1 | 1,2,3,4 | μs | - | 3 |
| SMTC configuration | 1,4 |  | SMTC.2 | |
| 2,3 | SMTC.1 | |
| PRS configuration | 1 |  | PRS.1.1 FR1 | |
| 2 | PRS.1.1 FR1 | |
| 3 | PRS.2.1 FR1 | |
| 4 | PRS.1.1 FR1 | |
| PRS Resource slot offset | 1, 2, 3, 4 | slot | 0 | 4 |
| Expected RSTD | 1, 2, 3, 4 | μs | N/A | 3 |
| Expected RSTD uncertainty | 1, 2, 3, 4 | μs | N/A | 5 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS | 1~4 | dB | 0 | 0 |
| Note2 | 1,2,4 | dBm/ SCS | -98 | |
| 3 | -95 | |
| PRS | 1~4 | dB | -6 | -13 |
| PRPNote3 | 1,2,4 | dBm/SCS | -103.7 | -109.9 |
| 3 | -100.7 | -106.9 |
| IoNote3 | 1,2,4 | dBm/  9.36MHz | -68.8 | -68.8 |
| 3 | dBm/  18.36MHz | -65.88 | -65.88 |
| PRS | 1~4 | dB | -5.7 | -11.9 |
| Propagation condition | 1~4 | - | AWGN | |
| Antenna configuration | 1~4 |  | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves. The Io is calculated based only on the symbols in which PRS is transmitted.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification. | | | | |

##### A.16.7.X.1.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1A.X.2.

##### A.16.7.X1.1 UE Rx-Tx time difference measurement accuracy for single positioning frequency layer in FR1 SA for RedCap UE without RX FH in RRC\_CONNECTED mode

###### A.16.7.X1.1.1 Test purpose and environment

The purpose of the test is to verify that the accuracy of the UE Rx-Tx time difference measurement without RX FH reported by the RedCap UE is within the specified limits in clause 10.1.x.x for 1Rx RedCap UE and in clause 10.1.x.x for 2Rx RedCap UE. The test is conducted in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations is listed in Table A.16.7.X1.1.1-1.

Table A.16.7.X1.1.1-1: 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. | |

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE before the start of the test. The UE Rx-Tx measurement accuracy test in this clause is valid for the cases where the RedCap UE is either not configured by the LMF to perform UE Rx-Tx time difference measurement with RX FH via *NR-Multi-RTT-RequestLocationInformation* or the UE is configured by the LMF to perform UE Rx-Tx time difference measurement with RX FH via *NR-Multi-RTT-RequestLocationInformation* but reports the UE Rx-Tx time difference measurement based on the single hop in *NR-Multi-RTT-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

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

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

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

###### A.16.7.X1.1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.16.7.X1.1.2-1.

Table A.16.7.X1.1.2-1: UE Rx-Tx time difference measurement accuracy test parameters.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | **Cell 2** |
| RF Channel Number |  | 1,2,3,4 | 1 | 1 |
| Measurement gap |  | 1,2,3,4 | GP#24 or GP#0 Note 4 | |
| DRX |  | 1,2,3,4 | OFF | |
| Time offset with Cell 1 | μs | 1,2,3,4 | N/A | 3 |
| TDD configuration |  | 1,4 | N/A | N/A |
| 2 | TDDConf.1.1 | TDDConf.1.1 |
| 3 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH RMC configuration |  | 1,4 | SR.1.1 FDD | N/A |
| 2 | SR.1.1 TDD |
| 3 | SR.2.1 TDD |
| RMSI CORESET RMC configuration |  | 1,4 | CR.1.1 FDD | N/A |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET RMC configuration |  | 1,4 | CCR.1.1 FDD | N/A |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| OCNG Patterns |  | 1,2,3,4 | OP.1 | OP.1 |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD | N/A |
| 2 | TRS.1.1 TDD |
| 3 | TRS.1.2 TDD |
| Initial BWP configuration |  | 1,2,3,4 | DLBWP.0.1  ULBWP.0.1 | N/A |
| Active DL BWP configuration |  | 1,2,3,4 | DLBWP.1.1 RedCap | N/A |
| Active UL BWP configuration |  | 1,2,3,4 | ULBWP.1.1 RedCap | N/A |
| PRS configuration |  | 1,4 | PRS.1.1 FR1 | PRS.1.1 FR1 |
| 2 | PRS.1.1 FR1 | PRS.1.1 FR1 |
| 3 | PRS.2.1 FR1 | PRS.2.1 FR1 |
| PRS Resource slot offset | slot | 1,2,3,4 | 0 | 4 |
| SRS configuration |  | 1,4 | POS-SRS.1 | N/A |
| 2 | POS-SRS.1 | N/A |
| 3 | POS-SRS.2 | N/A |
| Note 2 | dBm/SCS | 1,4 | -98 | |
| 2 | -98 | |
| 3 | -95 | |
| PRS | dB | 1,2,3,4 | -2.41 | -12.12 |
| PRS | dB | 1,2,3,4 | -2 | -10 |
| PRP Note 3 | dBm/SCS kHz | 1,4 | -100 | -108 |
| 2 | -100 | -108 |
| 3 | -97 | -105 |
| Io | dBm/9.36 MHz | 1,4 | -66.22 | -66.22 |
| dBm/9.36 MHz | 2 | -66.22 | -66.22 |
| dBm/18.72 MHz | 3 | -63.22 | -63.22 |
| Propagation Condition |  | 1,2,3,4 | AWGN | |

###### A.16.7.X1.1.3 Test requirements

The UE Rx-Tx time difference measurement without RX FH fulfils the UE Rx-Tx measurement accuracy requirements for AWGN propagation condition specified in the clause 10.1.x.x for 1Rx RedCap UE and in the clause 10.1.x.x for 2Rx RedCap UE for both Cell 1 and Cell 2.

#### A.16.7.X2.1 PRS-RSRP measurement accuracy without FH in RRC\_CONNECTED state in FR1

##### A.16.7.X2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the accuracy of PRS-RSRP measurement in RRC\_CONNECTED without FH by a RedCap UE is within the specified limits. This test will verify the requirements in clauses 10.1A.Y.2.1 and 10.1A.Y.2.1.

##### A.16.7.X2.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.16.7.X2.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.16.7.X2.1.2-2. In all test cases, Cell 1 is the PCell. PRS RX hopping is not requested in *NR-DL-AoD-RequestLocationInformation*.

Table A.16.7.X2.1.2-1: PRS-RSRP 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. | |

Table A.16.7.X2.1.2-2: PRS-RSRP test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | Test 2 | |
|  | | |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID | | |  | 489 | 0 | 489 | 0 |
| SSB ARFCN | | |  | freq1 | | freq1 | |
| Duplex mode | | Config 1,4 |  | FDD | | | |
|  | | Config 2,3 |  | TDD | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | |
| BWchannel | | Config 1,2,4 | MHz | 10: NRB,c = 52 | | | |
|  | | Config 2 |  | 20: NRB,c = 51 | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 RedCap | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 RedCap | | | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA |
|  | | Config 2 |  | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA |
|  | | Config 3 |  | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | | ms | Not Applicable | | | |
| Measurement gap | | |  | GP#24 or GP#0 Note 6 | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
|  | | Config 2 |  | SR.1.1 TDD |  | SR.1.1 TDD |  |
|  | | Config 3 |  | SR2.1 TDD |  | SR2.1 TDD |  |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
|  | | Config 2 |  | CR.1.1 TDD |  | CR.1.1 TDD |  |
|  | | Config 3 |  | CR2.1 TDD |  | CR2.1 TDD |  |
| Control channel RMC | | Config 1,4 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
|  | | Config 2 |  | CCR.1.1 TDD |  | CCR.1.1 TDD |  |
|  | | Config 3 |  | CCR2.1 TDD |  | CCR2.1 TDD |  |
| PRS configuration | | Config 1,4 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.Y FR1 | PRS.1.Y FR1 |
|  | | Config 2 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.Y FR1 | PRS.1.Y FR1 |
|  | | Config 3 |  | PRS.2.3 FR1 | PRS.2.3 FR1 | PRS.2.Y FR1 | PRS.2.Y FR1 |
| PRS Resource slot offset (slot) | | Config 1,2,3,4 | slot | 0 | 4 | 0 | 4 |
| SSB configuration | | Config 1,4 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
|  | | Config 2 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
|  | | Config 3 |  | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 |
| Time offset with Cell 1 | | Config 1,4 | μs | - | 3 | - | 3 |
|  | | Config 2,3 | - | 3 | - | 3 |
| Expected RSTD | | Config 1,2,3,4 | μs | 3 | | | |
| Expected RSTD uncertainty | | Config 1,2,3,4 | μs | 5 | | | |
| SMTC configuration | | Config 1,2,3,4 |  | SMTC.1 RedCap | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |  |  |
| EPRE ratio of PRS to SSS | | | dB | 0 | 0 | 0 | 0 |
| Note2 | Config 1,2,4 |  | dBm/15KhZ | -98 | | -98 | |
| Config 3 |  | -98 | | -98 | |
| Note2 | Config 1,2,4 | | dBm/SCS | -98 | | -98 | |
| Config 3 |  | -95 | | -95 | |
| PRS | | | dB | -2.41 | -12.12 | -2.41 | -12.12 |
| PRS | | | dB | -2 | -10 | -2 | -10 |
| PRP Note3 | Config 1,2,4 |  | dBm/SCS | -100 | -108 | -100 | -108 |
|  | Config 3 |  |  | -97 | -105 | -97 | -105 |
| IoNote3 | Config 1,2,4 |  | dBm/9.36MHz | -67.67 | | -67.67 | |
| Config 3 |  | dBm/18.36MHz | -64.75 | | -64.75 | |
| Propagation condition | | |  | AWGN | | | |
| Antenna configuration | | |  | 1x2 | | | |
| 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 subframes with transmitted PRS.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 6: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | | | | |

##### A.16.7.X2.1.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1A.Y.2.1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1A.Y.2.2.

#### A.16.7.X2.2 PRS-RSRP measurement accuracy with FH in RRC\_CONNECTED state in FR1

##### A.16.7.X2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the accuracy of PRS-RSRP measurement in RRC\_CONNECTED with FH by a RedCap UE is within the specified limits. This test will verify the requirements in clauses 10.1A.Y.2.1 and 10.1A.Y.2.1.

##### A.16.7.X2.2.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.16.7.X2.2.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.16.7.X2.2.2-2. In all test cases, Cell 1 is the PCell. PRS RX hopping is present in *NR-DL-AoD-RequestLocationInformation*.

Table A.16.7.X2.2.2-1: PRS-RSRP 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. | |

Table A.16.7.X2.2.2-2: PRS-RSRP test parameters

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | Test 2 | |
|  | | |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID | | |  | 489 | 0 | 489 | 0 |
| SSB ARFCN | | |  | freq1 | | freq1 | |
| Duplex mode | | Config 1,4 |  | FDD | | | |
|  | | Config 2,3 |  | TDD | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | |
| BWchannel | | Config 1,2,4 | MHz | [10: NRB,c = 52] | | | |
|  | | Config 3 |  | [20: NRB,c = 51] | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 RedCap | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 RedCap | | | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA |
|  | | Config 2 |  | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA |
|  | | Config 3 |  | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA |
| DRX Cycle | | | ms | Not Applicable | | | |
| Measurement gap | | |  | GP#24 or GP#0 Note 6 | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
|  | | Config 2 |  | SR.1.1 TDD |  | SR.1.1 TDD |  |
|  | | Config 3 |  | SR2.1 TDD |  | SR2.1 TDD |  |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
|  | | Config 2 |  | CR.1.1 TDD |  | CR.1.1 TDD |  |
|  | | Config 3 |  | CR2.1 TDD |  | CR2.1 TDD |  |
| Control channel RMC | | Config 1,4 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
|  | | Config 2 |  | CCR.1.1 TDD |  | CCR.1.1 TDD |  |
|  | | Config 3 |  | CCR2.1 TDD |  | CCR2.1 TDD |  |
| PRS configuration | | Config 1,4 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.X FR1 | PRS.1.X FR1 |
|  | | Config 2 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.X FR1 | PRS.1.X FR1 |
|  | | Config 3 |  | PRS.2.3 FR1 | PRS.2.3 FR1 | PRS.2.X FR1 | PRS.2.X FR1 |
| PRS Resource slot offset (slot) | | Config 1,2,3,4 | slot | 0 | 4 | 0 | 4 |
| SSB configuration | | Config 1,4 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
|  | | Config 2 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
|  | | Config 3 |  | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 |
| Time offset with Cell 1 | | Config 1,4 | μs | - | 3 | - | 3 |
|  | | Config 2,3 | - | 3 | - | 3 |
| Expected RSTD | | Config 1,2,3,4 | μs | 3 | | | |
| Expected RSTD uncertainty | | Config 1,2,3,4 | μs | 5 | | | |
| SMTC configuration | | Config 1,2,3,4 |  | SMTC.1 RedCap | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |  |  |
| EPRE ratio of PRS to SSS | | | dB | 0 | 0 | 0 | 0 |
| Note2 | Config 1,2,4 |  | dBm/15KhZ | -98 | | -98 | |
| Config 3 |  | -98 | | -98 | |
| Note2 | Config 1,2,4 | | dBm/SCS | -98 | | -98 | |
| Config 3 |  | -95 | | -95 | |
| PRS | | | dB | -2.41 | -12.12 | -2.41 | -12.12 |
| PRS | | | dB | -2 | -10 | -2 | -10 |
| PRP Note3 | Config 1,2,4 |  | dBm/SCS | -100 | -108 | -100 | -108 |
|  | Config 3 |  |  | -97 | -105 | -97 | -105 |
| IoNote3 | Config 1,2,4 |  | dBm/9.36MHz | -67.67 | | -67.67 | |
| Config 3 |  | dBm/18.36MHz | -64.75 | | -64.75 | |
| Propagation condition | | |  | AWGN | | | |
| Antenna configuration | | |  | 1x2 | | | |
| 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 subframes with transmitted PRS.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: The test configuration excludes support for band n51 and it is not required to run this test on band n51 in this release of the specification  Note 6: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | | | | |

##### A.16.7.X2.2.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1A.Y.2.1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1A.Y.2.2.

# A.16.7.X3.2 SA: PRS-RSRPP measurement accuracy TC with Rx FH in RRC\_CONNECTED state in FR1

## A.16.7.X3.2.1 Test purpose and Environment

The purpose of this test is to verify that the accuracy of PRS-RSRPP measurement in RRC\_CONNECTED with FH by a RedCap UE is within the specified limits. This test will verify the requirements in clauses10.1A.Y.2.2.

## A.16.7.X3.2.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.16.7.X3.2.2-1. Both absolute and relative accuracy of PRS-RSRPP measurements are tested by using the parameters in A.16.7.X3.2.2-2. In all test cases, Cell 1 is the PCell. PRS RX hopping is requested in *NR-DL-AoD-RequestLocationInformation*.

Table A.16.7.X3.2.2-1: PRS-RSRPP supported test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | NR 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 each supported band | |

Table A.16.7.X3.2.2-2: PRS-RSRPP test parameters

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | Test 2 | | |
|  | | |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 | |
| Cell ID | | |  | 489 | 0 | 489 | 0 | |
| SSB ARFCN | | |  | freq1 | | freq1 | | |
| Duplex mode | | Config 1,4 |  | FDD | | | | |
|  | | Config 2,3 |  | TDD | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | |
| BWchannel | | Config 1,2,4 | MHz | 20: NRB,c = 52 | | | | |
|  | |  |  |  | | | | |
|  | | Config 3 |  | 50: NRB,c = 51 | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | |
| Downlink dedicated BWP configuration | | |  | DLBWP.1.1 RedCap | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | |
| Uplink dedicated BWP configuration | | |  | ULBWP.1.1 RedCap | | | | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | NA | TRS.1.1 FDD | NA | |
|  | | Config 2 |  | TRS.1.1 TDD | NA | TRS.1.1 TDD | NA | |
|  | | Config 3 |  | TRS.1.2 TDD | NA | TRS.1.2 TDD | NA | |
| DRX Cycle | | | ms | Not Applicable | | | | |
| Measurement gap | | |  | GP#24 or GP#0 Note 7 | | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | - | SR.1.1 FDD | - | |
|  | | Config 2 |  | SR.1.1 TDD |  | SR.1.1 TDD |  | |
|  | | Config 3 |  | SR2.1 TDD |  | SR2.1 TDD |  | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | - | CR.1.1 FDD | - | |
|  | | Config 2 |  | CR.1.1 TDD |  | CR.1.1 TDD |  | |
|  | | Config 3 |  | CR2.1 TDD |  | CR2.1 TDD |  | |
| Control channel RMC | | Config 1,4 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - | |
|  | | Config 2 |  | CCR.1.1 TDD |  | CCR.1.1 TDD |  | |
|  | | Config 3 |  | CCR2.1 TDD |  | CCR2.1 TDD |  | |
| PRS configuration | | Config 1,4 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.x FR1 | PRS.1.x FR1 | |
|  | | Config 2 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.x FR1 | PRS.1.x FR1 | |
|  | | Config 3 |  | PRS.2.3 FR1 | PRS.2.3 FR1 | PRS.2.x FR1 | PRS.2.x FR1 | |
| PRS Resource slot offset (slot) | | Config 1,2,3,4 | slot | 0 | 4 | 0 | 4 | |
| SSB configuration | | Config 1 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 2 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 3 |  | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | |
| Time offset with Cell 1 | | Config 1 | ms | - | 3 | - | 3 | |
|  | | Config 2,3 | μs | - | 3 | - | 3 | |
| Expected RSTD | | Config 1,2,3,4 | μs | 3 | | | | |
| Expected RSTD uncertainty | | Config 1,2,3,4 |  | 5 | | | | |
| SMTC configuration | | Config 1,2,3,4 |  | SMTC.1 RedCap | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |  |  | |
| EPRE ratio of PRS to SSS | | | dB | 0 | 0 | 0 | 0 | |
| Note2 | Config 1,2,4 |  | dBm/15KhZ | -98 | | -98 | | |
| Config 3 |  | -98 | | -98 | | |
| Note2 | Config 1,2,4 | | dBm/SCS | -98 | | -98 | | |
| Config 3 |  | -95 | | -95 | | |
| *PRS* | | | dB | -2.41 | -12.12 | -2.41 | | -12.12 |
| PRS | | | dB | -2 | -10 | -2 | | -10 |
| PRS-RSRPP Note3 | Config 1, 2,4 |  | dBm/SCS | -100 | -108 | -100 | | -108 |
|  | Config 3 |  |  | -97 | -105 | -97 | | -105 |
| IoNote3 | Config 1,2,4 |  | dBm/19.08MHz | -64.57 | | -64.57 | | |
| Config 3 |  | dBm/47.88MHz | -60.59 | | -60.59 | | |
| Propagation condition | | |  | Two-tap channel defined in 38.101-4 Annex B.2.4,  *a* = 1, µs and Hz | | | | |
| Antenna configuration | | |  | 1x2 | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRPP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Void.  Note 6: Void.  Note 7: GP#24 is configured if UE supports MG#24, otherwise GP#0 is configured. | | | | | | | | |

## A.16.7.X3.2.3 Test requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1A.Y.2.2. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1A.Y.2.2.

## **--- End of Change #7\_006 ---**

## **--- Start of Change #7\_007 ---**

## A.16.A Measurement procedure for RedCap in RRC\_INACTIVE

### A.16.A.X RSTD Measurements

#### A.16.A.X.1 NR RSTD measurement reporting delay test case for for RedCap UE without FH in FR1 SA in RRC\_INACTIVE state

##### A.16.A.X.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.A.X.1.1-1.

Table A.16.A.X.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.A.X.1.1-2, and cell specific test parameters are listed in Table A.16.A.X.1.1-3 and Table A.16.A.X.1.1-4.

Table A.16.A.X.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 | |  | 4 | 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.A.X.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.A.X.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.A.X.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.X.3, i.e., between RSTD\_0000000 and RSTD1970049.

#### A.16.A.X.2 NR RSTD measurement reporting delay test case with PRS frequency hopping

##### A.16.A.X.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.A.X.2.1-1.

Table A.16.A.X.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note 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.A.X.2.1-2, and cell specific test parameters are listed in Table A.16.A.X.2.1-3 and Table A.16.A.X.2.1-4.

Table A.16.A.X.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 |  | TBD | PRS configured with frequency hopping as specified in clause A.3.31 |
| Config 2 |  | TBD |
| Config 3 |  | TBD |
| 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 | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.16.A.X.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.A.X.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.A.X.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 10.1.23.3, i.e., between RSTD\_0000000 and RSTD1970049.

##### A.16.A.X.3 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_INACTIVE state when eDRX cycle > 10.24s for RedCap UE

###### A.16.A.X.3.1 Test Purpose and Environment

The purpose of the test is to verify that the RSTD measurement, reported by RedCap UE with 1Rx or 2Rx branches, meets the requirements specified in Clause 5.6A.4.5 when the RedCap UE is configured with eDRX cycle longer than 10.24s in an environment with AWGN propagation conditions in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in Table A.16.A.X.3.1-1.

Table A.6.8.1.X1.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, [10 MHz] bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, [10 MHz] bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, [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 6.5.10], shall be provided to the UE during T1. The UE is configured to report positioning measurements every 20s via *reportingInterval* in *nr-DL-TDOA-RequestLocationInformation* such the value of *reportingInterval* is set to "*ri20*". The last TTI containing the two messages shall be provided to the UE ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the DL-TDOA assistance data and location information request.

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

The UE is configured with eDRX cycle of 40.96s.

The general test parameters are listed in Table A.16.A.X.3.1-2, and cell specific test parameters are listed in Table A.16.A.X.3.1-3 and Table A.16.A.X.3.1-4.

Table A.16.A.X.3.1-2: General test parameters for RSTD measurement reporting delay.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1,4 |  | SSB.4 RedCap FR1 |  |
| Config 2 |  | SSB.4 RedCap FR1 |
| Config 3 |  | SSB.5 RedCap FR1 |
| SMTC configuration | Config 1,4 |  | SMTC.1 RedCap |  |
| Config 2 |  | SMTC.1 RedCap |
| Config 3 |  | SMTC.1 RedCap |
| PDSCH RMC configuration | Config 1,4 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1,4 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1,4 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3,4 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active UL BWP configuration | Config 1,2,3,4 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1,4 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.1 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2) mod 6 = 0  and  (PCI of Cell 1 – PCI of Cell 3) mod 6 = 0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 1.28 |  |
| CN and RAN eDRX configuration | | s | eDRX length = 40.96  PTW length = 10.24 |  |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance ta specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 4 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to *NR-MutingPattern* defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.16.A.X.3.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  9.36 MHz | -56.54 | -56.54 | -56.54 |
| Config 2 | dBm/  9.36 MHz | -56.54 | -56.54 | -56.54 |
| Config 3 | dBm/  18.72 MHz | -56.54 | -56.54 | -56.54 |
| SSB RP Note4 | Config 1 | dBm/SCS | -82 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over 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.A.X.3.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 12 Low | 12 Low | 12 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1 | dB | -5 | -11 | -11 |
| Config 2 | dB | -5 | -11 | -11 |
| Config 3 | dB | -5 | -11 | -11 |
| Io Note 4 | Config 1 | dBm/  9.36MHz | -69.26 | -69.26 | -69.26 |
| Config 2 | dBm/  9.36MHz | -69.26 | -69.26 | -69.26 |
| Config 3 | dBm/  18.72MHz | -66.63 | -66.63 | -66.63 |
| PRS | | dB | -5.33 | -12.19 | -12.19 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T2) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the 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.A.X.3.2 Test Requirements

The RSTD measurement time 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 the repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in the Clause 10.1.23.3, i.e., between RSTD\_000000000 and RSTD\_126083073.

## **--- End of Change #7\_007 ---**

## **--- Start of Change #7\_01 ---**

##### A.16.A.X1.1 UE Rx-Tx measurement reporting delay test case for single positioning frequency layer in FR1 SA for RedCap UE without RX FH in RRC\_INACTIVE mode

###### A.16.A.X1.1.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement withotu RX FH reported by the RedCap UE meets the requirements specified in clause 5.6A.6.5 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured. The measurement reporting delay test defined in this clause is valid for both 1Rx and 2Rx RedCap UEs.

The supported test configurations in listed in Table A.16.A.X1.1.1-1.

Table A.16.A.X1.1.1-1: 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. | |

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

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In the next DL slot after slot #n, UE is released into RRC\_INACTIVE. 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 UE Rx-Tx time difference measurement with RX FH via *NR-Multi-RTT-RequestLocationInformation* or the UE is configured by the LMF to perform UE Rx-Tx time difference measurement with RX FH via *NR-Multi-RTT-RequestLocationInformation* but reports the UE Rx-Tx time difference measurement based on the single hop in *NR-Multi-RTT-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The RedCap UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.16.A.X1.1.1-2 and Table A.16.A.X1.1.1-3 respectively.

Table A.16.A.X1.1.1-2: General test parameters.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1,2,3,4 | Cell 1 | Cell 1 is the reference cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1,2,3,4 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1,2,3,4 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1,4 | 10: NRB,c = 52 |  |
| 2 | 10: NRB,c = 52 |  |
| 3 | 20: NRB,c = 52 |  |
| SSB configuration |  | 1,4 | SSB.4 RedCap FR1 |  |
|  | 2 | SSB.4 RedCap FR1 |  |
|  | 3 | SSB.5 RedCap FR1 |  |
| SMTC configuration |  | 1,4 | SMTC.1 RedCap |  |
|  | 2 | SMTC.1 RedCap |  |
|  | 3 | SMTC.1 RedCap |  |
| CP length |  | 1,2,3,4 | Normal |  |
| DRX cycle |  | 1,2,3,4 | 1.28s |  |
| Time offset between serving and neighbour cells | μs | 1,2,3,4 | 3 | Synchronous cells |
| T1 | s | 1,2,3,4 | 5 |  |
| T2 | s | 1,2,3,4 | 10 |  |

Table A.16.A.X1.1.1-3: Cell specific test parameters.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1,4 | N/A | | N/A | |
| 2 | TDDConf.1.1 | | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1,4 | SR.1.1 FDD | | N/A | |
| 2 | SR.1.1 TDD | |  | |
| 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1,4 | CR.1.1 FDD | | N/A | |
| 2 | CR.1.1 TDD | |
| 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1,4 | CCR.1.1 FDD | | N/A | |
| 2 | CCR.1.1 TDD | |
| 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1,2,3,4 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1,4 | TRS.1.1 FDD | | N/A | |
| 2 | TRS.1.1 TDD | |
| 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1,2,3,4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| PRS configuration |  | 1,4 | PRS.1.1 FR1 | | PRS.1.1 FR1 | |
| 2 | PRS.1.1 FR1 | | PRS.1.1 FR1 | |
| 3 | PRS.2.1 FR1 | | PRS.2.1 FR1 | |
| PRS muting info |  | 1,2,3,4 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1,4 | POS-SRS.1 | | N/A | |
| 2 | POS-SRS.1 | | N/A | |
| 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1,4 | -98 | | | |
| 2 | -98 | | | |
| 3 | -95 | | | |
| PRS | dB | 1,4 | -Infinity | -2.41 | -Infinity | -12.12 |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| PRS | dB | 1,4 | -Infinity | -2 | -Infinity | -10 |
| 2 |  |  |  |  |
| 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1,4 | -Infinity | -100 | -Infinity | -108 |
| 2 | -Infinity | -100 | -Infinity | -108 |
| 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/9.36 MHz | 1,4 | N/A | -66.22 | N/A | -66.22 |
| dBm/9.36 MHz | 2 | -66.22 | -66.22 |
| dBm/18.72 MHz | 3 | -63.22 | -63.22 |
| Propagation Condition |  | 1,2,3,4 | 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 subframes with transmitted PRS.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | | |

###### A.16.A.X1.1.2 Test requirements

The UE Rx-Tx time difference measurement time in RRC\_INACTIVE state fulfils the requirements specified in clause 5.6A.6.5.

The UE shall perform and report the UE Rx-Tx time difference measurements without RX FH for Cell 1 and Cell 2 within the specified UE Rx-Tx time difference measurement time 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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.

#### A.16.A.X1.2 UE Rx-Tx time difference measurement with Rx FH for single positioning frequency layer in FR1 SA in RRC\_INACTIVE state

##### A.16.A.X1.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement with Rx FH in RRC\_INACTIVE state meets the requirements specified in clause 5.6A.6.6 in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are listed in Table A.16.A.X1.2.1-1.

Table A.16.A.X1.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| **Configuration** | **Description** |
| 1 | 15 kHz SSB SCS, [10] MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, [10] MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, [20] MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, [10] MHz bandwidth, HD-FDD duplex mode |
| Note: The RedCap UE is only required to be tested in one of the supported test configurations. | |

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

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In the next DL slot after slot #n, UE is released into RRC\_INACTIVE state.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.16.8.X.1.1-2 and Table A.16.A.X1.2.1-3 respectively.

Table A.16.A.X1.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3, 4 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1, 2, 4 | [10: NRB,c = 52] |  |
| 3 | [20: NRB,c = 51] |  |
| SSB configuration |  | 1, 2 ,4 | SSB.1 FR1 |  |
|  |  | 3 | SSB.1 RedCap FR1 |  |
| SMTC configuration |  | 1, 2, 3 ,4 | SMTC.1 |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX cycle |  | 1, 2, 3, 4 | 1.28s |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| PRS RX hopping request |  | 1, 2, 3, 4 | requested |  |
| T1 | s | 1, 2, 3, 4 | 5 |  |
| T2 | s | 1, 2, 3, 4 | 10 |  |

Table A.16.A.X1.1.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1, 4 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| PRS configuration |  | 1, 4 | PRS.X.X FR1 | | PRS.X.X FR1 | |
|  | 2 | PRS.X.X FR1 | | PRS.X.X FR1 | |
|  | 3 | PRS.X.X FR1 | | PRS.X.X FR1 | |
| PRS muting info |  | 1, 2, 3, 4 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1, 4 | POS-SRS.1 | | N/A | |
|  |  | 2 | POS-SRS.1 | | N/A | |
|  |  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  | 2 | -Infinity | -100 | -Infinity | -108 |
|  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/19.08 MHz | 1, 4 | N/A | -64.57 | N/A | -64.57 |
| dBm/19.08 MHz | 2 | -64.57 | -64.57 |
| dBm/47.88 MHz | 3 | -60.59 | -60.59 |
| Propagation Condition |  | 1, 2, 3, 4 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |

##### A.16.A.X1.2.2 Test requirements

The UE Rx-Tx time difference measurement time in RRC\_INACTIVE state fulfils the requirements specified in clause 5.6A.6.6.

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

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.X.X.X.

#### A.16.A.X1.3. UE Rx-Tx time difference measurement for single positioning frequency layer with eDRX > 10.24s in FR1 SA

##### A.16.A.X1.3.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 5.6A.6.5 for UE Rx-Tx measurements in RRC\_INACTIVE with eDRX. The tests are conducted under AWGN propagation condition with the UE operating in FR1 stand-alone mode and configured to perform UE Rx-Tx measurements on a single positioning frequency layer (PFL) in FR1.

The supported test configuration in listed in Table A.16.A.X1.3-1.

. Table A.16.A.X1.3-1: Supported test configurations

|  |  |
| --- | --- |
| **Config** | **Description** |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | NR 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 each supported band | |

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

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and in RRC\_INACTIVE state during T2. Cell 1 and Cell 2 transmit PRS only during the second time interval of duration T2. Similarly, the UE is configured to transmit positioning SRS during only during the second time interval of duration T2.

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

The beginning of the time interval T2 shall be aligned with the beginning of the first DRX cycle in RRC\_INACTIVE.

The general test parameters and cell specific test parameters are as given in Table A.16.A.X1.3-2 and Table A.16.A.X1.3-3 respectively.

Table A.16.A.X1.3-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Active cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1, 2, 3, 4 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1, 2, 4 | 10: NRB,c = 52 |  |
| 3 | 20: NRB,c = 51 |  |
| SSB configuration |  | 1, 2, 4 | SSB.4 RedCap FR1 |  |
|  | 3 | SSB.5 RedCap FR1 |  |
| SMTC configuration |  | 1, 4 | SMTC.1 RedCap |  |
| 2, 3 | SMTC.1 RedCap |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX cycle |  | 1, 2, 3, 4 | 1.28s |  |
| eDRX cycle length (for both RAN and CN) | s | 1 | 40.96 |  |
| PTW window length | s | 1 | 1.28 |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| Expected RSTD | μs | 1 | 3 |  |
| Expected RSTD uncertainty | μs | 1 | 5 |  |
| T1 | s | 1, 2, 3, 4 | 5 |  |
| T2 | s | 1, 2, 3, 4 | 10 |  |

Table A.16.A.X1.3-2: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
|  |  | **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  |  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1, 2, 3, 4 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1, 4 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  |  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 RedCap  ULBWP.0.1 RedCap | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 RedCap | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 RedCap | | N/A | |
| PRS configuration |  | 1, 4 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 2 | PRS.1.2 FR1 | | PRS.1.2 FR1 | |
|  | 3 | PRS.2.1 FR1 | | PRS.2.1 FR1 | |
| PRS muting info |  | 1, 2, 3, 4 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1, 4 | POS-SRS.1 | | N/A | |
|  |  | 2 | POS-SRS.1 | | N/A | |
|  |  | 3 | POS-SRS.2 | | N/A | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  |  | 3 |  |  |  |  |
| PRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  | 2 | -Infinity | -100 | -Infinity | -108 |
|  | 3 | -Infinity | -97 | -Infinity | -105 |
| Io | dBm/9.36 MHz | 1, 4 | N/A | -67.92 | N/A | -69.63 |
| dBm/9.36 MHz | 2 | -67.92 | -69.63 |
| dBm/18.36 MHz | 3 | -65.01 | -.66.72 |
| Propagation Condition |  | 1, 2, 3, 4 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: The resources for uplink transmission are assigned to the UE prior to the start of time period T2. | | | | | | |

##### A.16.A.X1.3.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 5.6A.6.5.

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

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.

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

## **--- End of Change #7\_01 ---**

## **--- Start of Change #7\_012 ---**

#### A.16.A.X2.2 PRS-RSRP measurement delay with FH in RRC\_INACTIVE state in FR1

##### A.16.A.X2.2.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement in RRC\_INACTIVE with FH by a RedCap UE meets the delay requirements specified in clause 5.6A.5.6 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.16.A.X2.2.1-1.

Table A.16.A.X2.2.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, [10 MHz] bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, [10 MHz] bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, [20 MHz] bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, [10 MHz] bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

During T1 UE is in RRC\_CONNECTED, the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In the next DL slot after slot #n, UE is released into RRC\_INACTIVE.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The general test parameters are listed in Table A.16.A.X2.2.1-2, and cell specific test parameters are listed in Table A.16.A.X2.2.1-3.

Table A.16.A.X2.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1, 2, 4 | [10: NRB,c = 52] |  |
| 3 | [20: NRB,c = 51] |  |
| SSB configuration |  | 1, 2, 4 | SSB.1 FR1 |  |
|  |  | 3 | SSB.1 RedCap FR1 |  |
| SMTC configuration |  | 1, 2, 3, 4 | SMTC.1 RedCap |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX |  | 1, 2, 3, 4 | 1.28s |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3, 4 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3, 4 | 5 |  |
| PRS RX hopping request |  | 1, 2, 3, 4 | Present |  |
| T1 | s | 1, 2, 3, 4 | 2 |  |
| T2 | s | 1, 2, 3, 4 | 6 |  |

Table A.16.A.X2.2.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| PRS configuration |  | 1, 4 | PRS.1.X FR1 | | PRS.1.X FR1 | |
|  | 2 | PRS.1.X FR1 | | PRS.1.X FR1 | |
|  | 3 | PRS.2.X FR1 | | PRS.2.X FR1 | |
| PRS muting info |  | 1, 2, 3 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -88 | -88 | -Infinity | -88 |
| 2 | -88 | -88 | -Infinity | -88 |
| 3 | -85 | -85 | -Infinity | -85 |
| Io | dBm/9.36 MHz | 1, 4 | -70.05 | -67.67 | -70.05 | -67.67 |
|  | dBm/9.36 MHz | 2 | -70.05 | -67.67 | -70.05 | -67.67 |
|  | dBm/18.36 MHz | 3 | -67.13 | -64.75 | -67.13 | -64.75 |
| Propagation Condition |  | 1, 2, 3, 4 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: 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 subframes with transmitted PRS. | | | | | | |

##### A.16.A.X2.2.2 Test Requirements

The UE shall perform and report the PRS-RSRP measurements for Cell 1 and Cell 2, within the time limit specified in clause 5.6A.5.6, 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 correct events observed during repeated tests shall be at least 90%.

#### A.16.A.X2.3 PRS-RSRP reporting delay test case in RRC\_INACTIVE state in FR1 for case 2 when eDRX cycle > 10.24s

##### A.16.A.X2.3.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRP measurement for RedCap UE in RRC\_INACTIVE with eDRX meets the delay requirements specified in clause 5.6A.3.5 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.16.A.X2.3.1-1.

Table A.16.A.X2.3.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, [10] MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, [10] MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, [20] MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, [10] MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

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

During T1 UE is in RRC\_CONNECTED, the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In the next DL slot after slot #n, UE is released into RRC\_INACTIVE.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The general test parameters are listed in Table A.16.A.X2.3.1-2, and cell specific test parameters are listed in Table A.16.A.X2.3.1-3.

Table A.16.A.X2.3.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1, 4 | [10: NRB,c = 52] |  |
| 2 | [10: NRB,c = 52] |  |
| 3 | [20: NRB,c = 51] |  |
| SSB configuration |  | 1, 4 | SSB.1 FR1 |  |
|  |  | 2 | SSB.1 FR1 |  |
|  |  | 3 | SSB.2 RedCap FR1 |  |
| SMTC configuration |  | 1, 4 | SMTC.1 |  |
|  |  | 2 | SMTC.1 |  |
|  |  | 3 | SMTC.1 |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX | s | 1, 2, 3, 4 | 1.28 |  |
| eDRX cycle length (for both RAN and CN) | s | 1, 2, 3, 4 | 40.96 |  |
| PTW window length | s | 1, 2, 3, 4 | 1.28 |  |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3, 4 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3, 4 | 5 |  |
| T1 | s | 1, 2, 3, 4 | 5 |  |
| T2 | s | 1, 2, 3, 4 | 10 |  |

Table A.16.A.X2.3.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| PRS configuration |  | 1 | [PRS.1.3 FR1] | | [PRS.1.3 FR1] | |
|  | 2 | [PRS.1.3 FR1] | | [PRS.1.3 FR1] | |
|  | 3 | [PRS.2.3 FR1] | | [PRS.2.3 FR1] | |
| PRS muting info |  | 1, 2, 3, 4 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -2.41 | -Infinity | -12.12 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -88 | -88 | -Infinity | -88 |
| 2 | -88 | -88 | -Infinity | -88 |
| 3 | -85 | -85 | -Infinity | -85 |
| Io | dBm/9.36 MHz | 1, 4 | N/A | -67.92 | N/A | -69.63 |
|  | dBm/9.36 MHz | 2 | -67.92 | -69.63 |
|  | dBm/18.36 MHz | 3 | -65.01 | -66.72 |
| Propagation Condition |  | 1, 2, 3, 4 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves. | | | | | | |

##### A.16.A.X2.3.2 Test Requirements

The UE shall perform and report the PRS-RSRP measurements for Cell 1 and Cell 2, within the time limit specified in clause 5.6A.5.5, 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 correct events observed during repeated tests shall be at least 90%.

## **--- End of Change #7\_012 ---**

## **--- Start of Change #7\_013 ---**

A.16.A.X3.1 PRS-RSRPP measurement delay without FH in RRC\_INACTIVE state in FR1

A.16.A.X3.1.1 Test purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement without FH by a RedCap UE meets the delay requirements specified in clause 5.6A.7.5 in an environment with a 2-tap channel propagation condition.

The supported test configurations are specified in Table A.16.A.X3.1.1-1.

**Table A.16.A.X3.1.1-1: 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. | |

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. During T2 UE shall be in RRC\_INACTIVE state and all both cells transmit PRS resources within initial DL BWP of the UE and with the same numerology as the initial DL BWP.

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

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

The general test parameters are listed in Table A.16.A.X3.1.1-2, and cell specific test parameters are listed in Table A.16.A.X3.1.1-3.

**Table A.16.A.X3.1.1-2: General test parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Value** | **Comment** |
| Reference cell |  | 1, 2, 3, 4 | Cell 1 | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| RF Channel Number |  | 1, 2, 3, 4 | 1: Cell 1 and Cell 2 |  |
| BWchannel | MHz | 1, 2, 4 | 10: NRB,c = 52 |  |
| 3 | 20: NRB,c = 51 |  |
| SSB configuration |  | 1, 2, 4 | SSB.1 FR1 |  |
|  |  | 3 | SSB.1 RedCap FR1 |  |
| SMTC configuration |  | 1, 2, 3, 4 | SMTC.1 RedCap |  |
| CP length |  | 1, 2, 3, 4 | Normal |  |
| DRX | s | 1, 2, 3, 4 | 1.28 | ON |
| Time offset between serving and neighbour cells | μs | 1, 2, 3, 4 | 3 | Synchronous cells |
| Expected RSTD | μs | 1, 2, 3, 4 | 3 |  |
| Expected RSTD uncertainty | μs | 1, 2, 3, 4 | 5 |  |
| PRS RX hopping request |  | 1, 2, 3, 4 | NOT present |  |
| T1 | s | 1, 2, 3, 4 | 2 |  |
| T2 | s | 1, 2, 3, 4 | 5 |  |

**Table A.16.A.X3.1.1-3: Cell specific test parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Unit** | **Test configuration** | **Cell 1** | | **Cell 2** | |
| **T1** | **T2** | **T1** | **T2** |
| TDD configuration |  | 1, 4 | N/A | | N/A | |
|  |  | 2 | TDDConf.1.1 | | TDDConf.1.1 | |
|  |  | 3 | TDDConf.2.1 | | TDDConf.2.1 | |
| PDSCH RMC configuration |  | 1, 4 | SR.1.1 FDD | | N/A | |
|  | 2 | SR.1.1 TDD | |  | |
|  | 3 | SR.2.1 TDD | |  | |
| RMSI CORESET RMC configuration |  | 1, 4 | CR.1.1 FDD | | N/A | |
|  | 2 | CR.1.1 TDD | |
|  | 3 | CR.2.1 TDD | |
| Dedicated CORESET RMC configuration |  | 1, 4 | CCR.1.1 FDD | | N/A | |
|  | 2 | CCR.1.1 TDD | |
|  | 3 | CCR.2.1 TDD | |
| OCNG Patterns |  | 1, 2, 3, 4 | OP.1 | | OP.1 | |
| TRS Configuration |  | 1, 4 | TRS.1.1 FDD | | N/A | |
|  | 2 | TRS.1.1 TDD | |
|  | 3 | TRS.1.2 TDD | |
| Initial BWP configuration |  | 1, 2, 3, 4 | DLBWP.0.1 ULBWP.0.1 | | N/A | |
| PRS configuration |  | 1, 4 | PRS.1.3 FR1 | | PRS.1.3 FR1 | |
|  | 2 | PRS.1.3 FR1 | | PRS.1.3 FR1 | |
|  | 3 | PRS.2.3 FR1 | | PRS.2.3 FR1 | |
| PRS muting info |  | 1, 2, 3, 4 | ‘10’ | | ‘01’ | |
| Note 2 | dBm/SCS | 1, 4 | -98 | | | |
|  | 2 | -98 | | | |
|  | 3 | -95 | | | |
| Note 2 | dBm/15 kHz | 1, 4 | -98 | | | |
|  | 2 |  | | | |
|  | 3 |  | | | |
| PRS | dB | 1, 4 | -Infinity | -3 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS | dB | 1, 4 | -Infinity | -2 | -Infinity | -10 |
|  | 2 |  |  |  |  |
|  | 3 |  |  |  |  |
| PRS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -Infinity | -100 | -Infinity | -108 |
|  |  | 2 | -Infinity | -100 | -Infinity | -108 |
|  |  | 3 | -Infinity | -97 | -Infinity | -105 |
| SS-RSRP Note 3 | dBm/SCS kHz | 1, 4 | -88 | -88 | -Infinity | -88 |
| 2 | -88 | -88 | -Infinity | -88 |
| 3 | -85 | -85 | -Infinity | -85 |
| Io | dBm/9.36 MHz | 1, 4 | -70.05 | -67.67 | -70.05 | -67.67 |
|  | dBm/9.36 MHz | 2 | -70.05 | -67.67 | -70.05 | -67.67 |
|  | dBm/18.36 MHz | 3 | -67.13 | -64.75 | -67.13 | -64.75 |
| Propagation Condition |  | 1, 2, 3, 4 | Two-tap channel defined in 38.101-4 Annex B.2.4,  *a* = 1, µs and Hz | | | |
| Note 1: 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 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: 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 subframes with transmitted PRS. | | | | | | |

A.16.A.X3.1.2 Test Requirements

The UE shall perform and report the PRS-RSRPP measurements for Cell 1 and Cell 2, within the time limit specified in clause 5.6A.7.5, 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 correct events observed during repeated tests shall be at least 90%.

## **--- End of Change #7\_013 ---**

## **--- Start of Change #7\_014 ---**

## A.16.B Measurement performance requirements for RedCap in RRC\_INACTIVE

### A.16.B.X RSTD measurements

#### A.16.B.X.1 RSTD measurement accuracy test case for RedCap UE without FH in FR1 in RRC\_INACTIVE state

##### A.16.B.X.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 accuracy requirements specified in clause 10.1A.X.2 in an environment with AWGN propagation conditions.

The supported test configurations are specified in Table A.16.B.X.1.1-1.

Table A.16.B.X.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 two synchronous cells: Cell 1 and Cell 2. Cell 1 is the reference as well as the PCell. Cell 2 is a neighbour cell. Both cells are on the same NR RF channel in FR1. The UE is configured with DRX cycle of 1.28s. The *NR-TDOA-ProvideAssistanceData* and *NR-TDOA-RequestLocationInformation* message as defined in TS 37.355 shall be provided to the RedCap UE before the start of the test. The test duration should be larger than the UE measurement period as defined in clause 5.6A.4.5.

The RSTD measurement accuracy 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].

Table A.16.B.X.1.1-2: RSTD accuracy test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Config | Unit | Test 1 | |
| Cell 1 | Cell 2 |
| PRS ARFCN | 1~4 |  | freq1 | Freq1 |
| BWchannel | 1 | MHz | 10: NRB,c = 52 | |
| 2 | 10: NRB,c = 52 | |
| 3 | 20: NRB,c = 51 | |
| 4 | 10: NRB,c = 52 | |
| Duplex mode | 1 |  | FDD | |
| 2 | TDD | |
| 3 | TDD | |
| 4 | HD-FDD | |
| TDD configuration | 1 |  | N/A | |
| 2 | TDDConf.1.1 | |
| 3 | TDDConf.2.1 | |
| 4 | N/A | |
| PDSCH Reference measurement channel | 1 |  | SR.1.1 FDD | - |
| 2 | SR.1.1 TDD |  |
| 3 | SR.2.1 TDD |  |
| 4 | SR.1.1 FDD |  |
| RMSI CORESET Reference Channel | 1 |  | CR.1.1 FDD | - |
| 2 | CR.1.1 TDD | - |
| 3 | CR.2.1 TDD | - |
| 4 | CR.1.1 FDD |  |
| Dedicated CORESET Reference Channel | 1 |  | CCR.1.1 FDD | - |
| 2 | CCR.1.1 TDD | - |
| 3 | CCR.2.1 TDD | - |
| 4 | CCR.1.1 FDD | - |
| SSB configuration | 1 |  | SSB.1 FR1 | |
| 2 | SSB.1 FR1 | |
| 3 | SSB.1 RedCap FR1 | |
| 4 | SSB.1 FR1 | |
| OCNG Patterns | 1~4 |  | OP.1 | |
| TRS configuration | 1 |  | TRS.1.1 FDD | - |
| 2 | TRS.1.1 TDD |  |
| 3 | TRS.1.2 TDD |  |
| 4 | TRS.1.1 FDD |  |
| Initial BWP Configuration | 1~4 |  | DLBWP.0.1  ULBWP.0.1 | |
| Time offset with Cell 1 | 1,4 | μs | - | 3 |
| 2,3 | - | 3 |
| SMTC configuration | 1,4 |  | SMTC.2 | |
| 2,3 | SMTC.1 | |
| PRS configuration | 1 |  | PRS.1.3 FR1 | |
| 2 | PRS.1.3 FR1 | |
| 3 | PRS.2.3 FR1 | |
| 4 | PRS.1.3 FR1 | |
| PRS muting info | 1~4 |  | ‘10’ | ‘01’ |
| Expected RSTD | 1, 2, 3, 4 | μs | N/A | 3 |
| Expected RSTD uncertainty | 1, 2, 3, 4 | μs | N/A | 5 |
| EPRE ratio of PSS to SSS | 1~4 | dB | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| Note2 | 1,2,4 | dBm/ SCS | -98 | |
| 3 | -95 | |
|  | 1~4 | dB | -6 | -13 |
| PRS-RSRPNote3 | 1,2,4 | dBm/SCS | -103.7 | -109.9 |
| 3 | -100.7 | -106.9 |
| IoNote3 | 1,2,4 | dBm/  9.36MHz | -68.8 | -68.8 |
| 3 | dBm/  18.36MHz | -65.88 | -65.88 |
|  | 1~4 | dB | -5.7 | -11.9 |
| Propagation condition | 1~4 | - | AWGN | |
| Antenna configuration | 1~4 |  | 1x2 | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Void. | | | | |

##### A.16.B.X.1.2 Test Requirements

The RSTD measurement accuracy for Cell 2 shall fulfil the absolute requirement in clause 10.1A.X.2.

##### A.16.B.X1.1 UE Rx-Tx time difference measurement accuracy for single positioning frequency layer in FR1 SA for RedCap UE without RX FH in RRC\_INACTIVE mode

###### A.16.B.X1.1.1 Test purpose and environment

The purpose of the test is to verify that the accuracy of the UE Rx-Tx time difference measurement without RX FH reported by the RedCap UE is within the specified limits in clause 10.1.x.x for 1Rx RedCap UE and in clause 10.1.x.x for 2Rx RedCap UE. The test is conducted in AWGN propagation condition in FR1 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations in listed in Table A.16.B.X1.1.1-1.

Table A.16.B.X1.1.1-1: 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. | |

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE before the start of the test. The UE Rx-Tx measurement accuracy test in this clause is valid for the cases where the RedCap UE is either not configured by the LMF to perform UE Rx-Tx time difference measurement with RX FH via *NR-Multi-RTT-RequestLocationInformation* or the UE is configured by the LMF to perform UE Rx-Tx time difference measurement with RX FH via *NR-Multi-RTT-RequestLocationInformation* but reports the UE Rx-Tx time difference measurement based on the single hop in *NR-Multi-RTT-SignalMeasurementInformation* as specified in TS 37.355 [34, clause 6.5.12].

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

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

###### A.16.B.X1.1.2 Test parameters

The UE Rx-Tx time difference accuracy test parameters are given in Table A.16.B.X1.1.2-1.

Table A.16.B.X1.1.2-1: UE Rx-Tx time difference measurement accuracy test parameters.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | Cell 2 |
|  |  |
| RF Channel Number |  | 1,2,3,4 | 1 | 1 |
| DRX | s | 1,2,3,4 | 1.28 | |
| Time offset with Cell 1 | μs | 1,2,3,4 | N/A | 3 |
| TDD configuration |  | 1,4 | N/A | N/A |
| 2 | TDDConf.1.1 | TDDConf.1.1 |
| 3 | TDDConf.2.1 | TDDConf.2.1 |
| PDSCH RMC configuration |  | 1,4 | SR.1.1 FDD | N/A |
| 2 | SR.1.1 TDD |  |
| 3 | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration |  | 1,4 | CR.1.1 FDD | N/A |
| 2 | CR.1.1 TDD |
| 3 | CR.2.1 TDD |
| Dedicated CORESET RMC configuration |  | 1,4 | CCR.1.1 FDD | N/A |
| 2 | CCR.1.1 TDD |
| 3 | CCR.2.1 TDD |
| OCNG Patterns |  | 1,2,3,4 | OP.1 | OP.1 |
| Initial BWP configuration |  | 1,2,3,4 | DLBWP.0.1 ULBWP.0.1 | N/A |
| PRS configuration |  | 1,4 | PRS.1.1 FR1 | PRS.1.1 FR1 |
| 2 | PRS.1.1 FR1 | PRS.1.1 FR1 |
| 3 | PRS.2.1 FR1 | PRS.2.1 FR1 |
| PRS Resource slot offset | slot | 1,2,3,4 | 0 | 4 |
| SRS configuration |  | 1,4 | POS-SRS.1 | N/A |
| 2 | POS-SRS.1 | N/A |
| 3 | POS-SRS.2 | N/A |
| Note 2 | dBm/SCS | 1,4 | -98 | |
| 2 | -98 | |
| 3 | -95 | |
| PRS | dB | 1,4 | -2.41 | -12.12 |
| 2 |
| 3 |
| PRS | dB | 1,4 | -2 | -10 |
| 2 |
| 3 |
| PRP Note 3 | dBm/SCS kHz | 1,4 | -100 | -108 |
|  | 2 | -100 | -108 |
|  | 3 | -97 | -105 |
| Io | dBm/9.36 MHz | 1,4 | -66.22 | -66.22 |
| dBm/9.36 MHz | 2 | -66.22 | -66.22 |
| dBm/18.72 MHz | 3 | -63.22 | -63.22 |
| Propagation Condition |  | 1,2,3,4 | AWGN | |

###### A.16.B.X1.1.3 Test requirements

The UE Rx-Tx time difference measurement without RX FH fulfils the UE Rx-Tx measurement accuracy requirements for AWGN propagation condition specified in the clause 10.1.x.x for 1Rx RedCap UE and in the clause 10.1.x.x for 2Rx RedCap UE for both Cell 1 and Cell 2.

A.16.B.X2.1 PRS-RSRP measurement accuracy without FH in RRC\_INACTIVE state in FR1

A.16.B.X2.1.1 Test Purpose and Environment

The purpose of this test is to verify that the accuracy of PRS-RSRP measurement in RRC\_INACTIVE without FH by a RedCap UE is within the specified limits. This test will verify the requirements in clauses 10.1A.Y.2.1 and 10.1A.Y.2.1.

A.16.B.X2.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.16.B.X2.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.16.B.X2.1.2-2. In all test cases, Cell 1 is the PCell. PRS RX hopping is not requested in *NR-DL-AoD-RequestLocationInformation*.

**Table A.16.B.X2.1.2-1: PRS-RSRP 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. | |

**Table A.16.B.X2.1.2-2: PRS-RSRP test parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | **Test 2** | | |
|  | | |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** | |
| Cell ID | | |  | 489 | 0 | 489 | 0 | |
| SSB ARFCN | | |  | freq1 | | freq1 | | |
| Duplex mode | | Config 1,4 |  | FDD | | | | |
|  | | Config 2,3 |  | TDD | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | |
| BWchannel | | Config 1,2,4 | MHz | 10: NRB,c = 52 | | | | |
|  | | Config 3 |  | 20: NRB,c = 51 | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | |
| DRX Cycle | | | ms | 1280 | | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | - | SR.1.1 FDD | - | |
|  | | Config 2 |  | SR.1.1 TDD |  | SR.1.1 TDD |  | |
|  | | Config 3 |  | SR2.1 TDD |  | SR2.1 TDD |  | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | - | CR.1.1 FDD | - | |
|  | | Config 2 |  | CR.1.1 TDD |  | CR.1.1 TDD |  | |
|  | | Config 3 |  | CR2.1 TDD |  | CR2.1 TDD |  | |
| Control channel RMC | | Config 1,4 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - | |
|  | | Config 2 |  | CCR.1.1 TDD |  | CCR.1.1 TDD |  | |
|  | | Config 3 |  | CCR2.1 TDD |  | CCR2.1 TDD |  | |
| PRS configuration | | Config 1,4 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.Y FR1 | PRS.1.Y FR1 | |
|  | | Config 2 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.Y FR1 | PRS.1.Y FR1 | |
|  | | Config 3 |  | PRS.2.3 FR1 | PRS.2.3 FR1 | PRS.2.Y FR1 | PRS.2.Y FR1 | |
| PRS Resource slot offset (slot) | | Config 1,2,3,4 | slot | 0 | 4 | 0 | 4 | |
| SSB configuration | | Config 1,2,4 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | | Config 3 |  | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | |
| Time offset with Cell 1 | | Config 1,4 | ms | - | 3 | - | 3 | |
|  | | Config 2,3 | μs | - | 3 | - | 3 | |
| SMTC configuration | | Config 1,2,3,4 |  | SMTC.1 RedCap | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |  |  | |
| Note2 | Config 1,2,4 |  | dBm/15KhZ | -98 | | -98 | | |
| Config 3 |  | -98 | | -98 | | |
| Note2 | Config 1,2,4 | | dBm/SCS | -98 | | -98 | | |
| Config 3 |  | -95 | | -95 | | |
|  | | | dB | -2.41 | -12.12 | -2.41 | | -12.12 |
|  | | | dB | -2 | -10 | -2 | | -10 |
| PRS-RSRP Note3 | Config 1, 2,4 |  | dBm/SCS | -100 | -108 | -100 | | -108 |
|  | Config 3 |  |  | -97 | -105 | -97 | | -105 |
| IoNote3 | Config 1,2,4 |  | dBm/9.36MHz | -67.67 | | -67.67 | | |
| Config 3 |  | dBm/18.36MHz | -64.75 | | -64.75 | | |
| Propagation condition | | |  | AWGN | | | | |
| Antenna configuration | | |  | 1x2 | | | | |
| 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 subframes with transmitted PRS.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | | |

A.16.B.X2.1.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1A.Y.2.1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1A.Y.2.2.

A.16.B.X2.2 PRS-RSRP measurement accuracy with FH in RRC\_INACTIVE state in FR1

A.16.B.X2.2.1 Test Purpose and Environment

The purpose of this test is to verify that the accuracy of PRS-RSRP measurement in RRC\_INACTIVE with FH by a RedCap UE is within the specified limits. This test will verify the requirements in clauses 10.1A.Y.2.1 and 10.1A.Y.2.1.

A.16.B.X2.2.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.16.B.X2.2.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.16.B.X2.2.2-2. In all test cases, Cell 1 is the PCell. PRS RX hopping is present in *NR-DL-AoD-RequestLocationInformation*.

**Table A.16.B.X2.2.2-1: PRS-RSRP 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. | |

**Table A.16.B.X2.2.2-2: PRS-RSRP test parameters**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | | | **Unit** | **Test 1** | | **Test 2** | |
|  | | |  | **Cell 1** | **Cell 2** | **Cell 1** | **Cell 2** |
| Cell ID | | |  | 489 | 0 | 489 | 0 |
| SSB ARFCN | | |  | freq1 | | freq1 | |
| Duplex mode | | Config 1,4 |  | FDD | | | |
|  | | Config 2,3 |  | TDD | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | |
| BWchannel | | Config 1,2,4 | MHz | [10: NRB,c = 52] | | | |
|  | | Config 3 |  | [20: NRB,c = 51] | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | |
| DRX Cycle | | | ms | 1280 | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | - | SR.1.1 FDD | - |
|  | | Config 2 |  | SR.1.1 TDD |  | SR.1.1 TDD |  |
|  | | Config 3 |  | SR2.1 TDD |  | SR2.1 TDD |  |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | - | CR.1.1 FDD | - |
|  | | Config 2 |  | CR.1.1 TDD |  | CR.1.1 TDD |  |
|  | | Config 3 |  | CR2.1 TDD |  | CR2.1 TDD |  |
| Control channel RMC | | Config 1,4 |  | CCR.1.1 FDD | - | CCR.1.1 FDD | - |
|  | | Config 2 |  | CCR.1.1 TDD |  | CCR.1.1 TDD |  |
|  | | Config 3 |  | CCR2.1 TDD |  | CCR2.1 TDD |  |
| PRS configuration | | Config 1,4 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.X FR1 | PRS.1.X FR1 |
|  | | Config 2 |  | PRS.1.3 FR1 | PRS.1.3 FR1 | PRS.1.X FR1 | PRS.1.X FR1 |
|  | | Config 3 |  | PRS.2.3 FR1 | PRS.2.3 FR1 | PRS.2.X FR1 | PRS.2.X FR1 |
| PRS Resource slot offset (slot) | | Config 1,2,3,4 | slot | 0 | 4 | 0 | 4 |
| SSB configuration | | Config 1,2,4 |  | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 |
|  | | Config 3 |  | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 |
| Time offset with Cell 1 | | Config 1,4 | ms | - | 3 | - | 3 |
|  | | Config 2,3 | μs | - | 3 | - | 3 |
| SMTC configuration | | Config 1,2,3,4 |  | SMTC.1 RedCap | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  |  |  |  |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  |  |  |  |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH | | |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  |  |  |  |
| Note2 | Config 1,2,4 |  | dBm/15KhZ | -98 | | -98 | |
| Config 3 |  | -98 | | -98 | |
| Note2 | Config 1,2,4 | | dBm/SCS | -98 | | -98 | |
| Config 3 |  | -95 | | -95 | |
|  | | | dB | -2.41 | -12.12 | -2.41 | -12.12 |
|  | | | dB | -2 | -10 | -2 | -10 |
| PRS-RSRP Note3 | Config 1, 2,4 |  | dBm/SCS | -100 | -108 | -100 | -108 |
|  | Config 3 |  |  | -97 | -105 | -97 | -105 |
| IoNote3 | Config 1,2,4 |  | dBm/9.36MHz | -67.67 | | -67.67 | |
| Config 3 |  | dBm/18.36MHz | -64.75 | | -64.75 | |
| Propagation condition | | |  | AWGN | | | |
| Antenna configuration | | |  | 1x2 | | | |
| 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 subframes with transmitted PRS.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port. | | | | | | | |

A.16.B.X2.2.3 Test Requirements

In each test, the absolute PRS-RSRP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1A.Y.2.1. The relative PRS-RSRP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1A.Y.2.2.

# A.16.B.X3.2 SA: PRS-RSRPP measurement accuracy TC with Rx FH in RRC\_INACTIVE state in FR1

## A.16.B**.**X3.1.1Test purpose and Environment

The purpose of this test is to verify that the PRS-RSRPP measurement accuracy in FR1 with FH by a RedCap UE in RRC\_INACTIVE state is within the specified limits. This test will verify the requirements in clauses 10.1A.Y.2.2.

## A.16.B.X3.1.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in table A.16.B.X3.1.2-1. Both absolute and relative accuracy of PRS-RSRP measurements are tested by using the parameters in A.16.B.X3.1.2-2. In all test cases, Cell 1 is the PCell PRS RX hopping is requested in *NR-DL-AoD-RequestLocationInformation*.

Table A.16.B.X3.1.2-1: PRS-RSRPP supported test configurations

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | NR 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 each supported band | |

Table A.16.B.X3.1.2-2: PRS-RSRPP test parameters

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | | Unit | Test 1 | | | Test 2 | | |
|  | | |  | Cell 1 | | Cell 2 | Cell 1 | Cell 2 | |
| Cell ID | | |  | 489 | | 0 | 489 | 0 | |
| SSB ARFCN | | |  | freq1 | | | freq1 | | |
| Duplex mode | | Config 1,4 |  | FDD | | | | | |
|  | | Config 2,3 |  | TDD | | | | | |
| TDD configuration | | Config 1,4 |  | Not Applicable | | | | | |
|  | | Config 2 |  | TDDConf.1.1 | | | | | |
|  | | Config 3 |  | TDDConf.2.1 | | | | | |
| BWchannel | | Config 1,2,4 | MHz | 10: NRB,c = 52 | | | | | |
|  | |  |  |  | | | | | |
|  | | Config 3 |  | 20: NRB,c = 51 | | | | | |
| Downlink initial BWP configuration | | |  | DLBWP.0.1 | | | | | |
| Uplink initial BWP configuration | | |  | ULBWP.0.1 | | | | | |
| TRS configuration | | Config 1,4 |  | TRS.1.1 FDD | | NA | TRS.1.1 FDD | NA | |
|  | | Config 2 |  | TRS.1.1 TDD | | NA | TRS.1.1 TDD | NA | |
|  | | Config 3 |  | TRS.1.2 TDD | | NA | TRS.1.2 TDD | NA | |
| DRX cycle length | | Config 1,2,3 | ms | 1280 | | | | | |
| PDSCH Reference measurement channel | | Config 1,4 |  | SR.1.1 FDD | | - | SR.1.1 FDD | - | |
|  | | Config 2 |  | SR.1.1 TDD | |  | SR.1.1 TDD |  | |
|  | | Config 3 |  | SR2.1 TDD | |  | SR2.1 TDD |  | |
| RMSI CORESET Reference Channel | | Config 1,4 |  | CR.1.1 FDD | | - | CR.1.1 FDD | - | |
|  | | Config 2 |  | CR.1.1 TDD | |  | CR.1.1 TDD |  | |
|  | | Config 3 |  | CR2.1 TDD | |  | CR2.1 TDD |  | |
| Control channel RMC | | Config 1,4 |  | CCR.1.1 FDD | | - | CCR.1.1 FDD | - | |
|  | | Config 2 |  | CCR.1.1 TDD | |  | CCR.1.1 TDD |  | |
|  | | Config 3 |  | CCR2.1 TDD | |  | CCR2.1 TDD |  | |
| PRS configuration | | Config 1,4 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.x FR1 | PRS.1.x FR1 | |
|  | | Config 2 |  | PRS.1.3 FR1 | | PRS.1.3 FR1 | PRS.1.x FR1 | PRS.1.x FR1 | |
|  | | Config 3 |  | PRS.2.3 FR1 | | PRS.2.3 FR1 | PRS.2.x FR1 | PRS.2.x FR1 | |
| PRS Resource slot offset (slot) | | Config 1,2,3,4 | slot | 0 | | 4 | 0 | 4 | |
| SSB configuration | | Config 1,2,4 |  | SSB.1 FR1 | | SSB.1 FR1 | SSB.1 FR1 | SSB.1 FR1 | |
|  | |  |  |  | |  |  |  | |
|  | | Config 3 |  | SSB.1 RedCap FR1 | | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | SSB.1 RedCap FR1 | |
| Time offset with Cell 1 | | Config 1,4 | ms | - | | 3 | - | 3 | |
|  | | Config 2,3 | μs | - | | 3 | - | 3 | |
| SMTC configuration | | Config 1,2,3,4 |  | SMTC.1 RedCap | | | | | |
| OCNG Patterns | | |  | OCNG pattern 1 | | | | | |
| EPRE ratio of PSS to SSS | | | dB | 0 | | 0 | 0 | 0 | |
| EPRE ratio of PBCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PBCH to PBCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH DMRS to SSS | | |  |  | |  |  |  | |
| EPRE ratio of PDSCH to PDSCH | | |  |  | |  |  |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | | |  |  | |  |  |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | | |  |  | |  |  |  | |
| Note2 | Config 1,2,4 |  | dBm/15KhZ | -98 | | | -98 | | |
| Config 3 |  | -98 | | | -98 | | |
| Note2 | Config 1,2,4 | | dBm/SCS | -98 | | | -98 | | |
| Config 3 |  | -98 | | | -98 | | |
|  | | | dB | -2.41 | -12.12 | | -2.41 | | -12.12 |
|  | | | dB | -2 | -10 | | -2 | | -10 |
| PRS-RSRP Note3 | Config 1, 2,4 |  | dBm/SCS | -100 | | -108 | -100 | | -108 |
|  | Config 3 |  |  | -97 | | -105 | -97 | | -105 |
| IoNote3 | Config 1,2,4 |  | dBm/19.08MHz | -67.67 | | | -67.67 | | |
| Config 3 |  | dBm/47.88MHz | -64.75 | | | -64.75 | | |
| Propagation condition | | |  | Two-tap channel Note 7 | | | | | |
| Antenna configuration | | |  | 1x2 | | | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Void.  Note 6: Void  Note 7: The two-tap channel model is defined in 38.101-4 Annex B.2.4 (a = 1, τd=0.45 µs and fD=5 Hz). | | | | | | | | | |

## A.16.B.X3.1.3 Test requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1A.Y.2.2. The relative PRS-RSRPP measurement between the two PRS resources within the same cell shall fulfil the relative accuracy requirement in clause 10.1A.Y.2.2

## **--- End of Change #7\_014 ---**

## **--- Start of Change #7\_015 ---**

### A.17.6.X RSTD Measurements

#### A.17.6.X.2 NR RSTD measurement reporting delay test case with PRS frequency hopping

##### A.17.6.X.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.X.2.1-1. The test parameters are as given in Table A.17.6.X.2.1-2, Table A.17.6.X.2.1-3 and Table A.17.6.X.2.1-4.

Table A.17.6.X.2.1-1: Supported test configurations for NR RSTD

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

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. All cells are on the 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.X.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 |  | TBD | 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 | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 1.28 | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.17.6.X.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.X.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.X.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 10.1.23.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## **--- End of Change #7\_015 ---**

## **--- Start of Change #7\_02 ---**

#### A.17.6.X1.2 UE Rx-Tx time difference measurement with Rx FH for single positioning frequency layer in FR2 SA in RRC\_CONNECTED state

##### A.17.6.X1.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement with Rx FH meets the requirements specified in clause 9.9A.4.8 in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are listed in Table A.17.6.X1.2.1-1.

Table A.17.6.X1.2.1-1: Supported test configurations

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

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

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

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

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

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

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.17.6.X1.2.1-2 and Table A.17.6.X1.2.1-3 respectively.

Table A.17.6.X1.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | [100: NRB,c = 66] |  |
| SSB configuration |  | 1 | SSB.3 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| Measurement gap |  | 1 | GP#24 or GP#13 Note 1 |  |
| CP length |  | 1 | Normal |  |
| DRX |  | 1 | OFF |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells |
| PRS RX hopping request |  | 1 | requested |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 10 |  |
| Note 1: GP#24 is configured if RedCap UE supports MG#24, otherwise GP#13 is configured. | | | | |

Table A.17.6.X1.2.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 |  | 1 | Rough | | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| OCNG Patterns |  | 1 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1  ULBWP.0.1 | | N/A | |
| Active DL BWP configuration |  | 1 | DLBWP.1.1 RedCap | | N/A | |
| Active UL BWP configuration |  | 1 | ULBWP.1.1 RedCap | | N/A | |
| PRS configuration |  | 1 | PRS.X.X FR2 | | PRS.X.X FR2 | |
| PRS muting info |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 | -Infinity | -99 |
| Io | dBm/190.08 MHz | 1 | N/A | -54.62 | N/A | -54.62 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: 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.X1.2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 9.9A.4.8.

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

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.X.X.X.

## **--- End of Change #7\_02 ---**

## **--- Start of Change #7\_025 ---**

#### A.17.6.X3.2 PRS-RSRPP measurement with Rx FH reporting delay test case for single positioning frequency layer in FR2 SA in RRC\_CONNECTED state

##### A.17.6.X3.2.1 Test Purpose and Environment

The purpose of the test is to verify that the PRS-RSRPP measurement requirements with Rx FH in RRC\_CONNECTED state meets the delay requirements specified in Clause 9.9A.5.8 in an environment with two-tap channel propagation conditions in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are specified in Table A.17.6.X3.2.1-1.

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

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

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

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

The test parameters are as given in table A.17.6.X3.2.1-2, and table A.17.6.X3.2.1-3.

**Table A.17.6.X3.2.1-1: supported test configurations for PRS-RSRPP measurement for FR2**

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

**Table A.17.6.X3.2.1-2: General test parameters for PRS-RSRPP measurement reporting delay**

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

Table A.17.6.X3.2.1-3: Cell-specific test parameters for PRS-RSRPP measurement reporting delay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | [100: NRB,c = 66] | | [100: NRB,c = 66] | |
| BWP BW | | MHz | Config 1 | [100: NRB,c = 66] | | [100: NRB,c = 66] | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated DL BWP |  |  | DLBWP.1.1  RedCap | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1  RedCap | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | - | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PRS configuration | |  | Config 1 | [PRS.1.3 FR2] | | [PRS.1.3 FR2] | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -98 | | -98 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -89 | | -89 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -89 | -89 | -Infinity | -89 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -91 | -Infinity | -99 |
| PRS | | dB | Config 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | | dB | Config 1 | -Infinity | -2 | -Infinity | -10 |
| IoNote3 | | dBm/190.08 MHz Note5 | Config 1 | -54.00 | -54.62 | -54.00 | -54.62 |
| Propagation Condition | |  | Config 1 | Two-tap channel defined in 38.101-4 Annex B.2.4,  *a* = 1, µs and Hz | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: 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.X3.2.2 Test Requirements

The PRS-RSRPP measurement time fulfils the requirements specified in Clause 9.9A.5.8. The UE shall perform and report the PRS-RSRPP measurements for Cell 2 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in section 9.9A.5.8 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 the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS-RSRPP measurement for each correct event shall be within the PRS-RSRPP reporting range specified in Clause 10.1.38, i.e., between PRS RSRPP\_0 and PRS RSRPP\_126.

# A.17.7.X3.2 SA: PRS-RSRPP measurement accuracy TC with Rx FH in RRC\_CONNECTED state in FR2

## A.17.7.X3.2.1 Test purpose and Environment

The purpose of this test is to verify that the accuracy of PRS-RSRPP measurement with FH by a RedCap UE in RRC\_CONNECTED is within the specified limits. This test will verify the requirements in clauses 10.1A.Y.2.2.

## A.17.7.X3.2.2 Test parameters

In this set of test cases all cells are on the same carrier frequency. Supported test configurations are shown in Table A.17.7.X3.2.2-1. In all test cases, Cell 1 is the PCell. The TCI status for Cell 1 is defined in Table A.3.16.2-1 and TRS configuration for Cell 1 is defined in Table A.3.17.2.1-1.

Table A.17.7.X3.2.2-1: PRS-RSRPP supported test configurations

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

## A.17.7.X3.2.3 Test requirements

In each test, the absolute PRS-RSRPP measurement for each cell shall fulfil the absolute accuracy requirement in clause 10.1.38.2 if the reported PRS-RSRPP is in the range shown in table A.17.7.X3.2.3-1.

Table A.17.7.X3.2.3-1: PRS-RSRPP absolute accuracy test requirement

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

Table A.17.7.X3.2.3-2: PRS-RSRPP general test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Cell ID |  | 489 | 0 | 489 | 0 |
| SSB ARFCN |  | freq1 | | freq1 | |
| Duplex mode |  | TDD | | TDD | |
| TDD configuration |  | TDDConf.3.1 | | TDDConf.3.1 | |
| BWchannel | MHz | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| Downlink initial BWP configuration |  | DLBWP.0.1 | - | DLBWP.0.1 | - |
| Downlink dedicated BWP configuration |  | DLBWP.1.1 | - | DLBWP.1.1 | - |
| Uplink initial BWP configuration |  | ULBWP.0.1 | - | ULBWP.0.1 | - |
| Uplink dedicated BWP configuration |  | ULBWP.1.1 | - | ULBWP.1.1 | - |
| DRX cycle configuration |  | Not applicable | - | Not applicable | - |
| Measurement gap |  | GP#13 or GP#24 Note2 | | | |
| TRS configuration |  | TRS.2.1 TDD | - | TRS.2.1 TDD | - |
| TCI state |  | TCI.State.0 | - | TCI.State.0 | - |
| PDSCH Reference measurement channel |  | SR.3.1 TDD | - | SR.3.1 TDD | - |
| RMSI CORESET Reference Channel |  | CR.3.1 TDD | - | CR.3.1 TDD | - |
| Control channel RMC |  | CCR.3.1 TDD | - | CCR.3.1 TDD | - |
| OCNG Patterns |  | OP.3 | OP.3 | OP.3 | OP.3 |
| SSB configuration |  | SSB.1 RedCap FR2 | SSB.1 RedCap FR2 | SSB.1 RedCap FR2 | SSB.1 RedCap FR2 |
| SMTC configuration |  | SMTC.1 | SMTC.1 | SMTC.1 | SMTC.1 |
| Time offset with Cell 1 | μs | - | 3 | - | 3 |
| PRS configuration |  | PRS.1.3 FR2 | PRS.1.3 FR2 | PRS.1.x FR2 | PRS.1.x FR2 |
| PRS Resource slot offset | slot | 0 | 4 | 0 | 4 |
| PDSCH/PDCCH subcarrier spacing | kHz | 120 | 120 | 120 | 120 |
| EPRE ratio of PSS to SSS | dB | 0 | 0 | 0 | 0 |
| EPRE ratio of PBCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PBCH to PBCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDCCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDCCH to PDCCH\_DMRS |  |  |  |  |  |
| EPRE ratio of PDSCH\_DMRS to SSS |  |  |  |  |  |
| EPRE ratio of PDSCH to PDSCH\_DMRS |  |  |  |  |  |
| EPRE ratio of OCNG DMRS to SSSNote 1 |  |  |  |  |  |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |  |  |  |  |  |
| Propagation conditions |  | Two-tap channel defined in 38.101-4 Annex B.2.4,  *a* = 1, µs and Hz | | | |
| Antenna configuration |  | 1x2 | 1x2 | 1x2 | 1x2 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: GP#24 is configured if UE supports MG#24, otherwise GP#13 is configured. | | | | | |

Table A.17.7.X3.2.3-3: PRS-RSRPP OTA related test parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test 1 | | Test 2 | |
|  |  | Cell 1 | Cell 2 | Cell 1 | Cell 2 |
| Angle of arrival configuration |  | Setup 1 according to clause A.3.15.1 | | | |
| Assumption for UE beamsNote 7 |  | Rough | | Rough | |
| Note1 | dBm/15kHzNote4 | -98 | | Same as Test 1 | |
| Note1 | dBm/SCSNote4 | -89 | | Same as Test 1 | |
|  | dB | -2 | -10 | -2 | -10 |
| Es | dBm/SCSNote4 | - | - | - | - |
| PRS\_RPNote2 | dBm/SCS | -91 | -99 | -91 | -99 |
| BB Note6 | dB | -2.41 | -12.12 | -2.41 | -12.12 |
| IoNote2 | dBm/190.08 MHz Note4 | -54.62 | | -54.62 | |
| Note 1: Where used, interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 2: PRS\_RP, Es/Iot and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 3: Void  Note 4: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 5: Void  Note 6: Calculation of Es/IotBB includes the effect of UE internal noise up to the value assumed for the associated Refsens requirement in clause 7.3.2 of TS 36.101-2 [19], and an allowance of 1dB for UE multi-band relaxation factor ΔMBP from TS 38.101-2 [19] Table 6.2.1.3-4.  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | |

## **--- End of Change #7\_025 ---**

## **--- Start of Change #7\_027 ---**

## A.17.A Measurement procedure for RedCap in RRC\_INACTIVE

### A.17.A.X RSTD Measurements

#### A.17.A.X.2 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA in RRC\_INACTIVE state

##### A.17.A.X.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.A.X.2.1-1.

Table A.17.A.X.2.1-1: Supported test configurations for NR RSTD

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

In the test there are three synchronous cells: Cell 1, Cell 2 and Cell 3. Cell 1 is the reference as well as the PCell. Cell 2 and Cell 3 are the neighbour cells. All cells are on the 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 0.64s.

The general test parameters are listed in Table A.17.A.X.2.1-2, and cell specific test parameters are listed in Table Table A.17.A.X.2.1-3 and Table A.17.A.X.2.1-4.

Table A.17.A.X.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 |  | TBD | 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 | |  | 16 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | [1.28] | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.17.A.X.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.A.X.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.A.X.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 10.1.23.3, i.e., between RSTD\_0000000 and RSTD\_1970049.

## **--- End of Change #7\_027 ---**

## **--- Start of Change #7\_03 ---**

#### A.17.A.X1.2 UE Rx-Tx time difference measurement with Rx FH for single positioning frequency layer in FR2 SA in RRC\_INACTIVE state

##### A.17.A.X1.2.1 Test purpose and environment

The purpose of the test is to verify that the UE Rx-Tx measurement with Rx FH meets the requirements specified in clause 5.6A.6.6 in AWGN propagation condition in FR2 in standalone scenario when single positioning frequency layer is configured.

The supported test configurations are listed in Table A.17.A.X1.2.1-1.

Table A.17.A.X1.2.1-1: Supported test configurations

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

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

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

The *NR-Multi-RTT-ProvideAssistanceData* and *nr-Multi-RTT-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12.1], shall be provided to the RedCap UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In the next DL slot after slot #n, RedCap UE is released into RRC\_INACTIVE state.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The UE is configured to transmit positioning SRS during T2.

The general test parameters and cell specific test parameters are as given in Table A.17.A.X1.2.1-2 and Table A.17.A.X1.2.1-3 respectively.

Table A.17.A.X1.2.1-2: General test parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Active cell |  | 1 | Cell 1 | Cell 1 is the PCell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| Neighbour cell |  | 1 | Cell 2 | Cell 2 is a neighbour cell in *NR-Multi-RTT-ProvideAssistanceData* [34]. |
| RF Channel Number |  | 1 | 1 | For both Cell 1 and Cell 2 |
| BWchannel | MHz | 1 | [100: NRB,c = 66] |  |
| SSB configuration |  | 1 | SSB.3 FR2 |  |
| SMTC configuration |  | 1 | SMTC.1 |  |
| CP length |  | 1 | Normal |  |
| DRX |  | 1 | 1.28s |  |
| Time offset between serving and neighbour cells | μs | 1 | 3 | Synchronous cells |
| PRS RX hopping request |  | 1 | requested |  |
| T1 | s | 1 | 5 |  |
| T2 | s | 1 | 10 |  |

Table A.17.A.X1.2.1-3: Cell specific test parameters

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  |  | T1 | T2 | T1 | T2 |
| AoA setup |  | 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 |  | 1 | Rough | | Rough | |
| TDD configuration |  | 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| PDSCH RMC configuration |  | 1 | SR.3.1 TDD | | N/A | |
| RMSI CORESET RMC configuration |  | 1 | CR.3.1 TDD | | N/A | |
| Dedicated CORESET RMC configuration |  | 1 | CCR.3.1 TDD | | N/A | |
| OCNG Patterns |  | 1 | OP.1 | | OP.1 | |
| EPRE ratio of PSS to SSS | dB | 1 | 0 | | 0 | |
| EPRE ratio of PBCH DMRS to SSS |
| EPRE ratio of PBCH to PBCH DMRS |
| EPRE ratio of PDCCH DMRS to SSS |
| EPRE ratio of PDCCH to PDCCH DMRS |
| EPRE ratio of PDSCH DMRS to SSS |
| EPRE ratio of PDSCH to PDSCH DMRS |
| EPRE ratio of OCNG DMRS to SSSNote 1 |
| EPRE ratio of OCNG to OCNG DMRS Note 1 |
| EPRE ratio of PRS to SSS |
| TRS Configuration |  | 1 | TRS.2.1 TDD | | N/A | |
| Initial BWP configuration |  | 1 | DLBWP.0.1  ULBWP.0.1 | | N/A | |
| PRS configuration |  | 1 | PRS.X.X FR2 | | PRS.X.X FR2 | |
| PRS muting info |  | 1 | ‘10’ | | ‘01’ | |
| SRS configuration |  | 1 | POS-SRS.3 | | N/A | |
| Note 2 | dBm/SCS | 1 | -89 | | | |
| Note 2 | dBm/15 kHz | 1 | -98 | | | |
| PRS | dB | 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | dB | 1 | -Infinity | -2 | -Infinity | -10 |
| PRP Note 3 | dBm/SCS kHz | 1 | -Infinity | -91 | -Infinity | -99 |
| Io | dBm/190.08 MHz | 1 | N/A | -54.62 | N/A | -54.62 |
| Propagation Condition |  | 1 | AWGN | | | |
| Note 1: The resources for uplink transmission are assigned to the UE prior to the start of time period T2.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: PRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation  Note 8: 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.A.X1.2.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 5.6A.6.6.

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

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.X.X.X.

#### A.17.A.X1.3 UE Rx-Tx time difference measurements for single positioning frequency layer with eDRX > 10.24s in FR2 SA

##### A.17.A.X1.3.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 5.6A.6.5 for UE Rx-Tx measurements in RRC\_INACTIVE with eDRX. Refer to clause A.7.8.3.X.1 for test configuration and procedure.

##### A.17.A.X1.3.2 Test requirements

The UE Rx-Tx time difference measurement time fulfils the requirements specified in clause 5.6A.6.5.

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

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.

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 UE Rx-Tx measurement for each correct event shall be within the UE Rx-Tx reporting range specified in clause 10.1.25.3.1.

**--- other sections ---**

#### A.17.A.X2.3 PRS-RSRP reporting delay in RRC\_INACTIVE with eDRX

##### A.17.A.X2.3.1 Test Purpose and Environment

The purpose of the test is to verify a RedCap UE can meet the PRS RSRP measurement requirements specified in Clause 5.6A.5.5 for single positioning frequency layer under AWGN propagation conditions in RRC\_INACTIVE, when configured with eDRX and without FH. Supported test configurations are shown in table A.17.A.X2.3.1-1.

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

The test consists of two successive time periods, with time duration of T1, and T2 respectively. During time duration T1, the UE shall not have any timing information of Cell 2. Both cells transmit PRS during T2.

During T1 UE is in RRC\_CONNECTED, the *NR-DL-AoD-RequestLocationInformation* message and *NR-DL-AoD-ProvideAssistanceData* message as defined in TS 37.355 shall be provided to the UE during T1. The last slot containing the two messages for the assistance data and location information request is denoted as #n. In the next DL slot after slot #n, UE is released into RRC\_INACTIVE.

The beginning of the time interval T2 is the first PRS resource occasion occurring ΔT after the slot #n, where ΔT = 50 ms is the maximum processing time of the assistance data and location information request.

The test parameters are as given in table A.17.A.X2.3.1-2, and table A.17.A.X2.3.1-3.

Table A.17.A.X2.3.1-1: supported test configurations for PRS RSRP measurement for FR2-FR2

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

Table A.17.A.X2.3.1-2: General test parameters for PRS RSRP measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | Config 1 | NR cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| SMTC parameters |  | Config 1 | SMTC.1 | As specified in clause A.3.11 |
| SSB parameters |  | Config 1 | SSB.3 FR2 | As specified in clause A.3.10.2 |
| CP length |  | Config 1 | Normal |  |
| DRX |  | Config 1 | 0.64s |  |
| CN and RAN eDRX configuration |  | Config 1 | eDRX cycle = 40.96s  PTW length = 1.28s |  |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| Expected RSTD | μs | Config 1 | 3 |  |
| Expected RSTD uncertainty | μs | Config 1 | 5 |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | [41] |  |

Table A.17.A.X2.3.1-3: Cell-specific test parameters for PRS RSRP measurement reporting delay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PRS configuration | |  | Config 1 | PRS.1.1 FR2 | | PRS.1.1 FR2 | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | |  | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -98 | | -98 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -89 | | -89 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -91 | -91 | -Infinity | -99 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -91 | -Infinity | -99 |
| PRS | | dB | Config 1 | -Infinity | -2.41 | -Infinity | -12.12 |
| PRS | | dB | Config 1 | -Infinity | -2 | -Infinity | -10 |
| IoNote3 | | dBm/95.04Note5 | Config 1 | -57.89 | | -57.89 | |
| Propagation Condition | |  | Config 1 | AWGN | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

##### A.17.A.X2.3.2 Test Requirements

The PRS RSRP measurement time fulfils the requirements specified in Clause 5.6A.5.5. The UE shall perform and report the PRS RSRP measurements for Cell 2 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in section 5.6A.5.5 with Tavailable\_PRS = 0.64s starting from the beginning of time interval T2.

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

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

**--- other sections ---**

# A.17.B.X3.2 SA: PRS-RSRPP measurement accuracy TC with Rx FH in RRC\_INACTIVE state in FR2

## A.17.B.X3.2.1 Test purpose and Environment

The purpose of the test is to verify the PRS RSRPP measurement requirements with FH by RedCap UE in RRC\_INACTIVE state specified in Clause 5.6A.7 for single positioning frequency layer under AWGN propagation conditions in standalone scenario. Supported test configurations are shown in table A.17.B.X3.2.1-1.

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

The test consists of two 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. During T2 UE shall be in RRC\_INACTIVE state and both cells transmit PRS resources within initial DL BWP of the UE and with the same numerology as the initial DL BWP.

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

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

The test parameters are as given in table A.17.B.X3.2.1-2..

Table A.17.B.X3.2.1-1: supported test configurations for PRS RSRPP measurement for FR2

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

Table A.7.8.4.1.1-2: General test parameters for PRS RSRPP measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| NR RF Channel Number |  | Config 1 | 1: Cell 1 and Cell 2 | One TDD carrier frequency is used for the NR cells. |
| Active cell |  | Config 1 | NR cell 1 (Pcell) | Cell 1 is the PCell and the DL-AoD reference cell in the positioning assistance data. |
| Neighbour cell |  | Config 1 | NR cell 2 | Cell 2 is a neighbour cell in the positioning assistance data. |
| SMTC parameters |  | Config 1 | SMTC.1 RedCap |  |
| SSB parameters |  | Config 1 | SSB.1 RedCap FR2 |  |
| A3-Offset | dB | Config 1 | -6 |  |
| Hysteresis | dB | Config 1 | 0 |  |
| CP length |  | Config 1 | Normal |  |
| TimeToTrigger | s | Config 1 | 0 |  |
| Filter coefficient |  | Config 1 | 0 | L3 filtering is not used |
| DRX | s | Config 1 | 0.64 | ON |
| Time offset between serving and neighbour cells |  | Config 1 | 3μs | Synchronous cells. |
| Expected RSTD | μs | Config 1 | 3 |  |
| Expected RSTD uncertainty | μs | Config 1 | 5 |  |
| T1 | s | Config 1 | 5 |  |
| T2 | s | Config 1 | 7 |  |

Table A.17.B.X3.2.1-2: Cell-specific test parameters for PRS RSRPP measurement reporting delay

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Test configuration | Cell 1 | | Cell 2 | |
|  | |  | T1 | T2 | T1 | T2 |
| AoA setup | |  | Config 1 | Setup 1 as specified in clause A.3.15 | | | |
| Beam AssumptionNote 7 | |  | Config 1 | Rough | | Rough | |
| TDD configuration | |  | Config 1 | TDDConf.3.1 | | TDDConf.3.1 | |
| Duplex mode | |  | Config 1 | TDD | | TDD | |
| BWchannel | | MHz | Config 1 | 100: NRB,c = 66 | | 100: NRB,c = 66 | |
|  | |  |  |  | |  | |
| BWP configuration | Initial DL BWP |  | Config 1 | DLBWP.0.1 | | N/A | |
|  | Initial UL BWP |  |  | ULBWP.0.1 | | N/A | |
|  | Dedicated UL BWP |  |  | ULBWP.1.1 | | N/A | |
| OCNG Patterns defined in A.3.2.1.1 (OP.1) | |  | Config 1 | OP.1 | | OP.1 | |
| PDSCH Reference measurement channel | |  | Config 1 | SR.3.1 TDD | | - | |
| CORESET Reference Channel | |  | Config 1 | CR.3.1 TDD | | - | |
| Dedicated CORESET RMC configuration | |  | Config 1 | CCR.3.1 TDD | | - | |
| TRS configuration | |  | Config 1 | TRS.2.1 TDD | | - | |
| PDSCH/PDCCH subcarrier spacing | | kHz | Config 1 | 120 | | 120 | |
| PRS configuration | |  | Config 1 | PRS.1.x FR2 | | PRS.1.x FR2 | |
| PRS muting configuration | |  | Config 1 | ‘10’ | | ‘01’ | |
| EPRE ratio of PSS to SSS | | dB |  |  | |  | |
| EPRE ratio of PBCH DMRS to SSS | |  |  | |  | |
| EPRE ratio of PBCH to PBCH DMRS | |  |  | |  | |
| EPRE ratio of PDCCH DMRS to SSS | |  |  | |  | |
| EPRE ratio of PDCCH to PDCCH DMRS | | Config 1 | 0 | | 0 | |
| EPRE ratio of PDSCH DMRS to SSS | |  |  | |  | |
| EPRE ratio of PDSCH to PDSCH | |  |  | |  | |
| EPRE ratio of OCNG DMRS to SSS(Note 1) | |  |  | |  | |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) | |  |  | |  | |
| Note2 | | dBm/15kHz Note5 |  | -98 | | -98 | |
| Note2 | | dBm/SCS Note4 | Config 1 | -89 | | -89 | |
| SS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -89 | -91 | -Infinity | -99 |
| PRS-RSRP Note 3 | | dBm/SCS Note5 | Config 1 | -Infinity | -91 | -Infinity | -99 |
| PRS | | dB | Config 1 | -Infinity | -2.12 | -Infinity | -12.12 |
| PRS | | dB | Config 1 | -Infinity | -2 | -Infinity | -10 |
| IoNote3 | | dBm/190.08 MHz Note5 | Config 1 | -54.00 | -54.62 | -54.00 | -54.62 |
| Propagation Condition | |  | Config 1 | Two-tap channel defined in 38.101-4 Annex B.2.4,  *a* = 1, µs and Hz | | | |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 3: SS-RSRP/PRS-RSRP and Io levels have been derived from other parameters for information purposes. They are not settable parameters themselves.  Note 4: PRS-RSRP minimum requirements are specified assuming independent interference and noise at each receiver antenna port.  Note 5: Equivalent power received by an antenna with 0 dBi gain at the centre of the quiet zone  Note 6: As observed with 0 dBi gain antenna at the centre of the quiet zone  Note 7: Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation | | | | | | | |

## A.17.B.X3.2.2 Test requirements

The PRS RSRPP measurement time fulfils the requirements specified in Clause 5.6A.7.The UE shall perform and report the PRS RSRPP measurements for Cell 2 with respect to the reference cell in the DL-AoD assistance data, Cell 1, within the time duration specified in section 5.6A.7 starting from the beginning of time interval T2.

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

The rate of the correct events for the neighbour cell observed during repeated tests shall be at least 90%, where the reported PRS RSRPP measurement for each correct event shall be within the PRS RSRPP reporting range specified in Clause10.1A.Y.2.2, i.e., between PRS RSRPP\_0 and PRS RSRPP\_126.

## **--- End of Change #7\_03 ---**

## **--- Start of Change #7\_1 ---**

## B.2.14 Conditions for NR PRS-based measurements

This clause defines the following conditions for NR PRS-based measurements and corresponding procedures performed based on PRS: PRP and PRS Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.14-1 for FR1 NR cells.

The conditions are defined in Table B.2.14-2 for FR2 NR cells.

**Table B.2.14-1: Conditions for NR PRS-based measurements in FR1**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **NR operating band groups Note1** | **Minimum PRP1,2** | | | **PRS Ês/Iot** | |
| **dBm / SCSPRS** | | | **dB** | |
| **SCSPRS = 15 kHz** | **SCSPRS = 30 kHz** | **SCSPRS = 60 kHz** |
| **Conditions** | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | ≥ -6 Note2  ≥ -13 Note3  ≥ -3 Note4  ≥ -10 Note8 | ≥ -6 Note5  ≥ -3 Note6  ≥ 0 Note7 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | -118 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 |
| NR\_FDD\_FR1\_N | -120.5 | -117.5 | -114.5 |
| NOTE 1: NR operating band groups are defined in clause 3.5.2.  NOTE 2: PRS Ês/Iot for RSTD measurement reference cell PRS resource, and RSCPD measurement reference cell PRS resource.  NOTE 3: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, and RSCPD measurement neighbor cell PRS resource, PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement, and DL RSCP measurement.  NOTE 4: PRS Ês/Iot for PRS-RSRP measurement, PRS-RSRPP measurement, UE Rx-Tx time difference measurement, DL RSCP measurement, and PRS-RSRP measurement when performed by 1Rx RedCap UE.  NOTE 5: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, RSCPD measurement neighbor cell PRS resource, PRS-RSRP measurement, PRS-RSRPP measurement, UE Rx-Tx time difference measurement when performed with reduced number of samples, and DL RSCP measurement.  NOTE 6: PRS Ês/Iot for RSTD measurement reference cell PRS resource when performed with reduced number of samples, and DL RSCPD measurement reference cell PRS resource.  NOTE 7: PRS Ês/Iot for PRS-RSRP measurement, PRS-RSRPP measurement, UE Rx-Tx time difference measurement when performed with reduced number of samples, and DL RSCP measurement.  NOTE 8: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, UE Rx-Tx measurements when performed by 1Rx RedCap UE, and PRS-RSRPP measurement when performed by 1Rx RedCap UE. | | | | | | |

**Table B.2.14-2: Conditions for NR PRS-based measurements in FR2**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter** | **Angle of arrival** | **NR operating bands** | **Minimum PRP1,2 Note 2, Note 3** | | | | | | **PRS Ês/Iot** | |
| **dBm / SCSPRS** | | | | | | **dB** | |
| **SCSPRS = 120 kHz** | | | | | **SCSPRS = 60 kHz** |
| **UE power class** | | | | | **UE power class** |
| **1** | **2** | **3** | **4** | **5** | **1, 2, 3, 4** |
| **Conditions** | Rx Beam Peak | n257 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 | -117.4+Y5 | (Value for SCSPRS = 120 kHz) - 3dB | ≥ -6 Note4  ≥ -13 Note5  ≥ -3 Note6  ≥ -10 Note8 | ≥ -6 Note7  ≥ -3 Note8  ≥ 0 Note9 |
| n258 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 | -117.6+Y5 |
| n259 |  |  | -108.5 | -124.7+Y4 | -114.5+Y5 |
| n260 | -125.3+Y1 |  | -109.5 | -125.8+Y4 |  |
| n261 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 |  |
| n262 | -123.3+Y1 | -108.6 | -106.6 | -121.8+Y4 |  |
| Spherical coverage Note 1 | n257 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 | -109.4+Z5 | (Value for SCSPRS = 120 kHz) - 3dB | ≥ -6 Note4  ≥ -13 Note5  ≥ -3 Note6  ≥ -10 Note8 | ≥ -6 Note7  ≥ -3 Note8  ≥ 0 Note9 |
| n258 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 |  |
| n259 |  |  | -95.7 | -115.7+Z4 | -101.6+Z5 |
| n260 | -117.3+Z1 |  | -96.9 | -113.8+Z4 |  |
| n261 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 |  |
| n262 | -115.1+Z1 | -94.7 | -93.5 | -109.7+Z4 |  |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.  NOTE 2: Values specified at the Reference point to give minimum PRS Ês/Iot, with no applied noise.  NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ∆MBP,n and spherical coverage values are increased by ∆MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19].  NOTE 4: PRS Ês/Iot for RSTD measurement reference cell PRS resource, and RSCPD measurement reference cell PRS resource.  NOTE 5: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, and RSCPD measurement neighbor cell PRS resource, PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement, and DL RSCP measurement.  NOTE 6: PRS Ês/Iot for PRS-RSRP measurement, PRS-RSRPP measurement and UE Rx-Tx time difference measurement, DL RSCP measurement, and PRS-RSRP measurement when performed by 1Rx RedCap UE.  NOTE 7: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, RSCPD measurement neighbor cell PRS resource, PRS-RSRP measurement, PRS-RSRPP measurement, UE Rx-Tx time difference measurement when performed with reduced number of samples, and DL RSCP measurement.  NOTE 8: PRS Ês/Iot for RSTD measurement reference cell PRS resource when performed with reduced number of samples, and DL RSCPD measurement reference cell PRS resource.  NOTE 9: PRS Ês/Iot for PRS-RSRP measurement, PRS-RSRPP measurement, UE Rx-Tx time difference measurement when performed with reduced number of samples, and DL RSCP measurement.  NOTE 10: PRS Ês/Iot for RSTD measurement neighbor cell PRS resource, UE Rx-Tx measurements when performed by 1Rx RedCap UE, and PRS-RSRPP measurement when performed by 1Rx RedCap UE. | | | | | | | | | | |

*Editor’s notes for Table B.2.14-2:*

*- The value of Y for power classes 1 and 4 is FFS, where Y1 and Y4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively*

*- The value of Z for power classes 1 and 4 is FFS, where Z1 and Z4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively*

## **--- End of Change #7\_1 ---**

## **--- Start of Change #8 ---**

# B.4A Conditions for NR Sidelink Positioning Measurement Procedures and Performance Requirements

## B.4A.1 Conditions for NR SL-PRS based measurements

This clause defines the following condtions for NR SL-PRS based measurement procedures and accuracy requirements: SL-PRP and SL-PRS Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.4A.1-1 for FR1.

Table B.4A.1-1: Conditions for NR SL-PRS based measurements in FR1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Parameter** | **NR operating band groups Note1** | **Minimum SL-PRP1,2** | | | **SL-PRS Ês/Iot** |
| **dBm / SCSSL-PRS** | | | **dB** |
| **SCSSL-PRS = 15 kHz** | **SCSSL-PRS = 30 kHz** | **SCSSL-PRS = 60 kHz** |
| **Conditions** | NR\_TDD\_FR1\_B | -126.5 | -123.5 | -120.5 | ≥ TBD Note2  ≥ TBD Note3 |
| NR\_TDD\_FR1\_J | -122.5 | -119.5 | -116.5 |
| NOTE 1: NR operating band groups are defined in clause 3.5.2.  NOTE 2: SL-PRS Ês/Iot for SL-PRS resource of the reference UE for SL RSTD measurement.  NOTE 3: SL-PRS Ês/Iot for SL-PRS resource of the anchor UE, which is not the reference UE, for SL RSTD measurement, SL PRS-RSRP measurement, SL PRS-RSRPP measurement, SL Rx-Tx time difference measurement, SL AoA measurement, and SL RTOA measurement. | | | | | |

## **--- End of Change #8 ---**